

5-A Public Notices

NATIONAL SCIENCE FOUNDATION**Notice of Intent To Prepare an Environmental Impact Statement and Initiate Section 106 Consultation for Proposed Changes to Arecibo Observatory Operations, Arecibo, Puerto Rico and Notice of Public Scoping Meetings and Comment Period****AGENCY:** National Science Foundation.**ACTION:** Notice of intent to prepare an Environmental Impact Statement and initiate Section 106 consultation for proposed changes to Arecibo Observatory operations, Arecibo, Puerto Rico and notice of public scoping meetings and comment period.

SUMMARY: In compliance with the National Environmental Policy Act of 1969, as amended, the National Science Foundation (NSF) intends to prepare an Environmental Impact Statement (EIS) to evaluate potential environmental effects of proposed changes to operations at Arecibo Observatory, in Arecibo, Puerto Rico. (See supplementary information below for more detail.) By this notice, NSF is announcing the beginning of the scoping process to solicit public comments and identify issues to be analyzed in the EIS. NSF also intends to initiate consultation under Section 106 of the National Historic Preservation Act to evaluate potential effects to the Arecibo Observatory, which is a historic property listed in the National Register of Historic Places.

DATES: This notice initiates the public scoping process for the EIS and the initiation of public involvement under Section 106 per 36 CFR 800.2(d). Comments on issues may be submitted verbally during scoping meetings scheduled for June 7, 2016 (see details below) or in writing until June 23, 2016. To be eligible for inclusion in the Draft EIS, all comments must be received prior to the close of the scoping period. NSF will provide additional opportunities for public participation upon publication of the Draft EIS.

ADDRESSES: You may submit comments related to this proposal by either of the following methods:

- *Email to:* envcomp-AST@nsf.gov, with subject line "Arecibo Observatory."

- *Mail to:* Ms. Elizabeth Pentecost, RE: Arecibo Observatory, National Science Foundation, Suite 1045, 4201 Wilson Blvd., Arlington, VA 22230.

Scoping Meetings: NSF will host two public scoping meetings.

- *Daytime meeting:* June 7, 2016, at 9:30 a.m. to 11:30 a.m., DoubleTree by

Hilton San Juan, 105 Avenida De Diego, San Juan, PR, Phone: (787) 721-6500.

- *Evening meeting:* June 7, 2016, 6:00 p.m. to 8:00 p.m., Colegio de Ingenieros y Agrimensores de Puerto Rico/Puerto Rico Professional College of Engineers and Land Surveyors (Arecibo Chapter), Ave. Manuel T. Guillán Urdáz, Conector 129 Carr. 10, Arecibo, Puerto Rico, Phone: (787) 758-2250.

Comments will be transcribed by a court reporter. Spanish language translation will be provided for simultaneous translation of presentations. Please contact NSF at least one week in advance of the meeting if you would like to request special accommodations (*i.e.*, sign language interpretation, etc.).

FOR FURTHER INFORMATION CONTACT: For further information regarding the EIS process or Section 106 consultation, please contact: Ms. Elizabeth Pentecost, National Science Foundation, Division of Astronomical Sciences, Suite 1045, 4201 Wilson Blvd., Arlington, VA 22230; telephone: (703) 292-4907; email: epenteco@nsf.gov.

SUPPLEMENTARY INFORMATION: The Arecibo Observatory is an NSF-owned scientific research and education facility located in Puerto Rico. In 2011, NSF awarded a five-year Cooperative Agreement to SRI International (SRI), which together with Universities Space Research Association (USRA) and Universidad Metropolitana (UMET) have formed the Arecibo Management Team to operate and maintain the Arecibo Observatory for the benefit of research communities. Arecibo Observatory enables research in three scientific disciplines: Space and atmospheric sciences, radio astronomy, and solar system radar studies; the last of these is largely funded through a research award to USRA from the National Aeronautics and Space Administration. An education and public outreach program complements the Arecibo Observatory scientific program. A key component of the Arecibo Observatory research facility is a 305-meter diameter, fixed, spherical reflector. Arecibo Observatory infrastructure includes instrumentation for radio and radar astronomy, ionospheric physics, office and laboratory buildings, a heavily utilized visitor and education facility, and lodging facilities for visiting scientists.

Through a series of academic community-based reviews, NSF has identified the need to divest several facilities from its portfolio in order to retain the balance of capabilities needed to deliver the best performance on the key science of the present decade and

beyond. In 2012, NSF's Division of Astronomical Sciences' (AST's) portfolio review committee recommended that "continued AST involvement in Arecibo . . . be re-evaluated later in the decade in light of the science opportunities and budget forecasts at that time." In 2016, NSF's Division of Atmospheric and Geospace Sciences' (AGS') portfolio review committee recommended significantly decreasing funding for the Space and Atmospheric Sciences portion of the Arecibo mission. In response to these evolving recommendations, in 2016, NSF completed a feasibility study to inform and define options for the observatory's future disposition that would involve significantly decreasing or eliminating NSF funding of Arecibo. Concurrently, NSF sought viable concepts of operations from the scientific community via a Dear Colleague Letter NSF 16-005 (see www.nsf.gov/AST), with responses due by January 15, 2016. Alternatives to be evaluated in the EIS will be refined through continued public input, with preliminary alternatives that include the following:

- Continued NSF investment for science-focused operations (No-Action Alternative)
- Collaboration with interested parties for continued science-focused operations
- Collaboration with interested parties for transition to education-focused operations
- Mothballing of facilities (suspension of operations in a manner such that operations could resume efficiently at some future date)
- Deconstruction and site restoration

The purpose of the public scoping process is to determine relevant issues that will influence the scope of the environmental analysis, including identification of viable alternatives, and guide the process for developing the EIS. At present, NSF has identified the following preliminary resource areas for analysis of potential impacts: Air quality, biological resources, cultural resources, geological resources, solid waste generation, health and safety, socioeconomics, traffic, and groundwater resources. NSF will consult under Section 106 of the National Historic Preservation Act and Section 7 of the Endangered Species Act in coordination with this EIS process, as appropriate. Federal, state, and local agencies, along with other stakeholders that may be interested or affected by NSF's decision on this proposal are invited to participate in the scoping

process and, if eligible, may request to participate as a cooperating agency.

Proposal Information: Information will be posted, throughout the EIS process, at www.nsf.gov/AST.

Dated: May 18, 2016.

Suzanne H. Plimpton,

Reports Clearance Officer, National Science Foundation.

[FR Doc. 2016-12036 Filed 5-20-16; 8:45 am]

BILLING CODE 7555-01-P

NUCLEAR REGULATORY COMMISSION

[Docket Nos. 50-445, 50-446, and 72-74; License Nos. NPF-87 and NPF-89; NRC-2016-0020]

In the Matter of Luminant Generation Company LLC; Comanche Peak Nuclear Power Plant, Unit Nos. 1 and 2, and Independent Spent Fuel Storage Installation Facility

AGENCY: Nuclear Regulatory Commission.

ACTION: Direct and indirect transfer of license; order.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is issuing an order approving the direct transfer of ownership and indirect transfer of control of Facility Operating License (FOL) Nos. NPF-87 and NPF-89 and the general license for the independent spent fuel storage installation facility from the current holder, Luminant Generation Company LLC, to as-yet unnamed companies, herein identified as Comanche Peak LLC, as owner, and Operating Company LLC, as operator. The NRC will issue conforming amendments to the FOLs for administrative purposes to reflect the proposed license transfer. No physical changes to the facility or operational changes were proposed in the application. The Order is effective upon issuance.

DATES: The Order was issued on May 6, 2016, and is effective for 1 year.

ADDRESSES: Please refer to Docket ID NRC-2016-0020 when contacting the NRC about the availability of information regarding this document. You may obtain publicly-available information related to this document using any of the following methods:

- **Federal Rulemaking Web site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2016-0020. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; email: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the **FOR FURTHER**

INFORMATION CONTACT section of this document.

- **NRC's Agencywide Documents Access and Management System (ADAMS):** You may obtain publicly available documents online in the ADAMS Public Documents collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "ADAMS Public Documents" and then select "Begin Web-based ADAMS Search." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by email to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced in this document (if that document is available in ADAMS) is provided the first time that a document is referenced. The Order was issued to the licensee in a letter dated May 6, 2016 (ADAMS Accession No. ML16096A266).

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Margaret Watford, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-1233, email: Margaret.Watford@nrc.gov.

SUPPLEMENTARY INFORMATION: The text of the Order is attached.

Dated at Rockville, Maryland, this 16th day of May 2016.

For the Nuclear Regulatory Commission.

Margaret M. Watford,

Project Manager, Plant Licensing Branch IV-1, Division of Operating Reactor Licensing, Office of Nuclear Reactor Regulation.

Attachment—Order Approving Transfer of Licenses and Approving Conforming Amendments

United States of America

Nuclear Regulatory Commission

In the Matter of Luminant Generation Company LLC; Comanche Peak Nuclear Power Plant, Unit Nos. 1 and 2

Dockets Nos. 50-445 and 50-446
License Nos. NPF-87 and NPF-89

Order Approving the Transfer of Licenses and Approving Conforming Amendments

I.

Luminant Generation Company LLC (Luminant Power, the licensee) is the holder of the Facility Operating License (FOL) Nos. NPF-87 and NPF-89 of the Comanche Peak Nuclear Power Plant, Unit Nos. 1 and 2 (CPNPP), and the holder of the general license for the independent spent fuel storage installation (ISFSI) facility. CPNPP is located in Somervell County, Texas.

II.

Pursuant to Section 184 of the Atomic Energy Act of 1954, as amended (the Act), and Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.80, "Transfer of licenses," Luminant Generation Company LLC (Luminant Power) requested that the U.S. Nuclear Regulatory Commission (NRC) consent to the transfer of the FOL Nos. NPF-87 and NPF-89 for CPNPP, and the general license for the ISFSI facility (Docket No. 72-74) from the current holder, Luminant Power, to as-yet unnamed companies, herein identified as Comanche Peak LLC (CP LLC), as owner, and Operating Company LLC (OpCo LLC), as operator (together these entities are referred to as "the licensees"). Luminant Power submitted the request by application dated November 12, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15320A093), as supplemented by letters dated December 9, 2015, and March 14, March 29, April 7, and April 20, 2016 (ADAMS Accession Nos. ML15345A048, ML16076A162, ML16091A121, ML16099A291, and ML16112A396, respectively).

Luminant Power is acting on behalf of itself and the future to-be-formed companies. These future to-be-formed companies include the ultimate parent of CP LLC and OpCo LLC, Reorganized Texas Competitive Electric Holdings Corporation (Reorganized TCEH), and the intermediate parents, Intermediate Holding Company LLC, Asset Company LLC, and Preferred Stock Company Corporation (together with Luminant Power these entities are referred to as the "Applicants"). Entity names in the licensee's application and supplements are placeholders.

On April 29, 2014, Luminant Power notified the NRC of its filing of a bankruptcy (ADAMS Accession No. ML14120A212). Luminant Power is owned by Energy Future Competitive Holdings Company LLC (EFCH), through its wholly owned subsidiaries. The EFCH is a direct wholly owned subsidiary of Energy Future Holdings Corporation (EFH). The current and intended ownership structure of the facility is depicted in the simplified organizational charts provided in Exhibits A and B of Enclosure 1 in the submittal dated November 12, 2015. As a result of the proposed transactions and consistent with Exhibit B, EFH and EFCH will no longer ultimately own CPNPP. The licenses will be transferred from Luminant Power to CP LLC, responsible for ownership of the facility, and OpCo LLC, responsible for the operation and maintenance of CPNPP. At the emergence from bankruptcy, Reorganized TCEH, the ultimate parent company of CP LLC, will be owned by a numerous and diverse set of independent and unaffiliated stockholders. No single entity is expected to own a majority of, or exercise control over Reorganized TCEH or its Board of Directors. Current Luminant Power nuclear management and technical personnel will be employed by OpCo LLC. Accordingly, there will be no change in management or technical qualification, and OpCo LLC will continue to be technically qualified to operate the facility. No physical changes to the CPNPP and ISFSI facility or operational changes are proposed in the application.



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Válido del 18 de abril al 30 de julio de 2016 en restaurantes participantes. Para restaurantes participantes llamar al 787-773-0719. Oferta incluye sub de 6", bebida de 16oz o agua embotellada y galleta. Variedad de galletas sujeto a disponibilidad. Precios regulares de los subs fluctúan entre \$3 y \$4; refresco de 16oz o botella de agua es de \$1.50 y galleta es de \$0.75. Sujeto a impuestos sobre la venta. Cargos adicionales por extras o por convertir sandwich en Footlong. Dasani es una marca registrada de The Coca-Cola Company. ©2016 Subway IP Inc. SUBWAY® es una marca registrada de Subway IP Inc.

ENVIRONMENTAL IMPACT STATEMENT (EIS)



In compliance with the National Environmental Policy Act of 1969 (NEPA), as amended, the National Science Foundation (NSF) intends to prepare an Environmental Impact Statement (EIS) to evaluate potential environmental effects of proposed changes to operations at Arecibo Observatory, in Arecibo, Puerto Rico. NSF also intends to initiate consultation under Section 106 of the National Historic Preservation Act (NHPA) to evaluate potential effects to the Arecibo Observatory, which is a historic property listed in the National Register of Historic Places. By this notice, NSF is announcing the beginning of the scoping process to solicit public comments and identify issues to be analyzed in the EIS and the initiation of public involvement under Section 106. Comments on issues may be submitted verbally during scoping meetings scheduled for June 7, 2016 (see details below) or in writing until June 23, 2016. To be eligible for inclusion in the Draft EIS, all comments must be received prior to the close of the scoping period. NSF will provide additional opportunities for public participation upon publication of the Draft EIS.

NSF WILL HOST TWO PUBLIC SCOPING MEETINGS:

Daytime meeting: June 7, 2016, 9:30 am to 11:30 am
Double Tree by Hilton San Juan
105 Avenida De Diego
San Juan, Puerto Rico
Phone: (787) 721-6500

Evening meeting: June 7, 2016, 6:00 pm to 8:00 pm
Colegio de Ingenieros y Agrimensores de Puerto Rico/
Puerto Rico Professional College of Engineers and Land Surveyors (Arecibo Chapter)
Ave. Manuel T. Guillán Urdáz
Conector 129 Carr. 10
Arecibo, Puerto Rico
Phone: (787) 758-2250

You may submit comments related to this proposal by either of the following methods:

Email to: envcomp-AST@nsf.gov, with subject line "Arecibo Observatory"
Mail to: Ms. Elizabeth Pentecost, RE: Arecibo Observatory
National Science Foundation, Suite 1045
4201 Wilson Blvd
Arlington, VA 22230

Project information will be posted, throughout the EIS process, at www.nsf.gov/AST.

Comments will be transcribed by a court reporter. Translation in English and Spanish will be provided during the meeting. Please contact NSF at least one week in advance of the meeting if you would like to request special accommodations (for example, sign language interpretation).

DECLARACIÓN DE IMPACTO AMBIENTAL (DIA)



En cumplimiento con la Ley de Política Ambiental Nacional del 1969 (NEPA, por sus siglas en inglés), según enmendada, la Fundación Nacional de Ciencias (NSF, por sus siglas en inglés) tiene la intención de preparar una Declaración de Impacto Ambiental (DIA) para evaluar los efectos ambientales potenciales de los cambios propuestos a las operaciones en el Observatorio de Arecibo, en Arecibo, Puerto Rico. La NSF también tiene la intención de iniciar consulta bajo la Sección 106 de la Ley de Preservación Histórica Nacional (NHPA, por sus siglas en inglés) para evaluar los efectos potenciales al Observatorio de Arecibo, que es una propiedad histórica que se encuentra en la lista del Registro Nacional de Lugares Históricos.

Mediante esta notificación, la NSF está anunciando el inicio del proceso de definición de alcance para solicitar comentarios públicos e identificar asuntos a ser analizados en la DIA e iniciar el proceso de participación pública bajo la sección 106. Comentarios referentes a los asuntos pueden ser sometidos verbalmente durante las reuniones de definición de alcance programadas para el día 7 de junio de 2016 (ver detalles abajo) o por escrito hasta el día 23 de junio de 2016. Para ser elegible a ser incluido en el Borrador de la DIA, todos los comentarios deben ser recibidos previo al cierre del período de definición de alcance. La NSF va a proveer oportunidades adicionales para la participación pública una vez se publique el Borrador de la DIA.

LA NSF LLEVARÁ A CABO DOS EVENTOS DE DEFINICIÓN DE ALCANCE:

Reunión diurna: 7 de junio de 2016, 9:30 am a 11:30 am
DoubleTree by Hilton San Juan
105 Avenida De Diego
San Juan, Puerto Rico
Teléfono: (787) 721-6500

Reunión nocturna: 7 de junio de 2016, 6:00 pm to 8:00 pm
Colegio de Ingenieros y Agrimensores de Puerto Rico
Ave. Manuel T. Guillán Urdáz
Conector 129 Carr. 10
Arecibo, Puerto Rico
Teléfono: (787) 758-2250

Puede someter sus comentarios relacionados a esta propuesta por cualquiera de los siguientes métodos:

Correo electrónico a: envcomp-AST@nsf.gov, especifique en la línea del asunto "Arecibo Observatory"
Correo a: Ms. Elizabeth Pentecost, RE: Arecibo Observatory
National Science Foundation, Suite 1045
4201 Wilson Blvd
Arlington, VA 22230

La información del proyecto va a ser publicada, a través del proceso de DIA, en www.nsf.gov/AST.

Los comentarios van a ser transcritos por un reportero de la corte. Se va a proveer traducción en inglés y español durante la reunión. Por favor contacte a la NSF con al menos una semana de anticipación a la reunión si usted desea solicitar servicios especiales (como por ejemplo, interpretación de lenguaje de señas).

HABLA POR ELLOS.

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Mediante esta notificación, la NSF está anunciando el inicio del proceso de definición de alcance para solicitar comentarios públicos e identificar asuntos a ser analizados en la DIA e iniciar el proceso de participación pública bajo la sección 106. Comentarios referentes a los asuntos pueden ser sometidos verbalmente durante las reuniones de definición de alcance programadas para el día 7 de junio de 2016 (ver detalles abajo) o por escrito hasta el día 23 de junio de 2016. Para ser elegible a ser incluido en el Borrador de la DIA, todos los comentarios deben ser recibidos previo al cierre del periodo de definición de alcance. La NSF va a proveer oportunidades adicionales para la participación pública una vez se publique el Borrador de la DIA.

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Teléfono: (787) 758-2250

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Correo electrónico a: envcomp-AST@nsf.gov, especifique en la línea del asunto "Arecibo Observatory"
Correo a: Ms. Elizabeth Pentecost, RE: Arecibo Observatory
National Science Foundation, Suite 1045
4201 Wilson Blvd
Arlington, VA 22230

La información del proyecto va a ser publicada, a través del proceso de DIA, en www.nsf.gov/AST.

Los comentarios van a ser transcritos por un reportero de la corte. Se va a proveer traducción en inglés y español durante la reunión. Por favor contacte a la NSF con al menos una semana de anticipación a la reunión si usted desea solicitar servicios especiales (como por ejemplo, interpretación de lenguaje de señas).

(OMB) provide interested Federal agencies and the public an early opportunity to comment on information collection requests. OMB may amend or waive the requirement for public consultation to the extent that public participation in the approval process would defeat the purpose of the information collection, violate State or Federal law, or substantially interfere with any agency's ability to perform its statutory obligations. The Assistant Chief of Staff, Administration publishes that notice containing proposed information collection requests prior to submission of these requests to OMB. Each proposed information collection contains the following: (1) Type of review requested, *e.g.* new, revision extension, existing or reinstatement; (2) Title; (3) Summary of the collection; (4) Description of the need for, and proposed use of, the information; (5) Respondents and frequency of collection; and (6) Reporting and/or Recordkeeping burden. OMB invites public comment.

Currently, the National Mediation Board is soliciting comments concerning the proposed extension of the Application for Alternative Dispute Resolution (ADR) Services and is interested in public comment addressing the following issues: (1) Is this collection necessary to the proper functions of the agency; (2) will this information be processed and used in a timely manner; (3) is the estimate of burden accurate; (4) how might the agency enhance the quality, utility, and clarity of the information to be collected; and (5) how might the agency minimize the burden of this collection on the respondents, including through the use of information technology.

Dated: October 25, 2016.

Samantha Jones,

*Assistant Chief of Staff, Administration,
National Mediation Board.*

A. Application for ADR Services

Type of Review: Extension.

Title: Application for ADR Services.

Frequency: On occasion.

Affected Public: Union Officials and Officials of Railroads and Airlines.

Reporting and Recordkeeping Hour Burden: Responses: Estimate about 45 annually.

Burden Hours: 9.

Abstract: The Railway Labor Act, 45 U.S.C., 151a. General Purposes, provides that the purposes of the Act are (1) to avoid any interruption to commerce or to the operation of any carrier engaged therein. * * * (4) to provide for the prompt and orderly settlement of all disputes concerning

rates of pay, rules, or working conditions, and (5) to provide for the prompt and orderly settlement of all disputes growing out of grievances or out of the interpretation or application of agreements concerning rates of pay, rules, or working conditions. In fulfilling its role to administer the Act, the National Mediation Board offers the parties to disputes mediation and arbitration services. On a voluntary basis, training programs in Alternative Dispute Resolution (ADR) and facilitation services are also available. These ADR programs are designed to enhance the bargaining and grievance handling skill level of the disputants and to assist the parties in the resolution of disputes. The impact of these ADR programs is that mediation and arbitration can be avoided entirely or the scope and number of issues brought to mediation or arbitration is significantly reduced. This collection is necessary to confirm the voluntary participation of the parties in the ADR process. The information provided by the parties is used by the NMB to schedule the parties for ADR training and facilitation. Based on a recent survey of those who participated in the NMB's ADR Programs, 94.6% said they were satisfied with the ADR Programs and said they recommend the program for all negotiators. Collecting the brief information on the Application for ADR Services form allows the parties to voluntarily engage the services of the NMB in the orderly settlement of all disputes and fulfill the purposes of the Act.

Requests for copies of the proposed information collection request may be accessed from www.nmb.gov or should be addressed to Denise Murdock, NMB, 1301 K Street NW., Suite 250 E, Washington, DC 20005 or addressed to the email address murdock@nmb.gov or faxed to 202-692-5081. Please specify the complete title of the information collection when making your request.

Comments regarding burden and/or the collection activity requirements should be directed to Samantha Jones at 202-692-5010 or via Internet address jones@nmb.gov. Individuals who use a telecommunications device for the deaf (TDD/TDY) may call the Federal Information Relay Service (FIRS) at 1-800-877-8339.

[FR Doc. 2016-26115 Filed 10-27-16; 8:45 am]

BILLING CODE 7550-01-P

NATIONAL SCIENCE FOUNDATION

Notice of Availability and Notice of Public Meetings for the Draft Environmental Impact Statement (DEIS) for the Arecibo Observatory, Arecibo, Puerto Rico

AGENCY: National Science Foundation.

ACTION: Notice of Availability and Notice of Public Meetings.

SUMMARY: The National Science Foundation (NSF) has made available for public review and comment the Draft Environmental Impact Statement (DEIS) for Arecibo Observatory. This Draft Environmental Impact Statement (DEIS) has been prepared for the National Science Foundation (NSF) to evaluate the potential environmental effects of proposed operational changes due to funding constraints for the Arecibo Observatory in Arecibo, Puerto Rico. The DEIS was prepared in compliance with the National Environmental Policy Act of 1969. Consultation under Section 106 of the National Historic Preservation Act (NHPA) is being conducted concurrent to the NEPA process.

DATES: NSF will accept comments on the DEIS for 45 days following publication of this Notice of Availability. Comments may be submitted verbally during public meetings scheduled for November 16–17 (see **SUPPLEMENTARY INFORMATION** for more details) or in writing. Substantive comments will be addressed in a Final Environmental Impact Statement (FEIS).

ADDRESSES: You may submit comments by either of the following methods:

- *Email to:* envcomp-AST@nsf.gov with subject line "Arecibo Observatory"
- *Mail to:* Ms. Elizabeth Pentecost, RE: Arecibo Observatory, National Science Foundation, Suite 1045, 4201 Wilson Blvd., Arlington, VA 22230.

EIS Information: The DEIS, as well as information about the public meetings, is posted at www.nsf.gov/AST. A Spanish translation of the Executive Summary of the DEIS will be posted to the Web site.

A copy of the DEIS will be available for review at the following libraries in Puerto Rico:

Biblioteca Electrónica Pública
Municipal Nicolás Nadal Barreto, 210
Calle Santiago Iglesias, Arecibo, PR,
Phone: (787) 878-1178
Archivo General y Biblioteca Nacional
de PR, 500 Avenida Juan Ponce De
León, San Juan, PR, Phone: (787) 725-
1060 ext. 2001

FOR FURTHER INFORMATION CONTACT: For further information regarding the EIS

process or Section 106 consultation, please contact: Ms. Elizabeth Pentecost, National Science Foundation, Division of Astronomical Sciences, Suite 1045, 4201 Wilson Blvd., Arlington, VA 22230; telephone: (703) 292-4907; email: epenteco@nsf.gov.

SUPPLEMENTARY INFORMATION: The Arecibo Observatory is an NSF-owned scientific research and education facility located in Puerto Rico. In 2011, NSF awarded a Cooperative Agreement to SRI International (SRI), which together with Universities Space Research Association (USRA) and Universidad Metropolitana (UMET) formed the Arecibo Management Team to operate and maintain the Arecibo Observatory for the benefit of research communities. The initial 5-year period of performance of the Cooperative Agreement has recently been extended 18 months, to 31 March 2018. Arecibo Observatory enables research in three scientific disciplines: Space and atmospheric sciences, radio astronomy, and solar system radar studies; the last of these is largely funded through a research award to USRA from the National Aeronautics and Space Administration. An education and public outreach program complements the Arecibo Observatory scientific program. A key component of the Arecibo Observatory research facility is a 305-meter diameter, fixed, spherical reflector. Arecibo Observatory infrastructure includes instrumentation for radio and radar astronomy, ionospheric physics, office and laboratory buildings, a heavily utilized visitor and education facility, and lodging facilities for visiting scientists.

Through a series of academic community-based reviews, NSF has identified the need to divest of several facilities from its portfolio in order to retain the balance of capabilities needed to deliver the best performance on the key science of the present decade and beyond. In 2012, NSF's Division of Astronomical Sciences' (AST's) portfolio review committee recommended that "continued AST involvement in Arecibo . . . be re-evaluated later in the decade in light of the science opportunities and budget forecasts at that time. In 2016, NSF's Division of Atmospheric and Geospace Sciences' (AGS') portfolio review committee recommended significantly decreasing funding for the Space and Atmospheric Sciences portion of the Arecibo mission. In response to these evolving recommendations, in 2016, NSF completed a feasibility study to inform and define options for the observatory's future disposition that would involve significantly decreasing

or eliminating NSF funding of Arecibo. Concurrently, NSF sought viable concepts of operations from the scientific community via a Dear Colleague Letter NSF 16-005 (see www.nsf.gov/AST), with responses due in January 2016. NSF issued a Notice of Intent to prepare an EIS on May 23, 2016, held scoping meetings on June 7, 2016 and held a 30-day public comment period that closed on June 23, 2016. In October 2016, NSF issued Dear Colleague Letter NSF 16-144 (see www.nsf.gov/AST) to notify the Observatory stakeholder community that NSF intends to issue a follow-up solicitation, requesting the submission of formal proposals involving the continued operation of Arecibo Observatory. The intent of this solicitation will be to input additional information into the decision process for the ultimate disposition of Arecibo Observatory.

Proposed Alternatives to be analyzed in the DEIS include:

- Continued NSF investment for science-focused operations (No-Action Alternative).
- Collaboration with interested parties for continued science-focused operations (Agency Preferred Alternative).
- Collaboration with interested parties for transition to education-focused operations.
- Mothballing of facilities (suspension of operations in a manner such that operations could resume efficiently at some future date).
- Partial deconstruction and site restoration.
- Full deconstruction and site restoration.

No final decisions will be made regarding the proposed changes to operations at Arecibo Observatory prior to issuance of a Final Environmental Impact Statement and, subsequently, a Record of Decision for the Proposed Action.

Public Meetings: Public meetings to address the DEIS will take place in Puerto Rico with notification of the times and locations published in the local newspapers, as follows:

(1) Colegio de Ingenieros y Agrimensores de Puerto Rico/Puerto Rico Professional College of Engineers and Land Surveyors (Arecibo Chapter), Ave. Manuel T. Guillan Urdaz, Conector 129 Carr. 10, Arecibo, Puerto Rico, Phone: (787) 758-2250, November 16, 6:00 p.m. to 8:00 p.m.

(2) Doubletree by Hilton Hotel San Juan, 105 Avenida De Diego, San Juan, PR, Phone: (787) 721-6500, November 17, from 10:00 a.m. to 12:00 p.m.

The meetings will be transcribed by a court reporter. Spanish language translation will be provided. Please contact NSF at least one week in advance of the meeting if you would like to request special accommodations (*i.e.*, sign language interpretation, etc.).

A separate consultation meeting, pursuant to Section 106 of the NHPA, will be held from 1:00 p.m. to 2:30 p.m. at the Doubletree by Hilton Hotel San Juan, 105 Avenida De Diego, San Juan, PR on November 17, 2016, beginning one hour after the public meeting on the DEIS. All persons and entities that are consulting parties or are interested in becoming consulting parties are invited to attend. Spanish language translation will also be provided for this meeting.

Dated: October 24, 2016.

Suzanne H. Plimpton,

Reports Clearance Officer, National Science Foundation.

[FR Doc. 2016-26061 Filed 10-27-16; 8:45 am]

BILLING CODE 7555-01-P

NUCLEAR REGULATORY COMMISSION

[NRC-2016-0001]

Sunshine Act Meeting Notice

Date: October 31, November 7, 14, 21, 28, December 5, 2016.

Place: Commissioners' Conference Room, 11555 Rockville Pike, Rockville, Maryland.

Status: Public and Closed.

Week of October 31, 2016

Friday, November 4, 2016

10:00 a.m. Briefing on Security Issues (Closed Ex. 1)

Week of November 7, 2016—Tentative

There are no meetings scheduled for the week of November 7, 2016.

Week of November 14, 2016—Tentative

There are no meetings scheduled for the week of November 14, 2016.

Week of November 21, 2016—Tentative

There are no meetings scheduled for the week of November 21, 2016.

Week of November 28, 2016—Tentative

Tuesday, November 29, 2016

9:00 a.m. Briefing on Uranium Recovery (Public Meeting) (Contact: Samantha Crane: 301-415-6380)

This meeting will be webcast live at the Web address—<http://www.nrc.gov/>.

FUNDACION NACIONAL DE CIENCIAS
(NSF)

DECLARACION DE IMPACTAO AMBIENTAL (DIA)

En cumplimiento con la Ley de Política Ambiental Nacional del 1969 (NEPA, por sus siglas en inglés), según enmendada, la Fundación Nacional de Ciencias (NFS, por sus siglas en inglés) tiene la intención de preparar un Declaración de Impacto Ambiental (DIA) para evaluar los efectos ambientales potenciales de los cambios propuestos a las operaciones en el Observatorio de Arecibo, en Arecibo Puerto Rico.

AFIDAVIT

Yo, Carmencita Santana Rosado, habiendo prestado el debido juramento declaro:

Que soy Representante del periódico "EL NUEVO DIA" que se publica en Guaynabo, P.R.; que en las ediciones de este periódico correspondientes a los días:

24 DE MAYO DE 2016

se dio publicidad al anuncio expedido por

MS. ELIZABETH PENTECOST, RE: ARECIBO OBSERVATORY

en el caso arriba mencionado y copia del cual se une al presente afidávit para que forme parte del mismo.

Guaynabo, P.R. 24 MAYO 2016 20__

Carmencita Santana Rosado

Afidávit No. 80,583 del Registro.

Jurado y reconocido ante mi por Carmencita Santana Rosado, vecina de San Juan, mayor de edad, soltera, Representante del periódico "EL NUEVO DIA", a quien doy fe de conocer personalmente.

Guaynabo, P.R. 24 MAYO 2016 20__

J.D.

NOTARIO



FUNDACION NACIONAL DE CIENCIAS
(NSF)

DECLARACION DE IMPACTAO AMBIENTAL (DIA)

En cumplimiento con la Ley de Política Ambiental Nacional del 1969 (NEPA, por sus siglas en inglés), según enmendada, la Fundación Nacional de Ciencias (NSF, por sus siglas en inglés) tiene la intención de preparar un Declaración de Impacto Ambiental (DIA) para evaluar los efectos ambientales potenciales de los cambios propuestos a las operaciones en el Observatorio de Arecibo, en Arecibo Puerto Rico.

AFIDAVIT

Yo, Carmencita Santana Rosado, habiendo prestado el debido juramento declaro:

Que soy Representante del periódico "EL NORTE" que se publica en Guaynabo, P.R.: que en las ediciones de este periódico correspondientes a los días:

26 DE MAYO DE 2016

se dio publicidad al anuncio expedido por

MS. ELIZABETH PENTECOST, RE: ARECIBO OBSERVATORY

en el caso arriba mencionado y copia del cual se une al presente afidávit para que forme parte del mismo.

Guaynabo, P.R. 26 MAYO 2016 20__



Afidávit No. 80,736 del Registro.

Jurado y reconocido ante mi por Carmencita Santana Rosado, vecina de San Juan, mayor de edad, soltera, Representante del periódico "EL NORTE", a quien doy fe de conocer personalmente.

Guaynabo, P.R. 26 MAYO 2016 20__



NOTARIO





In compliance with the National Environmental Policy Act of 1969 (NEPA), as amended, the National Science Foundation (NSF) has prepared a Draft Environmental Impact Statement (DEIS) to evaluate the potential environmental effects of proposed operational changes due to funding constraints for the Arecibo Observatory, in Arecibo, Puerto Rico. Concurrent with the NEPA process, NSF has also initiated consultation under Section 106 of the National Historic Preservation Act (NHPA) to evaluate potential effects to the Arecibo Observatory, which is a historic property listed in the National Register of Historic Places.

By this notice, NSF is announcing the beginning of the public comment period to solicit public comments on the Draft EIS and continuation of public involvement under Section 106 by means of a meeting with Consulting Parties. Comments may be submitted verbally during the public meetings and Consulting Parties meeting scheduled for November 16-17, 2016 (see details below) or in writing until December 12, 2016. To be eligible for inclusion in the Final EIS, all comments must be received prior to the close of the public comment period.

The DEIS is posted at www.nsf.gov/AST (see "AST Facilities - Environmental Reviews") and copies are available for review at the following libraries in Puerto Rico:

Biblioteca Electrónica Pública Municipal Nicolás Nadal Barreto 210 Calle Santiago Iglesias Arecibo, PR Phone: (787) 878-1178	Archivo General y Biblioteca Nacional de Puerto Rico 500 Avenida Juan Ponce De León San Juan, PR Phone: (787) 725-1060 ext. 2001
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NSF will host two public meetings on the DEIS and one consulting parties meeting on Section 106 of the NHPA:

DEIS Evening meeting: November 16, 2016 from 6:00 pm to 8:00 pm
Colegio de Ingenieros y Agrimensores de Puerto Rico
Puerto Rico Professional College of Engineers and Land Surveyors (Arecibo Chapter)
Ave. Manuel T. Guillán Urdáz
Conector 129 Carr. 10
Arecibo, Puerto Rico
Phone: (787) 758-2250

DEIS Daytime meeting: November 17, 2016 from 10:00 am to 12:00 pm
DoubleTree by Hilton San Juan
105 Avenida De Diego
San Juan, Puerto Rico
Phone: (787) 721-6500

Comments will be transcribed by a court reporter. Translation in English and Spanish will be provided during the meeting. Please contact NSF at least one week in advance of the meeting if you would like to request special accommodations (for example, sign language interpretation).

Section 106 of the NHPA Consulting Parties meeting:
November 17, 2016 from 1:00 pm to 2:30 pm
DoubleTree by Hilton San Juan
105 Avenida De Diego
San Juan, Puerto Rico
Phone: (787) 721-6500

All persons and entities that are consulting parties or are interested in becoming consulting parties are invited to attend. Spanish language translation will also be provided for this meeting.

For further information regarding the EIS process or Section 106 consultation, and to submit comments on the DEIS, please contact:

Regular Mail:	Ms. Elizabeth Pentecost RE: Arecibo Observatory National Science Foundation, Division of Astronomical Sciences Suite 1045 4201 Wilson Blvd. Arlington, VA 22230
Email:	Envcomp-AST@nsf.gov , with subject line "Arecibo Observatory"
Telephone:	(703) 292-4907

Project information, including the DEIS and information about the public meeting is posted at www.nsf.gov/AST; meeting materials will also be posted following the meeting. A Notice of Availability has been published and is available on the Federal Register.



En cumplimiento con la Ley Nacional de Política Ambiental del 1969 (NEPA, por sus siglas en inglés), según enmendada, la Fundación Nacional de Ciencias (NSF, por sus siglas en inglés) ha preparado un Borrador de la Declaración de Impacto Ambiental (BDIA) para evaluar los potenciales efectos ambientales de los cambios operacionales propuestos debido a restricciones en el presupuesto asignado al Observatorio de Arecibo, en Arecibo, Puerto Rico. Concurrentemente con el proceso de NEPA, la NSF también ha iniciado un proceso de consulta bajo la Sección 106 de la Ley Nacional de Preservación Histórica (NHPA, por sus siglas en inglés) para evaluar los efectos potenciales al Observatorio de Arecibo, la cual es una propiedad histórica que ese encuentra en la lista del Registro Nacional de Lugares Históricos.

Mediante esta notificación, la NSF está anunciando el inicio del periodo de comentario público para solicitar comentarios del público sobre el BDIA y continuar con la participación del público bajo la Sección 106 a través de una reunión con las Partes Consultantes. Los comentarios pueden ser sometidos verbalmente durante las reuniones públicas con las Partes Consultantes programadas para los días 16 y 17 de noviembre de 2016 (ver detalles abajo) o por escrito hasta el 12 de diciembre de 2016. Para ser elegible para ser incluido en la DIA Final, todos los comentarios deben ser recibidos previo al cierre del periodo de comentario público.

El BDIA se puede acceder en la página de Internet www.nsf.gov/AST (ver "AST Facilities -- Environmental Reviews") y copias impresas están disponibles para revisión en las siguientes bibliotecas en Puerto Rico:

Biblioteca Electrónica Pública Municipal Nicolás Nadal Barreto 210 Calle Santiago Iglesias Arecibo, PR Teléfono: (787) 878-1178	Archivo General y Biblioteca Nacional de Puerto Rico 500 Avenida Juan Ponce De León San Juan, PR Teléfono: (787) 725-1060 ext. 2001
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La NSF llevará a cabo dos reuniones públicas sobre el BDIA y una reunión de las Partes Consultantes de la Sección 106 del NHPA:

Reunión nocturna sobre el BDIA:
16 de noviembre de 2016, de 6:00 pm a 8:00 pm
Colegio de Ingenieros y Agrimensores de Puerto Rico
(Capítulo de Arecibo)
Ave. Manuel T. Guillán Urdáz
Conector 129 Carr. 10
Arecibo, Puerto Rico
Teléfono: (787) 758-2250

Reunión diurna sobre el BDIA:
17 de noviembre de 2016, de 10:00 am a 12:00 pm
DoubleTree by Hilton San Juan
105 Avenida De Diego
San Juan, Puerto Rico
Teléfono: (787) 721-6500

Los comentarios van a ser transcritos por un taquígrafo. Se proveerá traducción en inglés y español durante la reunión. Favor contactar la NSF con al menos una semana de anticipación a la reunión si usted desea solicitar servicios especiales (como por ejemplo, interpretación de lenguaje de señas).

Reunión de las Partes Consultantes de la Sección 106:
November 17, 2016 de 1:00 pm a 2:30 pm
DoubleTree by Hilton San Juan
105 Avenida De Diego
San Juan, Puerto Rico
Teléfono: (787) 721-6500

Se invita a todas las personas y entidades que sean Partes Consultantes o que estén interesadas en convertirse en Partes Consultantes a asistir a esta reunión. También se proveerá traducción al español para esta reunión.

Para información adicional acerca del proceso de la DIA o de la consulta de la Sección 106, y para someter comentarios sobre el BDIA, favor de contactar:

Correo Regular:	Ms. Elizabeth Pentecost RE: Arecibo Observatory National Science Foundation, Division of Astronomical Sciences Suite 1045 4201 Wilson Blvd. Arlington, VA 22230
Email:	Envcomp-AST@nsf.gov , especif que en la línea del asunto: "Arecibo Observatory"
Teléfono:	(703) 292-4907

La información del Proyecto, incluyendo el BDIA y la información sobre la reunión pública están disponibles en la página de Internet www.nsf.gov/AST; los materiales de la reunión también estarán disponibles luego de la reunión en la misma página. Una Notificación de Disponibilidad ha sido publicada y está disponible en el Registro Federal.

Entregan terna al gobernador

Junta Fiscal presenta nombres de candidatos para ser el coordinador de revitalización

José A. Delgado
jdelgado@elnuevodia.com
Twitter: @JoseADelgadoEND

WASHINGTON.- El gobernador Alejandro García Padilla recibió anoche, de manos de la junta federal que controla las finanzas de su gobierno, un listado de tres candidatos al puesto de coordinador de revitalización de infraestructura, que podrá impulsar proyectos que se consideran claves para el desarrollo económico de Puerto Rico.

Los nombres fueron enviados por la Junta de Supervisión Fiscal -el nombre que le da la ley PROMESA a la nueva autoridad federal a cargo de las finanzas de la Isla-, justo al vencerse el plazo que tenían para someter al gobernador una terna de personas que consideran aptas para la posición.

Los tres candidatos son: **Aaron Bieleberg**, **Joseph Fontana** y **Riz Shah**. Los tres tienen por lo menos 14 años de experiencia en asuntos de infraestructura.

García Padilla tiene 10 días para notificarle a la Junta de Supervisión Fiscal a quien ha seleccionado.

Si no lo hace, entonces la junta podrá seleccionar el funcionario directamente. El coordinador de revitalización podrá impulsar proyectos de infraestructura de forma expedita, por encima de las normas del gobierno local.

No obstante, la junta dio a entender que el nombramiento que haga ahora puede ser interino y que más adelante puede proponer -al próximo gobernador- otro candidato.

Por otro lado, la junta federal anunció que la empresa Heidrick & Struggles le asiste en la búsqueda del candidato a director ejecutivo, al puesto permanente de coordinador de revitalización, y el asesor legal interno. Se trata de nombramientos que esperan completarse entre 90 y 120 días.

Según los mandatos de la junta, García Padilla tenía también hasta ayer para enviarle los informes de ingresos y gastos del gobierno de la Isla para el año fiscal que empezó el 1 de julio.

NOMBRES SUGERIDOS

AARON BIELEBERG
● Socio de la empresa especializada en proyectos de infraestructura McKinsey, con oficina en Washington D.C.

JOSEPH FONTANA
● Tiene 30 años de experiencia en proyectos de energía, acueductos y alcantarillados, finanzas y transacciones corporativas para la empresa Ernst & Young

RIZ SHAH
● Ingeniero arquitectónico a cargo del sector público de infraestructura en la oficina de Washington D.C. de la empresa PwC's Capital Projects & Infrastructure

QUIEBRAS

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 **Fundación de Niños SAN JORGE**



In compliance with the National Environmental Policy Act of 1969 (NEPA), as amended, the National Science Foundation (NSF) has prepared a Draft Environmental Impact Statement (DEIS) to evaluate the potential environmental effects of proposed operational changes due to funding constraints for the Arecibo Observatory, in Arecibo, Puerto Rico. Concurrent with the NEPA process, NSF has also initiated consultation under Section 106 of the National Historic Preservation Act (NHPA) to evaluate potential effects to the Arecibo Observatory, which is a historic property listed in the National Register of Historic Places.

By this notice, NSF is announcing the beginning of the public comment period to solicit public comments on the Draft EIS and continuation of public involvement under Section 106 by means of a meeting with Consulting Parties. Comments may be submitted verbally during the public meetings and Consulting Parties meeting scheduled for November 16-17, 2016 (see details below) or in writing until December 12, 2016. To be eligible for inclusion in the Final EIS, all comments must be received prior to the close of the public comment period.

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NSF will host two public meetings on the DEIS and one consulting parties meeting on Section 106 of the NHPA:

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Colegio de Ingenieros y Agrimensores de Puerto Rico
Puerto Rico Professional College of Engineers and Land Surveyors (Arecibo Chapter)
Ave. Manuel T. Guillán Urdáz
Conector 129 Carr. 10
Arecibo, Puerto Rico
Phone: (787) 758-2250

DEIS Daytime meeting: November 17, 2016 from 10:00 am to 12:00 pm
DoubleTree by Hilton San Juan
105 Avenida De Diego
San Juan, Puerto Rico
Phone: (787) 721-6500

Comments will be transcribed by a court reporter. Translation in English and Spanish will be provided during the meeting. Please contact NSF at least one week in advance of the meeting if you would like to request special accommodations (for example, sign language interpretation).

Section 106 of the NHPA Consulting Parties meeting:
November 17, 2016 from 1:00 pm to 2:30 pm
DoubleTree by Hilton San Juan
105 Avenida De Diego
San Juan, Puerto Rico
Phone: (787) 721-6500

All persons and entities that are consulting parties or are interested in becoming consulting parties are invited to attend. Spanish language translation will also be provided for this meeting.


For further information regarding the EIS process or Section 106 consultation, and to submit comments on the DEIS, please contact:

Regular Mail: Ms. Elizabeth Pentecost
RE: Arecibo Observatory
National Science Foundation, Division of
Astronomical Sciences
Suite 1045
4201 Wilson Blvd.
Arlington, VA 22230

Email: Envcomp-AST@nsf.gov, with subject line "Arecibo Observatory"
(703) 292-4907

Telephone: (703) 292-4907

Project information, including the DEIS and information about the public meeting is posted at www.nsf.gov/AST; meeting materials will also be posted following the meeting. A Notice of Availability has been published and is available on the Federal Register.



En cumplimiento con la Ley Nacional de Política Ambiental del 1969 (NEPA, por sus siglas en inglés), según enmendada, la Fundación Nacional de Ciencias (NSF, por sus siglas en inglés) ha preparado un Borrador de la Declaración de Impacto Ambiental (BDIA) para evaluar los potenciales efectos ambientales de los cambios operacionales propuestos debido a restricciones en el presupuesto asignado al Observatorio de Arecibo, en Arecibo, Puerto Rico. Concurrentemente con el proceso de NEPA, la NSF también ha iniciado un proceso de consulta bajo la Sección 106 de la Ley Nacional de Preservación Histórica (NHPA, por sus siglas en inglés) para evaluar los efectos potenciales al Observatorio de Arecibo, la cual es una propiedad histórica que se encuentra en la lista del Registro Nacional de Lugares Históricos.

Mediante esta notificación, la NSF está anunciando el inicio del período de comentario público para solicitar comentarios del público sobre el BDIA y continuar con la participación del público bajo la Sección 106 a través de una reunión con las Partes Consultantes. Los comentarios pueden ser sometidos verbalmente durante las reuniones públicas con las Partes Consultantes programadas para los días 16 y 17 de noviembre de 2016 (ver detalles abajo) o por escrito hasta el 12 de diciembre de 2016. Para ser elegible para ser incluido en la DIA Final, todos los comentarios deben ser recibidos previo al cierre del período de comentario público.

El BDIA se puede acceder en la página de Internet www.nsf.gov/AST (ver "AST Facilities -- Environmental Reviews") y copias impresas están disponibles para revisión en las siguientes bibliotecas en Puerto Rico:

Biblioteca Electrónica Pública Municipal Nicolás Nadal Barreto 210 Calle Santiago Iglesias Arecibo, PR Teléfono: (787) 878-1178	Archivo General y Biblioteca Nacional de Puerto Rico 500 Avenida Juan Ponce De León San Juan, PR Teléfono: (787) 725-1060 ext. 2001
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La NSF llevará a cabo dos reuniones públicas sobre el BDIA y una reunión de las Partes Consultantes de la Sección 106 del NHPA:

Reunión nocturna sobre el BDIA:
16 de noviembre de 2016, de 6:00 pm a 8:00 pm
Colegio de Ingenieros y Agrimensores de Puerto Rico
(Capítulo de Arecibo)
Ave. Manuel T. Guillán Urdáz
Conector 129 Carr. 10
Arecibo, Puerto Rico
Teléfono: (787) 758-2250

Reunión diurna sobre el BDIA:
17 de noviembre de 2016, de 10:00 am a 12:00 pm
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San Juan, Puerto Rico
Teléfono: (787) 721-6500

Los comentarios van a ser transcritos por un taquígrafo. Se proveerá traducción en inglés y español durante la reunión. Favor contactar la NSF con al menos una semana de anticipación a la reunión si usted desea solicitar servicios especiales (como por ejemplo, interpretación de lenguaje de señas).

Reunión de las Partes Consultantes de la Sección 106:
November 17, 2016 de 1:00 pm a 2:30 pm
DoubleTree by Hilton San Juan
105 Avenida De Diego
San Juan, Puerto Rico
Teléfono: (787) 721-6500

Se invita a todas las personas y entidades que sean Partes Consultantes o que estén interesadas en convertirse en Partes Consultantes a asistir a esta reunión. También se proveerá traducción al español para esta reunión.

Para información adicional acerca del proceso de la DIA o de la consulta de la Sección 106, y para someter comentarios sobre el BDIA, favor de contactar:

Correo Regular: Ms. Elizabeth Pentecost
RE: Arecibo Observatory
National Science Foundation, Division of
Astronomical Sciences
Suite 1045
4201 Wilson Blvd.
Arlington, VA 22230

Email: Envcomp-AST@nsf.gov, especific que en la línea del asunto: "Arecibo Observatory"
(703) 292-4907

Teléfono: (703) 292-4907

La información del Proyecto, incluyendo el BDIA y la información sobre la reunión pública están disponibles en la página de Internet www.nsf.gov/AST; los materiales de la reunión también estarán disponibles luego de la reunión en la misma página. Una Notificación de Disponibilidad ha sido publicada y está disponible en el Registro Federal.



GOBIERNO DE PUERTO RICO

DEPARTAMENTO DE EDUCACIÓN
Secretaría Auxiliar de Asuntos Federales

AVISO

SOLICITUD DE PROPUESTAS DE SERVICIOS PROFESIONALES PARA OFRECER TALLERES A PADRES Y MIEMBROS DE LAS FAMILIAS

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Los talleres deben enfocarse en el rol de la familia, en su desarrollo, en el rendimiento académico y el desarrollo socioemocional de sus hijos. Los mismos deben estar basados en la Política Pública vigente del DEPR sobre la participación de padres y familia y en los Estándares Nacionales para las Asociaciones Familia-Escuela (*National Standards for Family-School Partnerships*).

Las entidades elegibles para presentar las propuestas son:

- Instituciones de educación superior licenciadas por el Consejo de Educación Superior (CES),
- Entidades públicas,
- Entidades privadas,
- Organizaciones de base comunitaria (con o sin fines de lucro) con capacidad para ofrecer servicios de desarrollo profesional.

Los individuos no son elegibles para presentar propuestas.

La Secretaría Auxiliar de Asuntos Federales (SAAF), ofrecerá una reunión de orientación sobre esta convocatoria y los documentos necesarios para la preparación de las propuestas el **viernes, 30 de junio de 2017, a las 9:00 a. m.** en la escuela Libre de Música Ernesto Ramos Antonini ubicada en la Avenida Chardón #125 en Hato Rey, Puerto Rico.

Toda propuesta presentada debe ser un trabajo original de la entidad. En la eventualidad que se descubra un plagio, el DEPR tiene derecho a remover la propuesta y a no considerarla para evaluación. Las entidades elegibles que tienen un proyecto vigente en el DEPR deberán someter, junto con la propuesta, evidencia de tener capacidad fiscal y administrativa para operar más de un proyecto.

Capacidad de proveer los servicios

El DEPR se asegurará de que el recurso o firma a contratarse posea la capacidad de proveer el servicio de forma responsable y tenga la habilidad de ejecutar con buen éxito los servicios bajo los términos y condiciones de la convocatoria y el contrato que se otorgue. Se tomará en consideración:

- Integridad y Cumplimiento con la Política Pública
- Experiencia y registro de pasadas ejecuciones

Para más información, sobre el Formulario de Solicitud o sobre la convocatoria, puede llamar al (787) 773-2380. El paquete informativo, las instrucciones y el formulario estarán disponibles en la página web del DEPR o a través del correo electrónico: ayuda_propuesta@de.pr.gov a partir de la fecha de la orientación.

La aprobación de propuestas sobre esta convocatoria estará sujeta a la disponibilidad de fondos.

Se aceptarán las propuestas entregadas o utilizando el sistema de entrega del correo federal o privado que estén debidamente radicadas en el correo de la SAAF en o antes del 17 de julio de 2017 hasta las 4:30 p.m. La propuesta debe dirigirse a la Lcda. Laura E. Costa Rivera, secretaria auxiliar a:

Calle Federico Costas #150
Hato Rey, Puerto Rico 00919-0759

Cada proponente deberá someter la propuesta en original y tres (3) copias, no encuadernadas, preferiblemente con sujetador de metal (*binder clip*) y una copia en formato digital (*pendrive*).

Cada propuesta será evaluada de acuerdo con los criterios establecidos. El DEPR se reserva el derecho de rechazar o denegar solicitudes que no cumplan con los requisitos que aparecen en esta convocatoria o en los documentos del paquete informativo disponible en la página web del DEPR o con las disposiciones de ley y reglamentos estatales o federales aplicables a los programas que proveen los fondos. Se otorgarán contratos de servicios profesionales por el término de un año y podrá ser renovado por períodos adicionales hasta un máximo de tres años, sujeto a que el proveedor demuestre que ha logrado éxito y a la disponibilidad de los fondos federales.

No se aceptarán propuestas luego de la fecha y hora establecidas. Tampoco se aceptarán enmiendas al documento de la propuesta después que haya sido radicada. Si el DEPR identifica que hay errores menores en las propuestas recibidas, podrá solicitar que los mismos sean corregidos. La determinación de las propuestas adjudicadas es inapelable. El DEPR se reserva el derecho a sustituir o modificar el concepto de la propuesta en igualdad de condiciones. Asimismo, podrá utilizar las propuestas aprobadas como modelos de proyectos o prácticas efectivas.

Eligio Hernández Pérez, Ed. D
Secretario Interino

El Departamento de Educación no discrimina de ninguna manera por razón de edad, raza, color, sexo, nacimiento, condición de Veterano, ideología política o religiosa, origen o condición social, orientación sexual o identidad de género, discapacidad o impedimento físico o mental; ni por ser víctima de violencia doméstica, agresión sexual o acoso.



The National Science Foundation (NSF) seeks the views of the public in resolving potential adverse effects from the undertaking of federally-funded changes to Arecibo Observatory operations, in accordance with 36 CFR 800.6(a)(4). NSF announces the availability of the "Draft Programmatic Agreement (Draft PA) among the National Science Foundation, the Advisory Council on Historic Preservation, and the Puerto Rico State Historic Preservation Officer Implementing Section 106 of the National Historic Preservation Act for the Decision Regarding Potential Changes to Arecibo Observatory Operations in the Vicinity of Arecibo, Puerto Rico." The Draft PA has been prepared in compliance with Section 106 of the National Historic Preservation Act and will be available for public review and comment for thirty (30) calendar days. The public review period is ongoing and will end on July 24, 2017.

Copies of the Draft PA are available at:

**Biblioteca Electrónica Pública Municipal
Nicolás Nadal Barreto**
210 Calle Santiago Iglesias Arecibo, PR
Phone: (787)878-1178

**Archivo General y Biblioteca Nacional
de Puerto Rico**
500 Avenida Juan Ponce De León
San Juan, PR
Phone: (787)725-1060 Ext. 2001

A Section 106 Consulting Parties meeting will be held on July 6, 2017 starting at 6:00 PM at:

**Colegio de Ingenieros y Agrimensores de Puerto Rico
Puerto Rico Professional College of Engineers and Land Surveyors (Arecibo Chapter)**
Ave. Manuel T. Guillán Urdáz
Conector 129 Carr. 10 Arecibo, Puerto Rico
Phone: (787) 758-2250

The public is welcome to attend the Section 106 Consulting Parties meeting.

The Draft PA can also be viewed at the following website:

https://www.nsf.gov/mps/ast/env_impact_reviews/arecibo/arecibo_section106.jsp.

Comments can be submitted via email at: envcomp-AST@nsf.gov, with subject line "Arecibo Observatory", or through regular mail at:

Ms. Elizabeth Pentecost
RE: Arecibo Observatory
National Science Foundation
Suite 1045 4201 Wilson Blvd.
Arlington, VA 22230



La Fundación Nacional de las Ciencias (NSF, por sus siglas en inglés) solicita las opiniones del público para resolver los posibles efectos adversos relacionados a los cambios presupuestados por el gobierno federal a las operaciones del Observatorio de Arecibo, de acuerdo con 36 CFR 800.6(a)(4). La NSF anuncia la disponibilidad del "Borrador del Acuerdo Programático (AP) entre la Fundación Nacional de las Ciencias, el Consejo Asesor sobre Preservación Histórica y el Oficial de Preservación Histórica del Estado de Puerto Rico que está implementando la Sección 106 de la Ley de Preservación Histórica Nacional para la Decisión sobre Cambios Potenciales a las Operaciones del Observatorio de Arecibo en la Vecindad de Arecibo, Puerto Rico". El Borrador del AP se preparó en cumplimiento con la Sección 106 de la Ley Nacional de Preservación Histórica y estará disponible para revisión y comentarios del público durante treinta (30) días calendario. El período de revisión y comentarios del público está en curso y culminará el 24 de julio de 2017.

Copias del Borrador del AP están disponibles en:

**Biblioteca Electrónica Pública Municipal
Nicolás Nadal Barreto**
210 Calle Santiago Iglesias Arecibo, PR
Teléfono: (787)878-1178

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Puerto Rico**
500 Avenida Juan Ponce De León San Juan, PR
Teléfono: (787)725-1060 Ext. 2001

Se llevará a cabo una reunión de Partes Consultantes de la Sección 106 el 6 de julio de 2017, comenzando a las 6:00 PM en:

**Colegio de Ingenieros y Agrimensores de Puerto Rico
Puerto Rico Professional College of Engineers and Land Surveyors
(Arecibo Chapter)**
Ave. Manuel T. Guillán Urdáz
Conector 129 Carr. 10 Arecibo, Puerto Rico
Phone: (787) 758-2250

El público es bienvenido a asistir a la reunión de las Partes Consultantes de la Sección 106.

El Borrador del AP también se puede encontrar en la siguiente página de internet: https://www.nsf.gov/mps/ast/env_impact_reviews/arecibo/arecibo_section106.jsp.

Los comentarios se pueden someter a través de correo electrónico a: envcomp-AST@nsf.gov, colocando como tema "Arecibo Observatory", o a través del correo regular a:

Ms. Elizabeth Pentecost
RE: Arecibo Observatory
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Arlington, VA 22230



VANESSA SERRA@GFMEDIA.COM

MIÉRCOLES
28 de junio de 2017

"Aspiramos a convertir a la tienda de Mayagüez en el centro de la moda masculina desde Isabela hasta Ponce"

RAFAEL CORDERO SURIA
Co-proprietario

cia de médicos en la Sultana del cipales para abrir la nueva tienda.

deportivas, las cuales sirven para ir al trabajo y son piezas con más color. Mientras, la tercera tiene trajes de calle o de trabajo, camisas y corbatas.

La tienda cuenta con dos sastres, que son parte fundamental del servicio Clubman. "La sastrería es como la cocina del restaurante, que todo el mundo la ve y los clientes importantes conocen al chef. Aquí todos conocen al maestro sastre", manifestó.

El mercado de Clubman son los hombres ejecutivos y profesionales que han

alcanzado el éxito o aspiran a tenerlo en su carrera profesional, que les gusta vestir elegante y reconocen la calidad de la mercancía, y van a Clubman a premiarse, añadió Coredero Suria.

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Eligio Hernández Pérez, Ed. D
Secretario Interino



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Copies of the Draft PA are available at:

Biblioteca Electrónica Pública Municipal Nicolás Nadal Barreto 210 Calle Santiago Iglesias Arecibo, PR Phone: (787)878-1178	Archivo General y Biblioteca Nacional de Puerto Rico 500 Avenida Juan Ponce De León San Juan, PR Phone: (787)725-1060 Ext. 2001
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A Section 106 Consulting Parties meeting will be held on July 6, 2017 starting at 6:00 PM at:

Colegio de Ingenieros y Agrimensores de Puerto Rico
Puerto Rico Professional College of Engineers and Land Surveyors (Arecibo Chapter)
Ave. Manuel T. Guillán Urdáz
Conector 129 Carr. 10 Arecibo, Puerto Rico
Phone: (787) 758-2250

The public is welcome to attend the Section 106 Consulting Parties meeting.

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Ms. Elizabeth Pentecost
RE: Arecibo Observatory
National Science Foundation
Suite 1045 4201 Wilson Blvd.
Arlington, VA 22230



La Fundación Nacional de las Ciencias (NSF, por sus siglas en inglés) solicita las opiniones del público para resolver los posibles efectos adversos relacionados a los cambios presupuestados por el gobierno federal a las operaciones del Observatorio de Arecibo, de acuerdo con 36 CFR 800.6(a)(4). La NSF anuncia la disponibilidad del "Borrador del Acuerdo Programático (AP) entre la Fundación Nacional de las Ciencias, el Consejo Asesor sobre Preservación Histórica y el Oficial de Preservación Histórica del Estado de Puerto Rico que está implementando la Sección 106 de la Ley de Preservación Histórica Nacional para la Decisión sobre Cambios Potenciales a las Operaciones del Observatorio de Arecibo en la Vicindad de Arecibo, Puerto Rico". El Borrador del AP se preparó en cumplimiento con la Sección 106 de la Ley Nacional de Preservación Histórica y estará disponible para revisión y comentarios del público durante treinta (30) días calendario. El período de revisión y comentarios del público está en curso y culminará el 24 de julio de 2017.

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Se llevará a cabo una reunión de Partes Consultantes de la Sección 106 el 6 de julio de 2017, comenzando a las 6:00 PM en:

Colegio de Ingenieros y Agrimensores de Puerto Rico
Puerto Rico Professional College of Engineers and Land Surveyors (Arecibo Chapter)
Ave. Manuel T. Guillán Urdáz
Conector 129 Carr. 10 Arecibo, Puerto Rico
Phone: (787) 758-2250

El público es bienvenido a asistir a la reunión de las Partes Consultantes de la Sección 106.

El Borrador del AP también se puede encontrar en la siguiente página de internet:
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Los comentarios se pueden someter a través de correo electrónico a: envcomp-AST@nsf.gov, colocando como tema "Arecibo Observatory", o a través del correo regular a:

Ms. Elizabeth Pentecost
RE: Arecibo Observatory

5-B Scoping Transcripts

ARECIBO OBSERVATORY
PUBLIC SCOPING MEETING

TUESDAY, JUNE 7, 2016

6:11 P.M.

CHAired BY:
CAROLINE M. BLANCO, ESQ.
RALPH GAUME, PHD4

Reported By: Derek L. Hoagland
California CSR No. 13445

1 MS. BLANCO: Good evening,
2 everybody. Welcome. For the first
3 half hour of this meeting, it's an
4 informal opportunity to take a look
5 at the boards. We are going to
6 translate. There are boards in
7 both English and in Spanish. And
8 this is the informational portion
9 of the evening, the informal
10 informational portion of the
11 evening.

12 And beginning at 6:30, we will
13 have a brief presentation from NSF
14 to explain the process. And at the
15 end of the presentation, we will
16 welcome comments from anybody who
17 wishes to provide oral comments.

18 And just as a note, due to the
19 number of people who are here, we
20 are going to limit comments to
21 three minutes initially per person,
22 and with remaining time, people can
23 come back and add to those comments
24 if they wish. There are also
25 comment sheets available at the

1 table if you wish to provide
2 written comments.

3 And, finally, after the meeting
4 today, you can still submit
5 comments either by email or regular
6 mail up through June 23rd.

7 So we will see you back at
8 6:30.

9 (A recess transpires.)

10 MS. BLANCO: Folks, just a
11 reminder, we will be starting the
12 brief presentation in about five
13 minutes.

14 And just a clarification, the
15 timing for public comments tonight,
16 due to the fact that we are having
17 translation services, we will allow
18 four minutes for each comment, and
19 that will include the time for
20 translation as well. And, again,
21 if there is time remaining, we will
22 go back to people who still want to
23 make comments.

24 Thank you. We will be back in
25 five minutes.

1 (A recess transpires.)

2 MS. ALMODOVAR: Good afternoon.
3 Welcome to the Arecibo Observatory
4 public scoping meeting.

5 We have with us today
6 representatives from the National
7 Science Foundation. I have
8 Dr. Ralph Gaume. He is the program
9 director for Arecibo for the
10 Division of Astronomical Sciences.
11 Ms. Caroline Blanco, assistant
12 general counsel. Karen Pearce, she
13 is from the Office of Legislative
14 and Public Affairs with NSF.

15 This is a public scoping
16 meeting where we will gather
17 comments from the public regarding
18 preliminary proposal alternatives.

19 The details regarding today's
20 meeting and the proposed action
21 will be further explained by
22 Dr. Gaume and Ms. Blanco with a
23 brief presentation, which will be
24 translated into Spanish by our
25 translator, Mayra.

1 And we have with us Derek over
2 here. He will be our court
3 reporter.

4 For today, we just went through
5 a brief poster session at 6:30. We
6 are now doing the presentation, a
7 short presentation. And then at
8 7:00 we are going to start taking
9 the public comments.

10 Please remember to sign in if
11 you haven't done. If you want to
12 provide comments, please mark the
13 check mark to provide oral comments
14 today.

15 Let's go ahead and get started.

16 MR. GAUME: Thank you,
17 Caroline.

18 I would like to welcome
19 everybody here today. A lot of new
20 faces, some of the same faces as
21 earlier today. As Madeline said,
22 my name is Ralph Gaume. I am an
23 astronomer, and I am the program
24 officer for Arecibo Observatory at
25 the National Science Foundation.

1 So I would like to get maybe
2 the elephant in the room out of the
3 way right away. I am not here
4 today to announce a reduction in
5 funding or the closing of Arecibo
6 Observatory.

7 So let me provide a little bit
8 of background. And both Caroline
9 and I will talk about the process.
10 So in way of background, the
11 National Science Foundation is the
12 federal steward for ground-based
13 astronomy and space and atmospheric
14 sciences. We provide funding for
15 national and international
16 telescopes and facilities. And
17 besides our facilities that we
18 fund, we fund research grants that
19 allow individuals to conduct
20 specific science investigations.

21 So in the current fiscal year
22 in which we are in, the National
23 Science Foundation provides \$8.2
24 million to Arecibo Observatory.

25 There are two groups within the

1 National Science Foundation that
2 fund Arecibo Observatory: the
3 Division of Astronomical Sciences,
4 which I work in; and the Division
5 of Atmospheric and Geospace
6 Sciences. And the funding which we
7 provide is equally divided between
8 these two groups.

9 In addition to the National
10 Science Foundation funding, in the
11 current fiscal year, the Planetary
12 Science Division of NASA is
13 providing around \$3.7 million
14 funding to Arecibo.

15 Over the past decade, the
16 National Science Foundation has
17 received multiple advice from
18 external review committees who have
19 told us that we need to reduce or
20 cease support of some of our
21 existing telescopes and facilities.
22 And this is to allow for
23 construction and operation of new
24 telescopes, facilities, and
25 instruments, and also to continue

1 funding for our research grants
2 that enable scientists to conduct
3 individual science investigations.

4 Specifically for Arecibo, the
5 2012 astronomy portfolio review
6 said that the astronomy division
7 should reevaluate its participation
8 in Arecibo and another telescope
9 called SOAR later in the decade in
10 light of the science opportunities
11 and budget forecasts.

12 Furthermore, the report went on
13 to say that if funding remains
14 tight later in the decade, then the
15 funding that AST contributes to
16 Arecibo and SOAR must be weighed or
17 balanced against the needs of our
18 grants programs.

19 Very recently, the geospace
20 group at the National Science
21 Foundation conducted a portfolio
22 review which recommended that the
23 geospace group reduce its
24 management and operations support
25 for Arecibo Observatory to \$1.1

1 million by 2020. Of course, this
2 compares to the current support
3 level of 4.1 million annually.

4 So given these previous
5 community recommendations, combined
6 with our current budget
7 constraints, NSF has a need to
8 reduce funding levels for a number
9 of our astronomical and geospace
10 science telescopes and facilities.

11 So the purpose of this
12 environmental impact statement that
13 we are preparing is specifically to
14 evaluate the environmental impacts
15 of alternatives which address the
16 need to change operations at
17 Arecibo Observatory.

18 So let's look at these
19 alternatives. And they are
20 preliminary alternatives. So the
21 first one is continued NSF
22 investment for science-focused
23 observations -- operations, sorry.
24 So this is basically the no-action
25 alternative, continue on as we are

1 today.

2 The second alternative is
3 collaboration with interested
4 parties for continued
5 science-focused operations.

6 Collaboration with interested
7 parties for transition to
8 education-focused operations.

9 The fourth is moth-balling of
10 the facility, which is a suspension
11 of operations in such a manner that
12 operations could resume efficiently
13 at some future date.

14 And the final of the five
15 preliminary alternatives is
16 deconstruction and site
17 restoration.

18 And now I will turn it over to
19 Caroline -- Ms. Caroline Blanco to
20 talk a little bit more about the
21 process.

22 MS. BLANCO: Good evening,
23 everybody.

24 The environmental impact
25 statement process is a process that

1 is legally required by the National
2 Science Foundation pursuant to the
3 National Environmental Policy Act.
4 We are required to take a look at
5 the environmental impacts of
6 potential alternatives before a
7 decision is made. Importantly, it
8 requires us to have public input
9 into the decision-making process.
10 And some of the information we will
11 be looking at and analyzing are
12 these resource areas and potential
13 impacts on them by each
14 alternative. It is a broad range
15 of resources that we analyze,
16 including such things as air
17 quality, biological resources,
18 cultural resources, et cetera.

19 As I mentioned, this is a
20 public process, and there will be a
21 couple of public comment periods
22 throughout this process. And
23 comments received by the National
24 Science Foundation will be
25 considered and responded to in the

1 final environmental impact
2 statement.

3 This is the first stage, which
4 is called the scoping process, and
5 we are seeking public comments on
6 the proposed preliminary
7 alternatives. Your comments will
8 be very helpful in helping us to
9 refine those alternatives or to
10 learn of any new alternatives you
11 may suggest.

12 This is part of a 30-day public
13 comment period that will close on
14 June 23rd. As set forth in this
15 handout, which is available at the
16 front desk, there is a timeline for
17 the next major steps in this
18 process. After we receive public
19 comments from the scoping process,
20 we will refine the alternatives and
21 prepare a draft environmental
22 impact statement. And in that
23 draft environmental impact
24 statement we will include an
25 analysis of those potential impacts

1 from the resource areas we just
2 discussed on each of the
3 alternatives.

4 Following the issuance of that
5 document, which will be noticed in
6 the Federal Register and in the
7 local newspapers, it will begin --
8 we will begin a 45-day public
9 comment period. The comments can
10 be received either by email, by
11 regular mail, or during the two
12 public comment -- or public
13 meetings we will hold when -- after
14 it is released during the public
15 comment period.

16 We anticipate that we will
17 issue the draft environmental
18 impact statement in the late fall
19 of this year, 2016. After we
20 receive the public comments, we
21 will consider them, adjust the
22 draft environmental impact
23 statement accordingly, and prepare
24 a final environmental impact
25 statement. We anticipate issuing

1 the final environmental impact
2 statement during the spring of
3 2017.

4 After the final environmental
5 impact statement is issued, we will
6 have a time period where we will
7 consider the environmental impacts
8 on the alternatives, along with any
9 public comments received after the
10 final environmental impact
11 statement is issued, along with
12 other important factors that are
13 not part of this process, such as
14 the scientific merit, the budget
15 considerations, and other factors,
16 and then we will issue a final
17 decision. And we anticipate at
18 this point that that decision will
19 be issued at some point in the
20 summer of 2017.

21 The ambiguity in the target
22 dates is largely due to the fact
23 that this is a public process and
24 we cannot at this juncture
25 anticipate what the public comments

1 will be and how we will respond to
2 them. So those target dates are
3 our best estimates as of today.

4 There's one other process I
5 would like to mention, and that is
6 also listed on this fact sheet, and
7 it's referred to as Section 106.
8 And it is a process under the
9 National Historic Preservation Act.
10 It is another federal statute that
11 requires us to look at impacts on
12 nationally significant historic
13 properties. And that process
14 requires us to consult with
15 interested parties and the State
16 Historic Preservation Office of
17 Puerto Rico, and to consider
18 potential effects on the historic
19 properties, and work together to
20 find ways to avoid, minimize, or
21 mitigate those effects if they are
22 adverse.

23 On the sign-up sheet there is a
24 section there, a column that asks
25 if you would like to be a

1 consulting party. Please check it
2 if you are interested in
3 participating in that process. And
4 we will be handling these processes
5 concurrently to the best extent
6 possible.

7 And now I believe that was --
8 we will begin our public comment
9 period at this point. And as I
10 mentioned earlier, we will be
11 limiting comments initially to four
12 minutes, including the translation,
13 and that is simply to accommodate
14 everybody who is here who would
15 like to speak. If there is time
16 remaining, we will come back to
17 anybody who wishes to add to their
18 comments. And, again, if you would
19 still like to submit comments in
20 addition to what you have said this
21 evening, you can do so by email or
22 regular mail by June 23rd.

23 And it is particularly helpful
24 to us at this stage in the scoping
25 process if you can relate your

1 comments to the preliminary
2 proposed alternatives or new
3 alternatives.

4 And Madeline will be timing
5 people and giving 30-second
6 warnings before so that you can
7 wrap up your comments.

8 Thank you.

9 MS. ALMODOVAR: So I have the
10 sign-in sheet with me, so those of
11 you who have marked that you are
12 interested in providing oral
13 comments, I am going to go ahead
14 and read your name going down the
15 list, handing you the microphone,
16 and start taking the time. And I
17 will mention when the 30 seconds
18 are coming up.

19 The first person I have is
20 Patrick Taylor. Please raise your
21 hand because I don't know who you
22 are.

23 MR. TAYLOR: Hi. My name is
24 Patrick Taylor. I am the group
25 lead for planetary radar at Arecibo

1 Observatory.

2 And I wanted to say that any
3 level of divestment by the NSF of
4 Arecibo, without replacement of
5 that funding from some source, will
6 endanger the NASA-supported work
7 that we do, which is also
8 congressionally mandated, of
9 tracking and characterizing
10 potentially hazardous asteroids.

11 So it mentions on some of the
12 posters here that environmental
13 impacts may be mitigated to lessen
14 or remove that impact, which is
15 exactly what we are trying to do at
16 Arecibo, is prevent environmental
17 impacts from above. So supporting
18 new initiatives like LSST is
19 commendable for this mission, but
20 it's work done by Arecibo that
21 prevents us from losing track of
22 these asteroids in the future. So
23 in the future, we need to support
24 one of the proposed alternatives
25 that allows us to continue this

1 scientific work, because no other
2 telescope in the world can do what
3 we do. Thank you.

4 MS. ALMODOVAR: Next person,
5 Edgar Rivera-Valentín.

6 MR. RIVERA: Saludo. I am
7 Edgar Rivera-Valentín. I am a
8 planetary scientist at the Arecibo
9 Observatory. And I am a native
10 from this very city that you are
11 in. My family is from here. You
12 can see the hospital I was born in
13 right across the street. My dad
14 works right over there, right
15 across the street. And my father
16 is right there.

17 The point is, how I got into
18 science was because of the
19 observatory. So you want to talk
20 about a cultural resource for
21 Puerto Rico according to your EIS.
22 The last two options you have would
23 be a huge loss as a cultural
24 resource for all of Puerto Rico.

25 I went there when I was seven.

1 Seeing science that was done in my
2 backyard is what got me to do what
3 I do today. Now I run the Arecibo
4 Observatory Space Academy. Every
5 day I get to see the huge impact we
6 have on these high school students.
7 And it makes me cry because I can
8 see that the observatory is still
9 affecting students from my island.

10 So I really do hope that when
11 you consider any of the more
12 drastic options, you remember the
13 emotional cost of the cultural
14 resource that would be lost for all
15 the island. Thank you.

16 MS. ALMODOVAR: Next person is
17 Joan Schmelz.

18 MS. SCHMELZ: I am Joan
19 Schmelz. I am the deputy director
20 at Arecibo Observatory.

21 If we are considering
22 socioeconomic impacts, tourism and
23 STEM education are dependent on the
24 telescope. Tourists wouldn't come
25 to the site to see a hole in the

1 ground where the telescope used to
2 be. Students couldn't be inspired
3 by a telescope that is not there
4 anymore. The telescope itself
5 cannot be separated from the
6 science that is done there. This
7 science inspires the kids who come
8 to the observatory and the tourists
9 who come to visit.

10 For example, The Discovery of
11 the First Repeating Fast Radio
12 Burst was published in March in the
13 journal *Nature*. The resolution of
14 the distance controversy for the
15 Pleiades star cluster sets the
16 distance scale for the universe.
17 The anticipation of gravitational
18 waves from supermassive black holes
19 is a discovery that we are all
20 waiting for.

21 Arecibo science is new,
22 fundamental, and cutting edge. The
23 telescope is what makes these
24 discoveries possible.

25 Thank you.

1 MS. ALMODOVAR: The next person
2 is Brett Isham.

3 MR. ISHAM: I am Brett Isham
4 from the Interamerican university
5 in Bayamón, electrical and computer
6 engineering.

7 I spoke this morning. I won't
8 repeat those comments. I wanted to
9 say that I agree with Joan that the
10 education option on this, which
11 appears to me to be education only,
12 is unrealistic, that the research
13 done by the telescope is why there
14 is the inspiring education at the
15 telescope. I realize that
16 education has a broader impact at
17 NSF, but perhaps it could be
18 expanded at the observatory, and in
19 that case, maybe partnerships with
20 the Department of Education and
21 maybe even -- because of the many
22 comments by local people, maybe
23 even the Puerto Rico Department of
24 Education could be persuaded to
25 have some participation even

1 financially.

2 I think there are other
3 opportunities, some simple, some
4 more involved. For example, the
5 seminars -- the many seminars at
6 the observatory could be made
7 available on the Internet for
8 anyone in Puerto Rico or anywhere
9 to participate in.

10 I think some collaboration --
11 some enhanced collaboration within
12 the local campuses could expand
13 internships for students and
14 participation in those --
15 supervising those internships by
16 the faculty.

17 Aerospace in Puerto Rico is
18 growing. Perhaps aerospace and
19 electronics companies would be
20 willing to chip in for
21 education-related costs.

22 And I just wanted to mention
23 also that it extends beyond Puerto
24 Rico, as you heard this morning,
25 but I have a student here from

1 Sweden who is visiting here for
2 three months, and we are working on
3 projects with Arecibo.

4 Thank you.

5 MS. BLANCO: Thank you.

6 MS. ALMODOVAR: The next person
7 is Benjamin Sharky.

8 MR. SHARKY: Hello. I am
9 speaking as an undergraduate
10 physics student who has been
11 fortunate enough to work as a
12 summer intern this year and last
13 year. My experience working at
14 Arecibo has been deeply inspiring
15 to me because I have had the chance
16 to learn about a variety of
17 disciplines and have received
18 meaningful mentorship in both
19 astronomy and planetary science. I
20 have learned how to move forward
21 practically to approach a research
22 career while being continually
23 inspired every day by the welcoming
24 community environment that the
25 staff have created and the exciting

1 unique science that has been
2 mentioned previously that I would
3 not have had access to at my
4 university alone.

5 I know from talking with my
6 fellow interns that my experience
7 is not unique. The cultural impact
8 on inspiring and directing students
9 lives across the country and
10 directing their careers cannot be
11 overstated.

12 Thank you.

13 MS. ALMODOVAR: Thank you.
14 Next person, Scott Ransom.

15 MR. RANSOM: So hello. I am
16 Scott Ransom. I am an astronomer
17 and a professor, and my research is
18 critically based on the Arecibo
19 telescope.

20 So I am here representing two
21 groups. One of them is called
22 NANOGrav, which is looking to
23 detect gravitational waves. And
24 the other group is the Arecibo
25 Science Advocacy Partnership, known

1 as ASAP.

2 And I have two points to make,
3 one of them based on what would
4 happen if we lost scientific
5 capability and the other if we lost
6 educational capabilities with
7 Arecibo.

8 So the first point is the
9 scientific one -- go ahead. So the
10 senior review and portfolio review
11 which has kind of led us to this
12 crossroads are very important
13 things that NSF needs to do on a
14 recurring basis, especially in a
15 time of flat or even declining
16 budgets. But something -- a very
17 important thing to remember is that
18 the scientific context for those
19 reports has changed.

20 This year, one of the greatest
21 scientific discoveries of the last
22 century happened, the direct
23 detection of gravitational waves.
24 Arecibo is a crucial component of
25 NANOGrav, will open up the next

1 window of gravitational waves in
2 the coming years.

3 And one important point about
4 this is NANOGrav is now supported
5 by NSF physics via Physics Frontier
6 Center. So, hopefully, one of the
7 solutions with how we can
8 potentially help fund Arecibo in
9 the future, physics at NSF will be
10 part of that.

11 My last point is about the
12 educational opportunities. We have
13 heard of the fantastic
14 opportunities here in Puerto Rico,
15 but in the U.S. as a whole,
16 Hispanics are dramatically
17 underrepresented in STEM.

18 Hopefully I can finish this up
19 after another round of comments.

20 MS. BLANCO: Thank you. If
21 there is time left over, we will
22 come back to you.

23 MS. ALMODOVAR: Robert Minchin.

24 THE DEPONENT: Good evening. I
25 am Robert Minchin. I am the group

1 lead for radio astronomy at Arecibo
2 Observatory and I also run the
3 summer internship program that
4 gives research opportunities to
5 undergraduates and teachers.

6 I want to make a point that
7 over the last five years, we have
8 had 24 Hispanic students or
9 teachers on this internship
10 program. This may not sound like a
11 huge number, but with what Scott
12 was saying at the end of his
13 comment, if we are graduating 24
14 bachelor's in physics every year,
15 we would be in the top ten
16 universities in the U.S. producing
17 Hispanics physics graduates. Over
18 three-quarters of the Hispanics
19 that come are Puerto Rican. And
20 we have recently had the
21 (unintelligible) internship program
22 renewed for a further five years.
23 And one of our goals of this
24 expanded period is specifically to
25 target not just Hispanics, but

1 Hispanic woman who are doubly
2 affected by both being women and
3 Hispanics.

4 So this is the program that we
5 would be running here, but it
6 relies crucially on this
7 observatory being active in
8 research because it is not possible
9 to give someone research experience
10 if you are not doing research. So
11 we want to deliver it. We need to
12 do this. The community of science
13 in the U.S. needs programs like
14 this reaching out to minorities,
15 reaching out to woman. And this
16 is -- this expansion of the
17 community was identified by the
18 (unintelligible) survey as
19 something that we needed absolutely
20 in astronomy, and the same is true
21 for the other fields that work at
22 Arecibo.

23 But the first two options
24 obviously will allow us to continue
25 it. The third option, moving

1 toward education focused, that
2 would allow us to continue this if
3 it expanded education but did not
4 bring down the research element,
5 because if we went to education
6 focus and lost research, I think we
7 would be a worse education facility
8 than we are now.

9 MS. BLANCO: Thank you. We
10 will come back to you if there is
11 time.

12 MS. ALMODOVAR: Next person is
13 Ms. Sandra -- no? Okay.

14 Vivian Claudio. No?

15 Okay. Christopher Salter.

16 MR. SALTER: I must say, I am a
17 little saddened by the fact that
18 there are not more people from
19 Arecibo at the meeting when this is
20 supposed to be a public scoping
21 meeting. I wonder how much the NSF
22 actually did to publicize this
23 meeting within Arecibo and the
24 surrounding communities. Certainly
25 most of my neighbors and people

1 I've spoken to within the town knew
2 nothing of the occurrence of this
3 meeting.

4 I have been a radio astronomer
5 for over 50 years, 23 years of that
6 at Arecibo, and during that time
7 almost every year I have had
8 students, undergraduates who have
9 moved on, most of them entering a
10 research career in astronomy, many
11 in radio astronomy, and many of
12 them have moved to senior
13 positions, either senior staff at
14 American universities or Puerto
15 Rican universities. One is even a
16 senior scientist at the ALMA
17 telescope, which is one of the new
18 facilities that Ralph was
19 mentioning earlier.

20 And I would just like to
21 emphasize the importance of our
22 work teaching science teachers.
23 For many years, we ran teachers
24 workshops, and we also had at least
25 one or two teachers join us every

1 summer who joined us in our
2 research work.

3 Just this morning, I was
4 teaching to our undergraduates who
5 are here this summer and our
6 teachers who are here, and for me,
7 it's a wonderful experience. I
8 hope it was as good for them. But
9 what I think many of us feel, we
10 wish to put something back into
11 this place that has become our home
12 and we have got to love.

13 MS. BLANCO: Dr. Salter, I
14 wonder if I could just address your
15 question about the outreach that
16 NSF did for this meeting.

17 In addition to the Federal
18 Register notice that was published,
19 NSF also arranged to have published
20 in the San Juan newspaper and the
21 Arecibo newspaper announcing the
22 meeting.

23 MS. ALMODOVAR: And the
24 newspapers were *El Nuevo Día* and *El*
25 *Norte*.

1 MS. BLANCO: In addition, there
2 also were announcements on the
3 NSF's Division of Astronomy and
4 Geo -- AGS.

5 And just a reminder to
6 everybody that updates on the
7 process will be posted when they
8 occur on the NSF AST Web site that
9 is listed at the bottom of the fact
10 page. Thank you.

11 MS. ALMODOVAR: The next
12 person, Andrew Seymour.

13 MR. SEYMOUR: Hello. My name
14 is Andrew Seymour. I am a post doc
15 at the Arecibo Observatory.

16 I can expand on the science, I
17 can expand on the impact that a
18 person would have from an area
19 related to a telescope since I was
20 from around the DPT, but I feel
21 that the purpose of this meeting is
22 to look at the true environmental
23 impact.

24 Underneath the dish a diverse
25 biosystem has been able to flourish

1 for over 50 years. I think if we
2 were to return to nature, you could
3 not do so without destroying nature
4 itself. These plants will only
5 survive in full shade. Destroying
6 the dish would kill these plants
7 and expose the soil.

8 Coming from a state with
9 mountaintop removal, I have seen
10 firsthand how detrimental this can
11 be. Because the dish lies directly
12 above a sink hole as well, such
13 runoff would run directly into the
14 groundwater.

15 My suggestion to the committee
16 is to do a full geo, bio, and water
17 runoff study before any other
18 options in continuation is
19 considered.

20 Thank you.

21 MS. BLANCO: Thank you.

22 MS. ALMODOVAR: We have one
23 more person, Luisa Zambrano.

24 All right. That's all the
25 people I have on the list. Is

1 there anybody that hasn't spoken
2 yet that would like to?

3 MS. GHOSH: Hello. I am Tapasi
4 Ghosh. I also work at the
5 observatory in astronomy. I am
6 going to talk about again on the
7 socioeconomic side, mostly aspect
8 of us being here as a function.

9 Sociocultural is important
10 because -- because observatory is
11 here, we have a lot of scientists
12 here, and along with them come
13 their families, their spouses.
14 Often they are highly educated.

15 And I have two examples. One
16 of them is right here. Our
17 friend (unintelligible) --

18 THE REPORTER: I am sorry.

19 MS. GHOSH: Whose wives of two
20 of our colleagues Barry del Backo
21 (phonetic) and (unintelligible),
22 they started two schools. They
23 basically built up the two schools
24 from local schools, from a general
25 level to a very high standard. And

1 out of these schools, there were
2 three Presidential Scholars, if you
3 can imagine, from Arecibo. Three
4 students with Presidential
5 Scholars. And I will argue if
6 Arecibo were to vanish, similar
7 situations would be somewhat harder
8 to come by.

9 Thank you.

10 MS. BLANCO: Thank you.

11 MS. ALMODOVAR: Anyone else
12 that hasn't spoken that would like
13 to?

14 MS. BLANCO: Would anybody who
15 ran out of time like to speak?
16 Have you spoken yet and you wanted
17 to? We have one person who has not
18 yet spoken, and then I think we
19 should have time to have additional
20 comments.

21 MR. QUINTERO: (Speaking in
22 Spanish) Hi. My name Luis
23 Quintero. I am head of the
24 electronics department at the
25 Arecibo Observatory.

1 I can talk on behalf of the
2 electronics department, but I
3 believe that the same thing happens
4 in other departments of the
5 observatory. We contract to retain
6 products and services in Puerto
7 Rico and in the United States, and
8 we also use messenger and transport
9 services in Puerto Rico to be able
10 to receive these products and
11 services. As an example of that,
12 we are customers of the Puerto Rico
13 Telephone Company for our Internet
14 and phone services. And we also
15 try to seek local representatives
16 for product distribution, and we
17 try to do it locally because that's
18 money that stays in Puerto Rico.
19 And in terms of messenger services,
20 we use the USPS and FedEx. And in
21 terms of local transport, we have
22 also sought local transport
23 companies to do the shipments.

24 So in that case with fund cuts
25 to the Arecibo Observatory would

1 also entail cuts in the movement of
2 the economy -- of the local economy
3 of Puerto Rico in Arecibo.

4 MS. BLANCO: Thank you.

5 MR. RANSOM: So Scott Ransom
6 again. Just to finish about my
7 last topic about the educational
8 impacts of Arecibo.

9 So Arecibo can be incredibly
10 inspirational to Hispanic students
11 outside of Puerto Rico as well as
12 within. And a great example of
13 this is a program called the
14 Arecibo Remote Command Center at
15 the University of Texas.

16 That program uses the Arecibo
17 telescope. The students can use
18 it, do research on it and learn
19 about astronomy, and it's turned
20 into a pipeline for producing
21 Hispanic students in STEM.

22 This type of activity would not
23 be possible if Arecibo were not
24 actively doing research in the
25 future.

1 Thank you.

2 MS. BLANCO: Thank you.

3 Is there anybody else who
4 either hasn't spoken or already has
5 spoken who would like to? Yes.

6 MS. ZAMBRANO: Hi. My name is
7 Luisa Zambrano, and I work at
8 Arecibo Observatory as the
9 coordinator of the Space Academy.

10 In the last four years, the
11 Space Academy has been able to
12 serve to over 150 Puerto Rican
13 students. They are -- all the ones
14 of age to enroll in college are
15 doing so. All the ones of age to
16 be in college, they are currently
17 enrolled in college. So we have
18 100 percent college retention --
19 college seeking results. And you
20 heard from some of those students
21 this morning.

22 What is more interesting about
23 this is that throughout the four
24 years, we have been able to
25 maintain almost even male to female

1 ratio, which is very unusual for
2 science, especially among
3 Hispanics.

4 Some of the students from the
5 Space Academy have gone direct to
6 school in universities such as MIT,
7 Stanford, University of Maryland
8 and, of course, University of
9 Puerto Rico, Mayagüez campus.

10 But I won't take much more of
11 your time right now. We have
12 decided that we will share with you
13 our reports for the last eight
14 semesters of AOSA so they can be
15 included in your evaluation and
16 your study, as they are from the
17 impact it has in socioeconomic
18 side.

19 Thank you.

20 MS. BLANCO: Thank you.

21 Are there any more people that
22 would like to speak? Okay. And it
23 is okay if you have already spoken.
24 Yes.

25 MR. CRUZ: So my name is

1 Christian Cruz. I am the space
2 (unintelligible) of space and
3 atmospheric sciences at Arecibo.

4 THE REPORTER: I am the? I am
5 sorry, you need to hold the mic
6 very close to your mouth. Your
7 title?

8 I apologize. I need to hear
9 you, sir.

10 MR. CRUZ: I am the
11 (unintelligible) of space and
12 atmospheric sciences at Arecibo.

13 MS. BLANCO: I think it might
14 help if you hold the mic close to
15 your mouth.

16 MR. CRUZ: I am from Brazil. I
17 came here to work at Arecibo eight
18 years ago. For two times I run our
19 summer school program.

20 And I believe that this program
21 is 38 years old right now or 39
22 maybe. The last statistic I saw,
23 we had about 370 students. Among
24 them, more than 200 become doctors.
25 Yeah. This is the statistics from

1 how multiplicative are this place.

2 The second part of my argument
3 here is we are more than 50 years
4 old place, so we have more than 50
5 years of data. Very few places in
6 the world have this amount of data
7 for such a long time. But this
8 environment using our data, for
9 example, three years ago, we
10 detected a long transiting
11 (unintelligible) using this data
12 set. Three years ago we detect a
13 long term of trends over Arecibo.
14 Neutral waves. What it means
15 there? It means that we are seeing
16 a huge effect to the upper
17 atmosphere. Or, in other words,
18 the greenhouse effect. And very
19 few places in the world you can
20 detect that because we have this
21 long-term data set. If you broke
22 this chain, we are going to have
23 problems detecting that.

24 MS. BLANCO: Thank you.

25 Is there anybody who would like

1 to speak? Please remember, you
2 have until June 23rd to submit
3 comments. Comments can be
4 submitted either by email or
5 regular mail. And please watch for
6 any updates on the NSF AST Web site
7 that is listed at the bottom of the
8 fact sheet.

9 And the next step will be
10 preparation of the draft
11 environmental impact statement.
12 And that, again, will be followed
13 by a 45-day public comment period.
14 And that we anticipate will take
15 place in the late fall. And there
16 will be two more public meetings,
17 one in San Juan, and one here in
18 Arecibo.

19 And thank you very much for
20 coming tonight. We very much
21 appreciate your comments. Thank
22 you.

23 (The proceeding concluded
24 at 7:51 p.m.)

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REPORTER'S CERTIFICATE

I, DEREK L. HOAGLAND, Certified Shorthand Reporter #13445, State of California, do hereby certify that the foregoing is a true and correct transcript of the proceedings had in the within-entitled and numbered cause on the date hereinbefore set forth; and I do further certify that the foregoing transcript has been prepared under my direction.

DEREK L. HOAGLAND

ARECIBO OBSERVATORY
PUBLIC SCOPING MEETING

TUESDAY, JUNE 7, 2016

10:04 A.M.

CHAired BY:
CAROLINE M. BLANCO, ESQ.
RALPH GAUME, PHD4

Reported By: Derek L. Hoagland
California CSR No. 13445

1 MS. ALMODOVAR: Good morning,
2 everybody.

3 MR. GAUME: Good morning.

4 MS. ALMODOVAR: Can you all
5 hear me well?

6 Welcome to the Arecibo
7 Observatory public scoping meeting.
8 We have with us today
9 representatives from the National
10 Science Foundation. We have
11 Dr. Ralph Gaume, Caroline Blanco,
12 and we have Karen Pearce.

13 MS. PEARCE: Hello.

14 MS. ALMODOVAR: This is a
15 public scoping meeting where we
16 will gather comments from the
17 public regarding preliminary and
18 proposed alternatives.

19 The details regarding today's
20 meeting and the proposed action
21 will be further explained by
22 Dr. Gaume and Ms. Blanco during a
23 brief presentation, which will be
24 translated into Spanish by Mayra on
25 your right -- on your left. Sorry.

1 Well, today you had an
2 opportunity to look at the posters
3 and have some initial questions.
4 We will have a short presentation,
5 and then around 10:30, we will go
6 ahead and start the public comment
7 period. And some of you have
8 already signed up for public
9 comments. If you haven't done so,
10 you can do so, or when the people
11 that have already signed up are --
12 have completed their comments, then
13 you may raise your hand, and I will
14 open the microphone.

15 (Speaking in Spanish.)

16 MS. ALMODOVAR: Let's go ahead
17 and get started.

18 MR. GAUME: Thank you. So I am
19 very happy that everybody is here
20 today. Thank you all very much for
21 coming. My name is Ralph Gaume,
22 and I am the principal program
23 officer for the National Science
24 Foundation for Arecibo.

25 There has been a lot of

1 information out there in the press
2 that I have seen and read about
3 Arecibo Observatory and about what
4 we are doing here today. Some of
5 the information is actually
6 correct. We are here today to try
7 and clarify why -- what we're doing
8 and why we are doing it and to
9 answer your questions and to give
10 you an opportunity to provide your
11 input into the process. And,
12 fundamentally, we are not here
13 today to announce the closing of
14 Arecibo or the reduction of any
15 funding whatsoever.

16 So the National Science
17 Foundation is the federal steward
18 for ground-based astronomy and
19 space and atmospheric sciences. So
20 NSF provides the funding for
21 national and international
22 telescopes and facilities and
23 provides funding for research
24 grants that allow individuals and
25 groups to conduct specific science

1 investigation.

2 So with regards to Arecibo, in
3 this current fiscal year, the NSF
4 provides \$8.2 million to Arecibo
5 Observatory.

6 I am an astronomer, and the
7 astronomy group at the National
8 Science Foundation provides half of
9 that funding. There is another
10 group at the National Science
11 Foundation, the Division of
12 Atmospheric and Geospace Sciences,
13 which provides the other half of
14 the National Science Foundation
15 funding for Arecibo.

16 Also, in this fiscal year, the
17 Planetary Science Division of NASA
18 provides another \$3.7 million in
19 funding to the Arecibo Observatory.

20 So over the past decade, many
21 of you are aware that the National
22 Science Foundation has received
23 advice from external review
24 committees, and this advice has
25 stated that the National Science

1 Foundation needs to reduce or cease
2 support of some existing telescopes
3 and facilities, the purpose being
4 to provide construction funding and
5 operation funding for new
6 telescopes that the community has
7 asked us to build and also, very
8 importantly, to have the funding to
9 provide money for research grants
10 that enable individual science
11 investigations.

12 So with regards to Arecibo
13 Observatory, the 2012 portfolio
14 review report said that the
15 astronomy group should reevaluate
16 its participation in Arecibo and
17 another telescope called SOAR later
18 in this decade in light of the
19 science opportunities and budget
20 forecasts at that time. They also
21 recommended that if funding remains
22 tight later in the decade, that the
23 scientific need for continued
24 funding for Arecibo and SOAR must
25 be weighed against the needs of our

1 grants programs.

2 The space and atmospheric group
3 at the National Science Foundation
4 conducted a portfolio review this
5 year, and that report stated that
6 they should reduce the management
7 and operation support for Arecibo
8 to \$1.1 million by 2020. As I
9 mentioned before, that compares to
10 the current funding level of 4.1
11 million which the space and
12 atmospheric group is currently
13 providing.

14 So the only thing that has been
15 recognized thus far is that given
16 the previous community
17 recommendations from the science
18 community, the National Science
19 Foundation has a need to reduce
20 funding levels for a number of our
21 astronomical and geospace science
22 telescopes and facilities.

23 So the purpose of why we are
24 here today to do these scoping
25 meetings for the environmental

1 impact study, the purpose is to
2 evaluate the environmental impacts
3 of the proposed alternatives,
4 preliminary alternatives, which
5 will address the National Science
6 Foundation's need to change
7 operations at Arecibo Observatory.

8 So what are these alternatives?
9 There are five alternatives in the
10 preliminary list that we are
11 studying:

12 The first alternative is
13 continued NSF investment for
14 science-focused observations, which
15 is basically a continuation of what
16 we're doing now.

17 Second is collaboration with
18 interested parties for continued
19 science-focused observations.

20 Third, collaboration with
21 interested parties for transition
22 to education-focused operations.

23 Fourth is moth-balling of the
24 facility, which is basically a
25 suspension of operations in a

1 manner such that the facility and
2 operations can resume at some point
3 in the future.

4 And, fifth, deconstruction and
5 site restoration.

6 Let me turn it over to
7 Ms. Caroline Blanco.

8 MS. BLANCO: Thank you,
9 Dr. Gaume. Good morning. My name
10 is Caroline Blanco. I am the
11 assistant general counsel at
12 National Science Foundation, and I
13 oversee environmental matters.

14 So today's scoping meeting, as
15 Dr. Gaume expressed, is to
16 introduce you to the proposed
17 preliminary alternatives that NSF
18 has identified and to request
19 public input on those proposed
20 preliminary alternatives.

21 As is said in the handouts and
22 on the boards outside, NSF is
23 requesting public comments through
24 June 23rd of this month. The
25 public comments can be received

1 either today during this meeting or
2 by email or by regular U.S. mail.

3 We are requesting again that
4 these comments go to these
5 preliminary proposed alternatives
6 so that we have refined which
7 alternatives we will analyze in the
8 environmental impact study process.

9 And once we receive the
10 comments, we will prepare a draft
11 environmental impact statement, and
12 that document will include an
13 analysis of impacts that are
14 anticipated on the preliminary
15 proposed alternatives. And the
16 resources that will be analyzed
17 include all of these here,
18 including air quality, biological
19 resources, cultural resources,
20 et cetera.

21 I would like to emphasize that
22 this is a public process and that
23 no decision has been made. The
24 ultimate decision will not take
25 place for over a year from now and

1 will take into consideration
2 information on the environmental
3 impacts that will be considered
4 through NSF's environmental impact
5 statement process, including other
6 very important considerations, such
7 as science, budget, and other
8 considerations. But this is
9 process is -- involves the
10 environmental impacts of proposed
11 alternatives.

12 And the next step will be, as I
13 mentioned, the preparation of a
14 draft environmental impact
15 statement that we anticipate will
16 be issued in the late fall of this
17 year.

18 Once issued, that will begin a
19 45-day public comment period. And
20 during that public comment period,
21 we will return here for two more
22 public meetings, one in San Juan
23 and one in Arecibo. And, again,
24 during those public meetings, the
25 public will have an opportunity to

1 submit oral comments. And, also,
2 at that time during the 45-day
3 public comment period, just as is
4 the case here, people can submit
5 comments either through email or
6 regular mail.

7 And after we receive those
8 comments, NSF will consider them,
9 and we will adjust the draft
10 environmental impact statement
11 accordingly and produce a final
12 environmental impact statement.

13 And then the final
14 environmental impact statement we
15 anticipate will be issued in the
16 late spring of 2017.

17 After the final environmental
18 impact statement is issued, NSF
19 will take into consideration the
20 environmental impacts in the final
21 environmental impact statement and
22 then also consider the scientific
23 merits, budget constraints, and
24 other factors before issuing a
25 final decision. And that will

1 probably take place at some point
2 in the summer of 2017.

3 The time frames are rough
4 estimates at this point because
5 this is a public process and it
6 will depend on what type of
7 comments we receive from the
8 public. We also have a Web site on
9 the AST division Web -- that is on
10 the handouts, the Web addresses at
11 the bottom of this handout. And I
12 would encourage you to periodically
13 check that Web site to keep
14 informed on the process.

15 Thank you very much. We will
16 now take public comments.

17 MS. ALMODOVAR: (Speaking in
18 Spanish.) I have here the list of
19 people that have signed up to ask
20 questions if people are not sure.
21 I am going to read your names, so
22 bear in mind that Mayra is
23 translating here.

24 First person is Hilda Colón.
25 Second person Carla Colón. No?

1 Okay.

2 Brett Isham.

3 MR. ISHAM: Right here. I have
4 a few -- I am from Interamerican
5 University in Bayamón. I am a
6 little bit confused about what
7 you're asking here because of
8 the -- I guess it doesn't include
9 discussion of the alternatives or
10 just the environmental impact of
11 each alternative, which I have --
12 and the socioeconomic impacts
13 include things like education and
14 research impacts on, for example,
15 Interamerican University?

16 MS. BLANCO: At this stage,
17 this is a very preliminary stage in
18 the process. At this stage, the
19 scoping process is designed to
20 identify preliminary proposed
21 alternatives and to receive public
22 input on those alternatives
23 themselves. It is not the stage
24 where we are looking at
25 environmental impacts yet. That

1 stage will occur at the draft
2 environmental impact statement
3 process.

4 MR. ISHAM: Okay. So I would
5 like to echo the comment of
6 Dr. Gaume. I think that some of
7 the information in the portfolio
8 review is correct. And I don't --
9 I just wonder if the information in
10 various reviews is fact checked --
11 you don't have to answer that right
12 now -- because I hear a lot of
13 comments that some of it is not
14 correct.

15 It was also my impression --
16 which I don't know if everyone
17 would agree with me, but it was my
18 personal impression that the
19 mandate of the new management of
20 Arecibo that took over at the last
21 competition, their mandate was to
22 seek -- already implement the
23 second on your list, not continue
24 operations as they had been, but to
25 seek new collaborators. Sorry.

1 And I think also that -- so,
2 anyway, my impression was that the
3 second alternative was intended to
4 be the current state of Arecibo.

5 And the third alternative to
6 move toward education, I believe
7 that Arecibo Observatory, and I am
8 sure there could be more done, but
9 I believe that it is already one of
10 the NSF facilities in terms of the
11 national facilities that has some
12 of the most extensive education
13 programs. For example, 20,000
14 students from Puerto Rico every
15 year visit the observatory and the
16 education center, which is a pretty
17 nice science museum. And there are
18 or have been quite a few programs
19 for students -- high school
20 students and high school teachers
21 to improve science education in
22 Puerto Rico.

23 I guess a couple other things I
24 wanted to point out.

25 MS. BLANCO: Excuse me. I just

1 wanted to be sure other people have
2 an opportunity.

3 MR. ISHAM: Yes.

4 MS. BLANCO: Perhaps if you
5 could hold your comments the
6 remainder of --

7 MR. ISHAM: That's fine.

8 MS. BLANCO: -- and see for
9 other people. If we have time
10 remaining, we would welcome
11 additional comments.

12 MR. ISHAM: Okay. That's fine.

13 MS. BLANCO: And if there is no
14 time, you can, of course, still
15 submit comments by email or by
16 mail.

17 MR. ISHAM: All right.

18 MS. BLANCO: Thank you.

19 MS. ALMODOVAR: Next is Xavier
20 Siemens.

21 MR. SIEMENS: I can actually
22 translate myself. It might be a
23 little bit more quick. There may
24 be some jargon that will be a
25 little bit easier.

1 Okay. So my name is Xavier
2 Siemens, and I come from Milwaukee,
3 where I am a faculty member at the
4 University of Wisconsin.

5 I am here to talk about, I
6 guess, in that list of things sort
7 of cultural impacts or sort of
8 human environmental issues. I am
9 here on behalf of the North
10 American Nanohertz Observatory for
11 Gravitational Waves, NANOGrav, a
12 collaboration that involves over
13 100 students and scientists from 15
14 institutions in the U.S. and
15 Canada.

16 I am also the chair of the
17 NANOGrav collaboration and the
18 director of the National Science
19 Foundation's NANOGrav Physics
20 Frontiers Center.

21 Using Arecibo, our
22 collaboration is doing
23 gravitational wave astronomy. We
24 are leading the search for
25 low-frequency gravitational waves

1 produced by the mergers of
2 supermassive black holes that live
3 at the centers of galaxies.

4 These low-frequency
5 gravitational waves have periods 11
6 orders of magnitude longer than
7 those discovered by LIGO and
8 announced earlier this year. By
9 continuously monitoring millisecond
10 pulsars with Arecibo and the Green
11 Bank Telescope in West Virginia, we
12 are building an observatory much
13 like LIGO but that will open a new
14 window onto a completely different
15 part of the gravitational wave
16 spectrum.

17 We are now at a time when we
18 have reached unprecedented
19 sensitivities and expect to make a
20 detection soon. Arecibo is the
21 most sensitive radio telescope in
22 the world and a lack of access to
23 this instrument would cripple our
24 observatory, we would lose a factor
25 of 2 in sensitivity, seriously

1 damaging U.S. leadership in this
2 field.

3 Given the unprecedented
4 sensitivity of NANOGrav, which is
5 the result of our access to the
6 best facilities in the world,
7 Arecibo being the most sensitive,
8 and LIGO's recent gravitational
9 wave discovery announcement, which
10 was appropriately announced with
11 much fanfare by both LIGO folks and
12 NSF, and has already received
13 several major scientific prizes, we
14 were surprised to hear about NSF's
15 decision to conduct this review.

16 To be clear, what we are
17 putting in peril are three things:
18 The research and careers of our
19 more than 100 scientists and
20 students of NANOGrav, our U.S.
21 leadership in this field, and a new
22 scientific discovery as profound as
23 the one announced by LIGO earlier
24 this year.

25 MS. BLANCO: Thank you.

1 MS. ALMODOVAR: Next person is
2 Qihou Zhou.

3 MR. ZHOU: My name is Qihou
4 Zhou. Q-i-h-o-u, Z-h-o-u, if that
5 helps.

6 I come from Miami University.
7 I am professor of the electrical
8 and computer engineering
9 departments. But I am here mainly
10 on behalf of ASAP, Arecibo Science
11 Advocacy Partnership, which
12 consists of up to 150 members. By
13 training, I am an atmospheric
14 scientist.

15 Another representative from
16 ASAP, Scott Ransom, is going to
17 speak tonight.

18 So I am going to speak mainly
19 on two aspects. The first one is
20 impact of the Arecibo facility for
21 the study of climate change and
22 space environment.

23 Arecibo Observatory is
24 perhaps -- I would say definitely
25 the only facility that can probe

1 from the ground level to the
2 deepest part of space. And is
3 certainly true that Arecibo
4 Observatory is the only facility in
5 the world that can study the
6 atmosphere continuously from the
7 ground level to several thousand
8 kilometers. This unmatched
9 capability makes it a primary
10 instrument in studying our spatial
11 environment, including climate
12 change. One indicator of climate
13 change lies in the upper atmosphere
14 temperatures from 100 kilometers to
15 600 kilometers. As the surface
16 temperature rises, the upper
17 atmosphere cools. We know that
18 ground temperature has significant
19 local variations. The upper
20 atmosphere temperature is more
21 homogenous. Clearly, the longer
22 the data set is available, the
23 easier it is to discern any
24 long-term change. Continuous
25 operation of Arecibo is important

1 to understand climate change and
2 our spatial environment.

3 The second aspect that I want
4 to speak about is impact of Arecibo
5 on STEM education. It is well
6 known that Arecibo hosts many, many
7 high school students on a yearly
8 basis. The Arecibo Observatory
9 also inspires many undergraduate
10 students engaged in STEM studies.

11 THE INTERPRETER: In? I'm
12 sorry.

13 MR. ZHOU: STEM, Science,
14 technology, engineering and math.

15 As an example, Miami University
16 has an annual faculty-led winter
17 study-away workshop using the
18 Arecibo Observatory. Students come
19 to the observatory to take and
20 analyze the data and to experience
21 the local culture. In 2015 and
22 2016, there were 14 and 19
23 students, respectively,
24 participating in the Miami-Arecibo
25 workshops. Additionally, there are

1 another 5 to 8 Miami students
2 working on capstone and research
3 projects using the Arecibo data
4 every year.

5 Well, actually, I have a long
6 quote from a student about how he
7 is inspired by his experience here,
8 but I think for the sake of time, I
9 am just going to submit this
10 written statement.

11 MS. BLANCO: Yes. Thank you.
12 We have at least three more
13 speakers who have indicated they
14 would like to speak. And if --
15 again, if you would like to speak
16 at the end of that, again, you are
17 more than welcome to if we have
18 time. We have this room until
19 11:30. Thank you.

20 MS. ALMODOVAR: The next person
21 is José Molina.

22 MR. MOLINA: Hi. I am from the
23 National Space Society.

24 Well, I want to point out here
25 that we have Luisa Zambrana. She

1 is the founder and director of the
2 Space Academy. And we have a
3 couple of students back there which
4 are -- that have been inspired, you
5 know, by the facility, by the
6 science there. So it is really
7 important that we keep the
8 education aspect in line.

9 Furthermore, I would like to
10 add for the alternatives and
11 resources areas, I don't see the
12 commercialization or a partial or
13 full commercialization of the
14 Arecibo facility, so I suggest to
15 study the possible public
16 partnership.

17 And, yeah, that's all I have.
18 Thank you.

19 MS. BLANCO: Thank you.

20 MS. ALMODOVAR: The next person
21 is Luisa Fernando-Zambrana.

22 MS. FERNANDO: Good afternoon.
23 Good morning. My name is Luisa
24 Fernando-Zambrana. I am here as a
25 member of the National Space

1 Society. And I also work at the
2 Arecibo Observatory; although, my
3 statements do not reflect those of
4 the Arecibo Observatory, U.S. SRI,
5 S-R-I, or the Metropolitan
6 University or any of its partners.
7 I am here as a citizen and as a
8 scientist.

9 I wonder how will this new plan
10 will ensure that the future of the
11 Arecibo Observatory is not
12 determined by a private interest,
13 but, also -- but, indeed, for the
14 benefit of the science and for the
15 benefit of Puerto Rico.

16 We don't need to remind
17 everybody that Arecibo was the
18 first telescope to discover an
19 exoplanet or how many students have
20 walked through its hallways or
21 produced a dissertation thesis
22 relating to its science.

23 Now it is my turn. I am
24 writing my dissertation thesis
25 using the single dish largest radio

1 telescope in the world. And for
2 this, I have a vision where other
3 scientists will be able to follow
4 my road, as have those students
5 from the Space Academy.

6 I only want to invite the NSF
7 office assigned with this task to
8 take a detailed view on what has
9 happened with its previous attempts
10 to have the observatory continue
11 producing science. Partnerships
12 indeed have flourished and
13 developed amazing science. But,
14 however, it has created reemergence
15 of profits within the observatory,
16 which has led to a decrease in the
17 best use of the funds. So let's
18 take as an example what we have
19 done already, learn from it, and
20 try to get everybody's input to
21 keep Arecibo open. Thank you.

22 MS. ALMODOVAR: Amanda? Next
23 person is Amanda Marín Morales.

24 MS. MARÍN: Amanda Marín
25 Morales.

1 Good morning to all. I have
2 collaborated for 17 years with the
3 public schools of Puerto Rico, and
4 I know firsthand the impact that
5 the Arecibo Observatory has in our
6 high school students and their
7 education, and I believe that it
8 does not fit in my mindset to close
9 the Arecibo Observatory.

10 In my vision, it does fit the
11 possibility of future students
12 pursuing their careers in sciences,
13 and since maybe in our high
14 schools, they do not provide enough
15 information or tools for students
16 to elaborate in sciences, it is
17 wonderful to see how these students
18 flourish in the Arecibo
19 Observatory, because the Arecibo
20 Observatory is not only for the
21 students in Puerto Rico, it is also
22 for the Caribbean, for Latin
23 America, for all of them.

24 What we need is to develop more
25 scientists, more scientists of the

1 stature of Luisa and the scientists
2 that we have here. Scientists is
3 what we need the most.

4 MS. ALMODOVAR: Thank you.
5 Next person, Wilbert Ruperto.

6 MR. RUPERTO: Good morning,
7 ladies and gentlemen. My name is
8 Wilbert Andres Roberto Hernández,
9 and I am 16 years old. I am an
10 Arecibo Observatory Space Academy
11 spring 2015 semester alumni, and I
12 currently work at this institution
13 as a teacher's assistant. This is
14 a precollege research program for
15 high school students in Puerto
16 Rico. My participation in this
17 program began in January 2015, and
18 my life has not been the same since
19 then.

20 Let me tell you a bit of
21 backstory about myself. Ever since
22 I was a small child, I dreamt of
23 becoming an astronaut. And as I
24 grew older, I grew fond of science
25 and space through school classes

1 and some other medias for
2 information, such as the Internet.
3 However, I was missing a very
4 important part in my journey to
5 become an astronaut, and it was
6 hands-on research experience and
7 understanding of the scientific
8 method.

9 AOSA, the Arecibo Observatory
10 Space Academy, represented the
11 opportunity to gain that knowledge
12 and experience and also help me
13 decide on what I would study in
14 college.

15 Once I was accepted in the
16 academy, I noticed how I began
17 evolving as both an individual and
18 a team member through the
19 acquirements of new skills such as
20 scientific research planning and
21 execution and data analysis and the
22 refinement of many others, such as
23 public speaking and interaction
24 using English as a second language
25 and teamwork. In addition, I

1 developed a higher sense of respect
2 and responsibility towards myself,
3 my peers, and science as a branch
4 of study.

5 As I continued in the program,
6 I also got to meet many people,
7 including scientists and fellow
8 space geeks, whom all contributed
9 in some way or another to my
10 increasing affection towards the
11 Arecibo Observatory.

12 I consider every Saturday spent
13 at AO, Arecibo Observatory, as a
14 privilege and an honor that
15 inspired me even more to pursue my
16 path to the stars.

17 Even though after I finished my
18 research and presented it and
19 obtained my graduation diploma from
20 this academy, I felt that I wasn't
21 done. I felt I wanted to do more
22 and went and applied once again to
23 this academy and to which I was
24 later reaccepted as a teacher's
25 assistant. Since then, I have

1 grown and met even more amazing
2 people while working in this
3 position. I can even say that I
4 have found a second family and a
5 second home at Arecibo.

6 Today, I can say that every
7 moment spent at AO has impacted my
8 life in a great manner, a true
9 life-changing experience, and I am
10 eternally grateful to everyone who
11 helped make it so.

12 With the closing of the
13 observatory, I would be losing my
14 second home and one of my favorite
15 places in the world. But what
16 worries me the most is the fact
17 that closing the observatory will
18 be also closing a door to many
19 hopeful teenagers that see the
20 facility and the space academy as
21 an alternative and an additional
22 learning system and even a
23 definitive path to reaching their
24 professional goals. I want the
25 observatory to keep inspiring

1 people, like us, the AOSA alumni,
2 to study a career in any of the
3 STEM branches and together build a
4 better future where human
5 advancement is greater.

6 I call upon you, distinguished
7 members of the NSF and other
8 agencies and institutions, to take
9 into consideration the impact the
10 Arecibo Observatory has on the
11 Puerto Rican youth and population
12 in overall. Thanks.

13 MS. ALMODOVAR: Miguel
14 Sarriera.

15 MR. SARRIERA: Good morning.
16 My name is Miguel Sarriera. I am a
17 resident of the town of
18 Quebradillas in the northern coast
19 of Puerto Rico, and I frequently
20 use and enjoy the scenery on the
21 surrounding natural areas to the
22 Arecibo Observatory.

23 In the year 1960, specifically
24 on June 14th, The Government of
25 Puerto Rico enacted Law No. 88.

1 That law was designed to promote
2 and protect the establishment and
3 operations of the Arecibo radio
4 observatory.

5 To do that, it included several
6 prohibitions about activities
7 within a radius of four miles to
8 the Arecibo Observatory. Those
9 prohibitions included the
10 construction and operation of
11 transmission and distribution --
12 high voltage transmission and
13 distribution lines, AM, FM and TV
14 transmitters, and the operation of
15 a wide array of electric appliances
16 and systems.

17 As a result of those
18 prohibitions, development within
19 this radius has been extremely
20 limited. As an indirect
21 consequence of those prohibitions,
22 we have an exuberant and incredibly
23 beautiful natural area and a very
24 important example of the ecology of
25 the northern Kársticas region in

1 Puerto Rico. We are talking here
2 about a total of 32,172 acres.

3 This is a scoping meeting for
4 the development or the -- yes,
5 development of an environmental
6 impact statement. My request to
7 the NSF is that this document
8 should include a section studying
9 the environmental impact of other
10 alternatives that represent a
11 cessation of the operation of the
12 observatory in relation to these
13 prohibitions. Because if there is
14 no observatory, these prohibitions
15 are irrelevant, and the indirect
16 environmental benefits that they
17 currently represent will be no
18 longer available and that will have
19 an environmental impact. And that
20 will be my request.

21 MS. BLANCO: Thank you.

22 MS. ALMODOVAR: We have one
23 more person signed up. Carla
24 Colón.

25 MS. COLÓN: Good morning. I am

1 small. Well, I have seen that
2 between all of you grown people and
3 a lot of big titles and all of
4 that, I am just a little girl. But
5 just like you, the Arecibo
6 Observatory Space Academy inspired
7 me and gave me love to science.

8 My speech will be like really
9 short. But I just want to say
10 that -- encourage you just to not
11 change our hopes. You know, the
12 educational system of Puerto Rico,
13 it doesn't give that much emphasis
14 to science. The observatory gives
15 us hope. It gives us hope and
16 gives us desire for more. So,
17 please, keep it just -- keep an
18 open mind for us.

19 MS. BLANCO: Thank you.

20 MS. ALMODOVAR: So we have
21 already gone through everyone who
22 wrote themselves down, and she has
23 asked me for a chance, and you will
24 have another chance. Okay.

25 MS. MARTORELL: (Speaking in

1 Spanish) Good morning. My name is
2 Deborah Martorell. I am a
3 meteorologist and science reporter
4 for WAPA TV. I worked in WAPA TV
5 for 22 years, and I have had a
6 journalism career for 30 years.

7 I am here dealing with the
8 coverage of the hearing. I do not
9 usually intervene or give my input
10 in settings like this, especially
11 because of the coverage, but I have
12 an obligation as a citizen and as a
13 witness of the Arecibo telescope to
14 give my opinion.

15 For years I have been in charge
16 of the work that the Arecibo
17 Observatory does in terms of the
18 meteorology and also in the
19 educational aspect. It is a very
20 special place for Puerto Rico, not
21 only for its historical value, but
22 also for its scientific value that
23 it has for the people. I am also
24 witness to its scientific value and
25 also to a day like today, meteor of

1 an asteroid that is passing by at a
2 100,000 miles right now that is
3 being observed at the Arecibo
4 Observatory.

5 It is very important for us to
6 save the Arecibo Observatory.
7 Puerto Rico is going through a very
8 serious economic situation which is
9 directly affecting the educational
10 part. I have been a witness to how
11 there is no money to even tend to
12 children of special education. I
13 have been a witness to how the
14 Arecibo Observatory has been -- is
15 an important place in promoting
16 that study of sciences and
17 education as in the space academy.

18 I do hope you take this in
19 consideration when you deal with
20 the alternatives for the Arecibo
21 Observatory, because it is a very
22 valuable piece of education and
23 science for Puerto Rico.

24 Thank you.

25 MS. BLANCO: Thank you.

1 MS. LÓPEZ: Good morning. My
2 name is Adriana López. I am 14
3 years old. And I was an alumni of
4 the fall class of 2015. And I can
5 say that Arecibo Observatory Space
6 Academy has had certainly a great
7 effect and has had a great impact
8 on my life.

9 Always in my life I have been
10 fascinated with space, and it has
11 led me to join several camps, but
12 none of them affected me like AOSA.
13 This academy provided me with
14 skills not even my own academic
15 institution did. I learned and
16 experienced how to truly work in
17 team, keep track of my work, and
18 even organize my own journal.

19 This has even led for my own
20 study method to be formed. And for
21 example, while I was in school, I
22 was rather bored, but once I joined
23 AOSA, I was full of things, and I
24 had to organize myself. One of the
25 requirements was to even create

1 your own research project, and that
2 was extremely hard. So I can
3 certainly say that the impact and
4 the amount of things I just learned
5 because of AOSA is monumental and
6 can greatly affect any teenager
7 that truly puts their mind to it.

8 So with this I end that I am
9 considering becoming a teacher's
10 assistant next semester if the
11 Arecibo Observatory is still open.

12 Thank you very much.

13 MS. BLANCO: Thank you.

14 MS. ALMODOVAR: We have one
15 more comment.

16 MS. COLÓN: Thank you very
17 much. My name is Hilda Colón, and
18 I wanted just to add two or three
19 aspects to what has already been
20 said.

21 One of them is that I received
22 a request from the Ángel Ramos
23 Foundation president because he
24 wants to let you all know that the
25 foundation is very interested in

1 participating in this and that they
2 will be submitting a written
3 opinion with a written document by
4 June -- earlier than June 23rd.
5 Just for the record.

6 On the other hand, I cannot
7 tell you how impressed I am with
8 the participation of the students
9 and everybody here. And I also
10 want to add that the experience
11 with the undergraduates as well as
12 graduate students at the Arecibo
13 Observatory is just as impacting as
14 what you have just recently heard.

15 Now, we are also looking at
16 another factor as a faculty member
17 in Puerto Rico, and that's the
18 special education area. And that's
19 another area in which we intend to
20 participate very soon in an
21 organized way using the science of
22 the Arecibo Observatory as the
23 means.

24 So at this point I think I am
25 going to stop because you know the

1 rest of the story of what I was
2 going to say. Thank you very much
3 for your attention.

4 MS. BLANCO: Thank you. Is
5 there anybody left who would
6 still -- would like to speak who
7 hasn't had a chance to do so?

8 We will ask people who haven't
9 yet spoken first and then we will
10 go back to anyone still left.

11 MR. LUGO: So I am Ramon Lugo
12 from the University of Central
13 Florida.

14 So two questions. You don't
15 really describe the review process
16 with respect to externals like
17 Congress and the Office of Science
18 and Technology policy.

19 And then, finally, also, are
20 you having a group of external
21 consultants review your
22 contractor's work? In NASA, when
23 we do environmental impact
24 statements, we always bring in
25 external stakeholders and experts

1 to review the contractor's work
2 before the final decision is made.
3 So are you doing that as well?

4 MS. BLANCO: The first question
5 you asked with regard to external
6 reviews by other agencies and
7 Congress, that is not part of the
8 environmental impact statement
9 process under the National
10 Environmental Policy Act. However,
11 there are other federal agencies,
12 Congress. This is an open process.

13 MR. LUGO: Right.

14 MS. BLANCO: We noticed this
15 process in the Federal Register.
16 So, therefore, any federal agency
17 or congress or any member of the
18 public who wishes to comment may do
19 so.

20 The second question you asked
21 was with regard to contractor
22 oversight. NSF is fortunate to
23 have the contracting services of
24 CH2M Hill to help support NSF in
25 this process. However, NSF is

1 ultimately responsible for this
2 process and conducts very careful
3 oversight. And NSF is here today,
4 and we will be here again when the
5 draft environmental impact
6 statement comment period commences,
7 and we are taking the lead role
8 throughout this process. Thank
9 you.

10 Other people who haven't yet
11 spoken?

12 Okay. Then I would like to
13 offer the opportunity to continue
14 speaking if you wish.

15 MR. ISHAM: Brett Isham from
16 Interamerican University,
17 electrical and computer
18 engineering.

19 I just wanted to mention some
20 of our projects that we have that
21 are related to Arecibo Observatory.

22 On the Aguadilla campus of
23 Interamerican University, we are in
24 the process of constructing a
25 high-frequency array of radio

1 antennas. We also have a -- we are
2 a lead institution on a Puerto Rico
3 CubeSat project which also has a
4 high-frequency radio instrument on
5 board. Both of these projects have
6 direct ties to Arecibo Observatory
7 because they will be used in joint
8 observations of the atmosphere and
9 with the high-frequency atmospheric
10 modification facility at Arecibo.
11 And one of the primary motivations,
12 also, of both projects is
13 undergraduate student
14 participation.

15 I also wanted to mention
16 because some -- there are other
17 institutions whose representatives
18 are not here that have projects
19 related to Arecibo. University of
20 Colorado has an HF radar in Cayey.
21 So that is -- also contributes to
22 joint observations with Arecibo and
23 will with our Interamerican project
24 as well.

25 Cornell University has

1 30-megahertz radio on St. Croix
2 which is used jointly with Arecibo.

3 Johns Hopkins has radio
4 receivers on Culebra, which I have
5 been collaborating with this week
6 with Arecibo high-frequency
7 ED (phonetic) campaign
8 observations.

9 And Oberlin College is a
10 collaborator on the NANOGrav
11 project, and they have -- I know
12 Dan Steinberg there, who is
13 professor of astronomy and physics,
14 and has many students working on
15 Arecibo data.

16 More generally, I wanted to
17 mention briefly a couple of
18 impressions I had. When Arecibo
19 started operating in the early
20 1960s, there were a series of
21 papers about new observations
22 within the incoherent scattered
23 radar. It has struck me profoundly
24 recently that the latest
25 observations with Arecibo are

1 comparable in their novelty and new
2 capabilities with the -- in the
3 area of incoherent scatter, for
4 example, the new receiving systems
5 allow observations of plasma lines
6 out to 1,000 kilometers. In
7 contrast, past observations in the
8 '60s were just very limited in
9 their range.

10 And so that's just one example.
11 There is other -- gyro lines now
12 can be routinely observed. And
13 these full -- observations to the
14 full atmosphere of the incoherent
15 scatter spectrum can be observed 24
16 hours a day, which is a new
17 capability only in the past couple
18 of years.

19 Since you were answering
20 questions, I was just curious if
21 NSF does fact check those reports
22 such as the Ford-Colley review and
23 other reports.

24 MS. BLANCO: That is something
25 that is outside of the

1 environmental review process. I
2 personally couldn't answer that
3 question for you. I can say that
4 those processes are very well
5 vetted, though.

6 MR. ISHAM: Thank you.

7 MR. ZHOU: Can I still ask a
8 clarifying question? I would like
9 to know whether the EIS is going to
10 drive the decision on the
11 alternatives or should the
12 alternatives drive on the EIS.

13 MS. BLANCO: The alternatives --
14 I will answer this briefly because we
15 are out of time. The alternatives --
16 this stage addresses -- let me start
17 again.

18 This stage only addresses the
19 alternatives, and that is the basis
20 for the process, because after this
21 point, we will refine the
22 alternatives and then look at the
23 environmental impacts of those
24 alternatives. So this is the stage
25 where if there is public input on

1 different alternatives or
2 refinement of these preliminary
3 alternatives, this is the time to
4 voice that -- those comments.

5 MR. ZHOU: So there will be
6 five different EIS depending on the
7 five alternatives?

8 MS. BLANCO: These are at this
9 point conceptual alternatives.
10 They haven't been refined yet
11 because this public process is
12 still open. And when the public
13 comment period closes on June 23rd,
14 we will take another look to see if
15 refinement is appropriate.

16 So thank you, everybody, very
17 much for participating, and I do
18 encourage you, if you have more
19 comments, to please submit them by
20 email or by U.S. mail by June 23rd,
21 which is the deadline for receiving
22 public comment on the record.

23 And please make sure, if you
24 haven't already, to pick up the
25 handout, which has information on

1 how to keep up with this process
2 and gives a description of the
3 basic timeline and also the
4 proposed action and alternatives.

5 And one important thing I do
6 want to mention, on this handout,
7 it refers to Section 106, and
8 Section 106 is part of the National
9 Historic Preservation Act, and it
10 is a process where we work with
11 people who are interested, called
12 consulting parties, and with the
13 State Historic Preservation Office
14 in Puerto Rico to look at potential
15 effects, adverse or otherwise, to
16 the proposed alternatives. And if
17 there are adverse effects, we work
18 with the consulting parties on ways
19 to avoid, minimize or mitigate
20 those effects.

21 So if you are interested in
22 becoming a consulting party, please
23 make sure that you check that box
24 on the sign-in sheet. And if you
25 find that you did put your name on

1 the sign-in sheet but you are not
2 getting information through this
3 process, it may be that we couldn't
4 read the information on it, so
5 please contact us.

6 Thank you very much.

7 (The proceeding adjourned
8 at 11:37 a.m.)

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REPORTER'S CERTIFICATE

I, DEREK L. HOAGLAND, Certified Shorthand Reporter #13445, State of California, do hereby certify that the foregoing is a true and correct transcript of the proceedings had in the within-entitled and numbered cause on the date hereinbefore set forth; and I do further certify that the foregoing transcript has been prepared under my direction.

DEREK L. HOAGLAND

5-C Scoping Materials



National Science
Foundation

Environmental Impact Statement and Section 106 Consultation for Proposed Changes to Arecibo Observatory Operations

Arecibo, Puerto Rico

Overview:

The National Environmental Policy Act requires federal agencies to conduct an environmental review to assess the potential environmental impacts of federal actions that could significantly affect the environment.

Section 106 of the National Historic Preservation Act requires federal agencies to consult with interested parties and the State Historic Preservation Officer regarding potential effects of their proposed actions on significant historic properties, such as the Arecibo Observatory.

The purpose of the public scoping process is to determine relevant issues that will influence the scope of the environmental analysis, including identification of viable alternatives. Additional opportunities for public participation will be available throughout the process.

Project Timeline Schedule for Public Involvement:

- **Scoping Comment Period:**
May 24-June 23, 2016
- **Draft EIS target release:**
Late Fall 2016
 - 45-Day Comment Period on Draft EIS
 - Public meetings on Draft EIS
- **Final EIS target release:**
Spring 2017
- **Record of Decision target release:**
Summer 2017

Submit Comments:

You may submit comments by either of the following methods:

Email to: envcomp-AST@nsf.gov, with subject line "Arecibo Observatory"

Mail to: Ms. Elizabeth Pentecost,
RE: Arecibo Observatory
National Science Foundation,
Suite 1045 4201 Wilson Blvd
Arlington, VA 22230

Project information will be posted, throughout the EIS process, at www.nsf.gov/AST.



National Science
Foundation

Environmental Impact Statement and Section 106 Consultation for Proposed Changes to Arecibo Observatory Operations

Arecibo, Puerto Rico

Alternatives to be evaluated in the EIS will be refined through continued public input. Preliminary alternatives include the following:

- Continued NSF investment for science-focused operations (No-Action Alternative)
- Collaboration with interested parties for continued science-focused operations
- Collaboration with interested parties for transition to education-focused operations
 - Mothballing of facilities (suspension of operations in a manner such that operations could resume efficiently at some future date)
 - Deconstruction and site restoration

Potential Resources to be considered:

An impact is a change or consequence that results from a proposed activity; it can be positive, negative or both. It may be mitigated to lessen or remove the impact. At present, NSF has preliminarily identified the following resource areas for analysis of potential impacts:

air quality

geological resources

biological resources

solid waste generation

health and safety

socioeconomics

traffic

cultural resources

groundwater resources

Section 106 Process for the Arecibo Observatory:

In coordination with the EIS, NSF will consult with the State Historic Preservation Officer and other consulting parties on potential effects to historic properties located within the Area of Potential Effects (APE).

- NSF proposes that the APE encompass the full Arecibo Observatory property.
- Arecibo Observatory (as the "National Astronomy and Ionosphere Center") is listed in National Register of Historic Places as a historic district that is significant in the areas of science, engineering, and education.
- Consultation would be focused on identifying potential effects and any measures to avoid, minimize, and/or mitigate adverse effects; in the case of adverse effects, a Memorandum of Agreement may be used to formalize such measures.



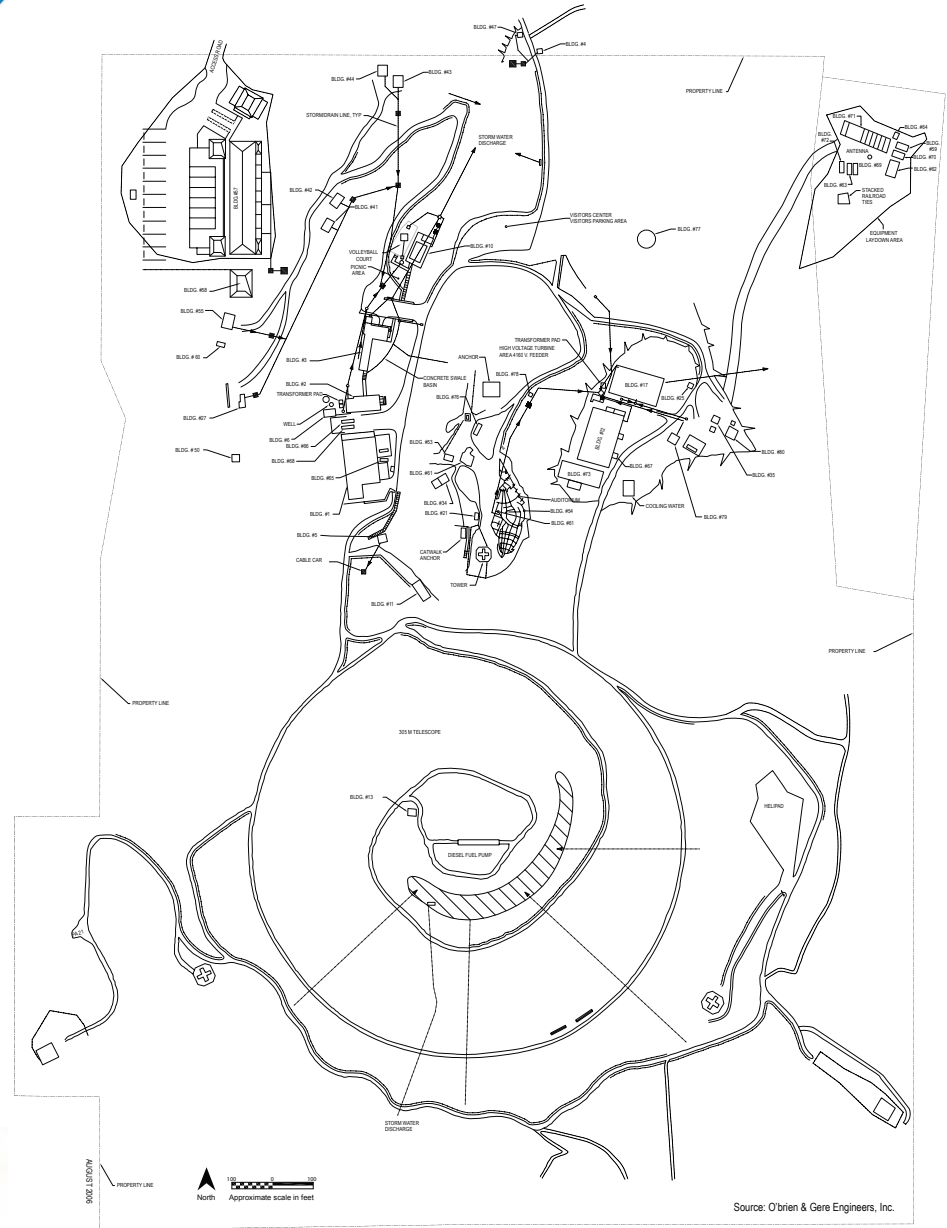
Environmental Impact Statement and Section 106 Consultation for Proposed Changes to Arecibo Observatory Operations



Site Plan

Arecibo, Puerto Rico


Arecibo is a municipality on the northern coast of Puerto Rico, on the shores of the Atlantic Ocean, located north of Utuado and Ciales; east of Hatillo; and west of Barceloneta and Florida. It is about 50 miles west of San Juan, the capital city.



BUILDING NO. DESCRIPTION

- | | | | |
|---|--|---------------------------------------|--|
| 1. OPERATIONS BUILDING | 34. HIGH VOLTAGE POWER SUPPLY BLDG. | 69. VISITOR CENTER TRAILER | 76. INFIRMARY FOR SCIENCE TRAILER |
| 2. ADMIN. TRAINING BUILDING | 35. CUMMINGS GENERATOR CONTROL BLDG. | 80. ANT. REECE TESTING BLDG. | 77. PHASE REFERENCE ANTENNA (SMA) |
| 3. VISITOR CENTER QUARTERS AND CATERING | 36. VISITOR CENTER QUARTERS AND CATERING | 81. LEARNING CENTER | 78. COFFEY HSE |
| 4. WEST HILL V.S.Q. BACHELOR UNIT NO. 1 | 37. WEST HILL V.S.Q. BACHELOR UNIT NO. 2 | 82. HPF STORAGE TRAILER | 79. ENGINEERING OFFICE BUILDING |
| 5. ENTRANCE GUARD HOUSE | 38. CABLE CAR HOUSE | 83. ONCOSCOPE TRAILER | 80. CUMMINGS DIESEL GENERATOR BUILDING |
| 6. SWIMMING POOL RESTROOMS | 39. SWIMMING POOL RESTROOMS | 84. ELECTRONIC TRAILER | |
| 7. LEVER BUILDING-ROCKING LIFT | 40. MAINTENANCE SHOPS | 85. DIESEL GENERATOR TRAILER | |
| 8. MAINTENANCE SHOPS | 41. SCENE SHACK | 86. ATMOSPHERIC SCIENCE TRAILER | |
| 9. WAREHOUSE | 42. ANTENNA TESTING RANGE | 87. INTERFERENCE MONITORING SHACK | |
| 10. PAINT STORAGE BUILDING | 43. PAINT STORAGE BUILDING | 88. SCIENTIFIC OFFICES TRAILER | |
| 11. OPTICAL LABS | 44. OPTICAL LABS | 89. ELECTRONIC TRAILER (W/SPAREPARTS) | |
| | | 90. COMPUTER TRAILER | |
| | | 91. ELECTRONIC TRAILER (SPAREPARTS) | |
| | | 92. HP TRANSMITTER BUILDING | |


Source: O'brien & Gere Engineers, Inc.



NSF Environmental Impact Statement and Section 106 Consultation for Proposed Changes to Arecibo Observatory Operations

Scoping Meeting/ Reunión de Definición de Alcance

Daytime: Doubletree by Hilton, San Juan, 9:30-11:30 AM
Evening: College of Engineers and Land Surveyors, Arecibo, 6:00-8:00 PM



Arecibo Observatory Environmental Impact Statement (EIS) Scoping Meeting: *Overview*

- Introduction of team members
 - [Presentación de los miembros del equipo](#)
- Background information
 - [Información de trasfondo](#)
- The proposed preliminary alternatives and resource areas to be studied
 - [Las alternativas preliminares propuestas y las áreas de recurso a ser estudiadas](#)
- The EIS process
 - [El proceso de la Declaración de Impacto Ambiental \(DIA\)](#)
- Public Comments
 - [Comentarios del Público](#)

06/07/2016 Arecibo EIS Scoping Meetings 2




Background/ **Trasfondo**

(1)

- The National Science Foundation (NSF) is the federal steward for ground based astronomy and space and atmospheric science.
- La Fundación Nacional de la Ciencia (NSF, por sus siglas en inglés) es la representante federal para la astronomía y la ciencia del espacio y atmosférica con base en tierra.
- NSF provides funding for national and international telescopes and facilities and provides funding for research grants that allow individuals and groups to conduct specific science investigations.
- NSF provee fondos para los telescopios y las instalaciones nacionales e internacionales y provee fondos para becas de investigación que permiten que individuos y grupos realicen investigaciones científicas específicas.

06/07/2016 Arecibo EIS Scoping Meetings 3




Background/ **Trasfondo**

(2)

- In fiscal year (FY) 2016, NSF is providing \$8.2M to Arecibo Observatory.
- En el año fiscal (FY, por sus siglas en inglés) 2016, la NSF está proveyendo \$8.2 millones al Observatorio de Arecibo.
- NSF funding for Arecibo Observatory is equally divided between the NSF Division of Astronomical Sciences (AST) and the NSF Division of Atmospheric and Geospace Sciences (AGS).
- Los fondos que otorga NSF para el Observatorio de Arecibo se dividen en partes iguales entre la División de Ciencias Astronómicas de NSF (AST, por sus siglas en inglés), y la División de las Ciencias Atmosféricas y Geoespaciales de NSF (AGS, por sus siglas en inglés)
- In FY 2016 the Planetary Science Division of NASA is providing \$3.7M funding to Arecibo Observatory.
- En FY 2016, la División de Ciencia Planetaria de la NASA está proveyendo \$3.7 millones en fondos para el Observatorio de Arecibo.

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Background/ **Trasfondo**

(3)

- Over the past decade NSF has received advice from external review committees stating that NSF will need to reduce or cease support of some existing telescopes and facilities to allow for (1) construction and operation of new telescopes, facilities, and instruments, (2) continued funding for research grants that enable individual science investigations.
- A través de la década pasada la NSF ha recibido consejo de parte de comités de revisión externos que indican que el NSF va a necesitar reducir o cesar el apoyo a algunos telescopios e instalaciones existentes para permitir (1) la construcción y operación de nuevos telescopios, instalaciones e instrumentos, (2) continuar proveyendo fondos para becas de investigación que permiten investigaciones científicas individuales.

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Arecibo EIS Scoping Meetings
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Background/ **Trasfondo**

(4)

- With regards to the Arecibo Observatory:
 - The 2012 report: *Advancing Astronomy in the Coming Decade: Opportunities and Challenges* stated:

“AST should reevaluate its participation in Arecibo and SOAR later in the decade in light of the science opportunities and budget forecasts at that time. If funding remains tight later in the decade, then the scientific need for continued AST funding for Arecibo and SOAR must be weighed against the needs in the grants programs.”
- Con respecto al Observatorio de Arecibo:
 - El informe de 2012 titulado: *“Advancing Astronomy in the Coming Decade: Opportunities and Challenges”*, indicó:

“El AST debe reevaluar su participación en Arecibo y SOAR más tarde en la década a la luz de las oportunidades de ciencia y las proyecciones de presupuesto en ese momento. Si el presupuesto sigue ajustado más tarde en la década, entonces la necesidad científica para la otorgación de fondos de parte del AST a Arecibo y SOAR deben ser evaluados contra las necesidades de los programas de propuestas.”

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Arecibo EIS Scoping Meetings
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Background/ **Trasfondo**

(4) (Continued)

- With regards to the Arecibo Observatory (Continued):
 - The 2016 report: *Investments in Critical Capabilities for Geospace Science 2016 to 2025* stated:

"The GS should reduce its M&O [Management and Operations] support for the Arecibo Observatory (AO) to \$1.1M by 2020, i.e., to a proportional pro rata level approximately commensurate with its fractional NSF GS proposal pressure and usage for frontier research." (This compares to a current support level of \$4.1 million annually from AGS.)
 - El informe de 2016 titulado: *Investments in Critical Capabilities for Geospace Science 2016 to 2025*, indicó:

"El GS debe reducir su apoyo al Manejo y Operaciones (M&O, por sus siglas en inglés) del Observatorio de Arecibo (AO, por sus siglas en inglés) a \$1.1 millones para el año 2020, i.e., a un nivel de razón proporcional aproximadamente conmensurado con la fracción de presión de propuestas de GS de NSF y su uso para investigación de desarrollo innovador." (Esto se compara con un nivel de apoyo actual de \$4.1 millones de AGS.)

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Arecibo EIS Scoping Meetings

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Background/ **Trasfondo**


(5)

- Given previous community recommendations combined with current budget constraints, NSF has a need to reduce funding levels for a number of its astronomical and geospace science telescopes and facilities.
- Dadas las previas recomendaciones de la comunidad en combinación con las actuales limitaciones de presupuesto, la NSF tiene una necesidad de reducir los niveles de fondos para una cantidad de sus telescopios e instalaciones astronómicas y geospaciales.

06/07/2016

Arecibo EIS Scoping Meetings

8




Background/ **Trasfondo**

(6)

- The purpose of the Arecibo Observatory EIS is to evaluate the environmental impacts of the alternatives addressing the need to change operations at Arecibo Observatory.
- **El propósito de la DIA para el Observatorio de Arecibo es evaluar los impactos ambientales de las alternativas que atienden la necesidad del cambio a las operaciones en el Observatorio de Arecibo.**

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EIS: Alternatives and Resource Areas/ **DIA: Alternativas y Áreas de Recursos**

(1)

<p>Preliminary Alternatives for Study</p> <ul style="list-style-type: none"> • Continued NSF investment for science-focused operations (No-Action Alternative) • Collaboration with interested parties for continued science-focused operations • Collaboration with interested parties for transition to education-focused operations • Mothballing of facilities (suspension of operations in a manner such that operations could resume efficiently at some future date) • Deconstruction and site restoration 	<p>Alternativas Preliminares para Estudio</p> <ul style="list-style-type: none"> • Inversión continua de parte de la Fundación Nacional de Ciencias (NSF, por sus siglas en inglés) para operaciones enfocadas en ciencia (Alternativa De No Acción) • Colaboración con grupos o entidades interesados en continuar las operaciones enfocadas en la ciencia • Colaboración con grupos o entidades interesados para una transición de las operaciones a unas con enfoque a la educación • Suspensión de actividad en las facilidades (suspensión de las operaciones de una manera que las operaciones se puedan continuar eficientemente en una fecha futura) • Deconstrucción y restauración del sitio
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EIS: Alternatives and Resource Areas/
DIA: Alternativas y Áreas de Recursos
(2)

<p>Preliminary List of Resources to be analyzed during the EIS</p> <ul style="list-style-type: none"> • Air quality, biological resources, cultural resources, geological resources, solid waste generation, health and safety, socioeconomics, traffic, groundwater resources. 	<p>Lista Preliminar de Recursos a ser analizados durante la DIA</p> <ul style="list-style-type: none"> • Calidad de aire, recursos biológicos, recursos culturales, recursos geológicos, generación de desperdicios sólidos, salud y seguridad, socio economía, tránsito vehicular, recursos de aguas subterráneas.
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EIS: Alternatives and Resource Areas/
DIA: Alternativas y Áreas de Recursos
(3)

- The EIS is a public process, and comments received during the public comment periods will be considered by NSF as part of its decision-making process.
- La DIA es un proceso público, y los comentarios recibidos durante los períodos de comentario público serán considerados por la NSF como parte de su proceso de toma de decisiones.
- No decisions have been made!
- ¡No se han tomado decisiones!

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5-D Scoping Comment Matrix

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
1	Michael K	Shepard	Bloomsburg University of PA	<p>Using the S-band radar at Arecibo Observatory, we observed 16 Psyche, the largest M-class (metallic) asteroid in the main belt and a potential spacecraft target. We obtained 18 radar imaging and 6 continuous wave runs in November and December 2015, and combined these with 16 Arecibo observations in 2005 and 6 recent adaptive-optics (AO) images [Conrad et al. 2016] to generate a three-dimensional shape model of Psyche. We find Psyche to be roughly ellipsoidal with dimensions 279 x 232 x 189 km. Our radar measurements are consistent with a metal (iron-nickel) object and 40% bulk porosity. Our radar images show at least two large crater-like depressions.</p> <p>The Arecibo images were absolutely essential for the generation of the shape model. The results and the shape model are currently being used by JPL scientists as they submit their Phase 2 Discovery Mission proposal, "Psyche: Journey to a Metal World."</p> <p>Authors Michael K. Shepard, Bloomsburg University, 400 E. Second St., Bloomsburg, PA 17815, USA James Richardson, Patrick A. Taylor, Linda A. Rodrigues-Ford, Arecibo Observatory, USRA Arecibo, PR 00612, USA and 18 additional coauthors.</p>	Against Closure	Email	5/26/2016	
2	Tracy	Becker	Southwest Research Institute	<p>Please find details below regarding the Becker et al., 2015 publication in Icarus using radar observations made at the Arecibo Observatory (attached or doi:10.1016/j.icarus.2014.10.048) :</p> <p>Title: Physical modeling of triple near-Earth Asteroid (153591) 2001 SN263 from radar and optical light curve observations Author list: Tracy M. Becker, Ellen S. Howell, Michael C. Nolan, Christopher Magri, Petr Pravec, Patrick A. Taylor, Julian Oey, David Higgins, Jozef Világi, Leonard Kornoš, Adrián Galád, Štefan Gajdoš, Ninel M. Gaftonyuk, Yuriy N. Krugly, Igor E. Molotov, Michael D. Hicks, Albino Carbognani, Brian D. Warner, Frederic Vachier, Franck Marchis, Joseph T. Pollock</p> <p>Abstract: On February 12, 2008, radar observations conducted at the Arecibo Observatory revealed that Asteroid (153591) 2001 SN263 had two small satellites, making it the first-known triple near-Earth asteroid (NEA) system. In this work, we used the delay-Doppler images observed at Arecibo, supplemented by visible light curve data obtained from 8 observatories across the globe, to produce 3-D shape models of the three components of the asteroid 2001 SN263. The models place limits on the size, density, rotation period and the pole direction of the three bodies in the asteroid system. These physical properties help to constrain formation mechanisms and the evolution of binary and ternary systems. Radar observations, like those from Arecibo, are required for observing and reproducing the high-resolution structure of asteroids, short of sending a spacecraft. The resulting shape models provide strong constraints on the asteroids' density and internal structure, essential characteristics for understanding the near-Earth asteroid population.</p> <p>On a personal note, I began this research as an REU student at the Arecibo Observatory in 2008. The experience inspired me to pursue research in planetary science and I was awarded my doctorate in the field in May of this year.</p>	Against Closure	Email	5/27/2016	Becker_2001SN263.pdf
3	Yuri Y.	Kovalev		<p>RadioAstron Observations of the Quasar 3C273: A Challenge to the Brightness Temperature Limit</p> <p>Kovalev, Y. Y.; Kardashev, N. S.; Kellermann, K. I.; Lobanov, A. P.; Johnson, M. D.; Gurvits, L. I.; Voitsik, P. A.; Zensus, J. A.; Anderson, J. M.; Bach, U.; Jauncey, D. L.; Ghigo, F.; Ghosh, T.; Kraus, A.; Kovalev, Yu. A.; Lisakov, M. M.; Petrov, L. Yu.; Romney, J. D.; Salter, C. J.; Sokolovsky, K. V.</p> <p>Inverse Compton cooling limits the brightness temperature of the radiating plasma to a maximum of $10^{11.5}$ K. Relativistic boosting can increase its observed value, but apparent brightness temperatures much in excess of 10^{13} K are inaccessible using ground-based very long baseline interferometry (VLBI) at any wavelength. We present observations of the quasar 3C 273, made with the space VLBI mission RadioAstron on baselines up to 171,000 km, which directly reveal the presence of angular structure as small as 26 mas (2.7 light months) and brightness temperature in excess of 1013 K. These measurements challenge our understanding of the non-thermal continuum emission in the vicinity of supermassive black holes and require a much higher Doppler factor than what is determined from jet apparent kinematics.</p> <p>http://adsabs.harvard.edu/abs/2016ApJ...820L...9K</p>	Against Closure	Email	5/28/2016	

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
4	Yuri Y.	Kovalev		<p>Extreme Brightness Temperatures and Refractive Substructure in 3C273 with RadioAstron</p> <p>Johnson, Michael D.; Kovalev, Yuri Y.; Gwinn, Carl R.; Gurvits, Leonid I.; Narayan, Ramesh; Macquart, Jean-Pierre; Jauncey, David L.; Voitsik, Peter A.; Anderson, James M.; Sokolovsky, Kirill V.; Lisakov, Mikhail M.</p> <p>Earth-space interferometry with RadioAstron provides the highest direct angular resolution ever achieved in astronomy at any wavelength. RadioAstron detections of the classic quasar 3C 273 on interferometric baselines up to 171,000 km suggest brightness temperatures exceeding expected limits from the "inverse-Compton catastrophe" by two orders of magnitude. We show that at 18 cm, these estimates most likely arise from refractive substructure introduced by scattering in the interstellar medium. We use the scattering properties to estimate an intrinsic brightness temperature of $7e12$ K, which is consistent with expected theoretical limits, but which is ~ 15 times lower than estimates that neglect substructure. At 6.2 cm, the substructure influences the measured values appreciably but gives an estimated brightness temperature that is comparable to models that do not account for the substructure. At 1.35 cm, the substructure does not affect the extremely high inferred brightness temperatures, in excess of 10^{13} K. We also demonstrate that for a source having a Gaussian surface brightness profile, a single long-baseline estimate of refractive substructure determines an absolute minimum brightness temperature, if the scattering properties along a given line of sight are known, and that this minimum accurately approximates the apparent brightness temperature over a wide range of total flux densities.</p> <p>http://adsabs.harvard.edu/abs/2016ApJ...820L..10J</p>	Against Closure	Email	5/28/2016	
5	Eric	Dahlstorm	International Space Consultants	<p>Thank you for the opportunity to comment on the beginning of the NSF effort on the Environmental Impact Statement (EIS) related to the Arecibo observatory.</p> <p>Although I have not had an opportunity to use the Arecibo observatory, I was trained in radio astronomy before I became a space science and space engineering consultant.</p> <p>I appreciate the severe budget constraints faced by the NSF that have forced a review of the future support of the Arecibo observatory. Currently, the value of the observatory is judged solely by its contribution to the division of astronomical sciences. But I feel the observatory has much more value beyond the astronomical sciences.</p> <p>Here are three other areas where Arecibo makes significant contributions:</p> <ol style="list-style-type: none"> 1. Arecibo continues to contribute to the search for extraterrestrial intelligence (SETI). This is a highly uncertain effort of course, but the potential value to humanity of a successful detection is immense. 2. Arecibo has also, in the past, been used to test technologies for power beaming from space. The design of space based solar power systems has continued, and the value of Arecibo for this application could be significant. 3. And finally, Arecibo plays an important role in using interplanetary radar to map near-Earth asteroids. The more than 600 asteroids mapped by this technique play an important role in our understanding of how to deal with a potentially threatening asteroid. If any asteroid were discovered to be on a trajectory to impact Earth, Arecibo would immediately be called upon to provide accurate radar mapping. <p>While Arecibo may be judged to contribute insufficiently strictly in astronomical sciences, the telescope may play vital roles in - the development of future energy for humanity; perhaps discovering ETI, the greatest discovery of all time; and it may help protect the very existence of human civilization. If Arecibo did not exist, we would have many reasons to build it.</p> <p>I hope that we can find a way that these other contributions of Arecibo may support the operating budget to maintain the observatory. However, I understand that you are simply asking for comments on the EIS process at this time.</p>	Against Closure	Email	5/30/2016	
6	Eric	Dahlstorm	International Space Consultants	<p>My comment on the EIS process follows:</p> <p>Two of the alternatives - "Mothballing of facilities", and "Deconstruction and site restoration" - would seem to be the alternatives with significant environmental impacts.</p> <p>I suggest that these alternatives also include an estimate of the environmental impact of *restoring* the observatory to operation. In other words, if an environmental impact is identified for removing hardware from the site, the study should also include (as a separate entry) an estimate of the environmental impact for *returning* the equipment to the site.</p> <p>If, for example, we discover an asteroid on a potentially threatening trajectory, we would immediately send the trucks back up to the observatory to restore Arecibo to full function. Any estimate of the environmental impact of decommissioning should account for the potential need to reactivate the observatory.</p>	Resource Considerations	Email	5/30/2016	

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
7	Sarah	Scholes		<p>My name is Sarah Scoles, and I'm a science writer doing a story for Scientific American about the upcoming June 7 meeting at Arecibo Observatory, to begin the environmental impact scoping process. I'd like to get your perspective on this meeting and the whole scoping and decision-making process.</p> <p>I'm at the American Astronomical Society's Solar Physics meeting right now, so a phone meeting might be difficult (as it might be for you, too, since this is short notice), but I'm hoping you can give a comment by email for the article, which I am turning in on Thursday.</p> <p>I'm just wondering</p> <ul style="list-style-type: none"> • how a potential closing of Arecibo would affect American astronomy, for better, worse, or neutral. 	Decision Process	Email	5/31/2016	
8	Sarah	Scholes		<p>My name is Sarah Scoles, and I'm a science writer doing a story for Scientific American about the upcoming June 7 meeting at Arecibo Observatory, to begin the environmental impact scoping process. I'd like to get your perspective on this meeting and the whole scoping and decision-making process.</p> <p>I'm at the American Astronomical Society's Solar Physics meeting right now, so a phone meeting might be difficult (as it might be for you, too, since this is short notice), but I'm hoping you can give a comment by email for the article, which I am turning in on Thursday.</p> <p>I'm just wondering</p> <ul style="list-style-type: none"> • where in the decision-making process the NSF is (in terms of whether to mothball, change to educational focus, etc.), as well as in the scoping process • and how much response you have received so far to the request for comment. 	General	Email	5/31/2016	
9	Frankie	Lucena		<p>I would like to express my opinion regarding the hearing for changes and the environmental impact of the Arecibo Observatory. First I would like to express the importance the observatory is to not only the citizens of Puerto Rico but also to the tourist who come here to visit us from all over the world. I had some friends from the Czech Republic come to Puerto Rico this past January and they were very eager to visit the observatory. Unfortunately it was closed for renovation so they never got to see it but they will return next year and hopefully it will be open. Our economy could use all the help we can get and tourist do want to visit the observatory so please consider this in your decision.</p> <p>I would also like to add that the observatory plays host to many scientist and researchers and when they visit the observatory they too help in contributing to our economy by spending money during their stay here. Professor John Mathews from Penn State University is one of those scientists that uses the observatory for his research and comes here quite often. Their research and discoveries will attract more visitors in the future. Maybe it was their research that lead to Hollywood coming here to film Contact and also a segment of a James Bond movie. The Arecibo Observatory has been seen in many Documentaries and TV specials over the years and this helps generate interest abroad which will lead to tourists wanting to visit there.</p> <p>Please consider all of this while making your decision.</p>	Against Closure	Email	6/2/2016	
10	Frank T.	Djuth	Geospace Research, Inc.	<p>The proposed changes to Arecibo Observatory will be highly detrimental to the education of underprivileged children on the Island of Puerto Rico.</p> <p>The current activities of Arecibo Observatory include more than just scientific research. Approximately 20,000 K-12 students travel to the Arecibo Observatory Visitor Center each year, most of which come from low-income families. The Visitor Center resembles a miniature air and space museum and is inspiring to say the least. Students need such exposure so that they see what higher education brings and how it offers a path to an exciting and productive career. Also Arecibo upgrades the teaching capabilities of high school teachers through STEM learning and conducts a Saturday School Space Academy for local high school students. This essentially gives the students advanced placement. No other observatory worldwide does more to advance the socioeconomic development of the underprivileged.</p> <p>I am convinced that very few people understand what it means for a child to be a member of a poor family when it comes to education. The family tends to have a very limited educational background, and the child is provided little support or encouragement to excel in school. The educational problem that will arise from the proposed Arecibo Observatory changes will be much deeper than even the unemployment disaster of laying off more than one hundred local Puerto Rican residents who work at the Observatory. In the current Puerto Rican economy quality jobs are almost impossible to find.</p>	Against Closure	Email	6/3/2016	

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
11	Frank T.	Djuth	Geospace Research, Inc.	<p>The proposed changes to Arecibo Observatory will be highly detrimental to the education of underprivileged children on the Island of Puerto Rico.</p> <p>Academy for local high school students. This essentially gives the students advanced placement. No other observatory worldwide does more to advance the socioeconomic development of the underprivileged.</p> <p>I am convinced that very few people understand what it means for a child to be a member of a poor family when it comes to education. The family tends to have a very limited educational background, and the child is provided little support or encouragement to excel in school. The educational problem that will arise from the proposed Arecibo Observatory changes will be much deeper than even the unemployment disaster of laying off more than one hundred local Puerto Rican residents who work at the Observatory. In the current Puerto Rican economy quality jobs are almost impossible to find.</p>	Against Closure	Email	6/3/2016	
12	Olivia	Keenan		<p>Title: The Arecibo Galaxy Environment Survey X: The Structure of Halo Gas Around M33</p> <p>Authors: Miss Olivia C. Keenan, Prof. Jon I. Davies, Dr Rhys Taylor and Dr Robert F. Minchin</p> <p>Abstract: Understanding the distribution of gas in and around galaxies is vital for our interpretation of galaxy formation and evolution. As part of the Arecibo Galaxy Environment Survey (AGES) we have observed the neutral hydrogen (HI) gas in and around the nearby Local Group galaxy M33 to a greater depth than previous observations. As part of this project we investigated the absence of optically detected dwarf galaxies in its neighbourhood, which is contrary to predictions of galaxy formation models. We observed 22 discrete clouds, 11 of which were previously undetected and none of which have optically detected counterparts. We find one particularly interesting hydrogen cloud, which has many similar characteristics to hydrogen distributed in the disk of a galaxy. This cloud, if it is at the distance of M33, has a HI mass of around $10^{7.7} M_{\text{sun}}$ and a diameter of 18 kpc, making it larger in size than M33 itself.</p> <p>Paper reference: http://arxiv.org/abs/1511.02710</p>	Against Closure	Email	6/3/2016	
13	Michael	Smith	The University of Kent	<p>The Centre for Astrophysics & Planetary Science at the University of Kent in England collaborates with many research institutes in the United States. Amongst these, the Arecibo Observatory has been very important with two of our doctoral students gaining excellent data and hands-on experience in the last year. It is clear that Arecibo is a great asset for astronomy, both now and in the next twenty years ahead for sure. We must find a way to maintain it and sustain the science output. It has potential to make many significant discoveries in an era where radio astronomy will become increasingly important.</p>	Against Closure	Email	6/4/2016	
14	Iyles	Joseph		<p>I have some serious concerns regarding the potential of shutting down the Observatory.</p> <ol style="list-style-type: none"> 1. Lost Data 2. The information provided from this satellite exceeds all cost. We still even today can't fully grasp the potential of this data. It's the only one like it and nothing else comes even close in comparison. 3. The cost to shut down outweighs the cost of improving operations. This would cost at least 150 million dollars just to demolish with the potential of a much higher cost with long term environmental side effects / Cost. 4. Effects of the local economy which is already struggling. <p>Point blank there's always a way and reason. You just have to search for it and quit letting idiots mislead you along the way.</p>	Against Closure	Email	6/6/2016	
15	Robert	McEachen		<p>this is an irreplaceable asset that must be maintained. it is a COST EFFECTIVE investment in our scientific world leadership</p>	Against Closure	Website	6/6/2016	
16	Harry S.	Pickering	Southern Cross Astronomical Society	<p>I speak in opposition of any proposal to close the National Science Foundation Arecibo Radio Telescope. On a personal note, this scientific instrument helped spark my interest in astronomy when I was a young man in the 1960's. I was fortunate enough to be able to travel and visit the facility and its museum several years ago, a life long dream of mine. In my personal opinion, the 12 million dollar annual budget, if I am correct, in the scope of our Nation's astronomical and space science budget is miniscule. The benefits and payoff this telescope has yielded towards the understanding of our universe have been immense and well worth the investment. This radio telescope is instrumental in our Nation's security, as it relates to tracking and studying potential catastrophic asteroids that could cross Earth's orbit. Shutting down this telescope will also set back our Nation's research into the study of Pulsars and other space projects. No other Nation in the World can match this radio telescope, in terms of its capabilities, or advancements, or its value.</p> <p>These proposals could not come at a worse time. Our government needs to do what it can to stimulate Puerto Rico's collapsing economy, not contribute to further unemployment and inflation. Not to mention closing the Space Academy at Arecibo, further diminishing the hopes of our youth who aspire to study space science.</p> <p>Thank you for providing me this opportunity for input into the Environmental Impact Study.</p>	Against Closure	Email	6/6/2016	

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
17	Glenn	Whiteside		<p>For the Arecibo Observatory operations I would like the NSF to support the following options with the following priorities or a combination of all</p> <p>3. Mothballing or deconstructing the facilities should not be viable options for this great Nobel-prize winning facility that has made so many wonderful discoveries over the years.</p> <p>1. Continued NSF investment for science-focused operations (No-Action Alternative) 2. Collaboration with interested parties for continued science-focused operations 3. Collaboration with interested parties for transition to education-focused operations</p>	Against Closure	Website	6/6/2016	
18	Glenn	Whiteside		<p>For the Arecibo Observatory operations I would like the NSF to support the following options with the following priorities or a combination of all</p> <p>3. Mothballing or deconstructing the facilities should not be viable options for this great Nobel-prize winning facility that has made so many wonderful discoveries over the years.</p> <p>1. Continued NSF investment for science-focused operations (No-Action Alternative) 2. Collaboration with interested parties for continued science-focused operations 3. Collaboration with interested parties for transition to education-focused operations</p>	Alternative Consideration	Email	6/6/2016	
19	Lydmarie Rivera	Antonetti		<p>Hola,mi nombre Es Lydmarie Rivera Antonetti ,tengo 16 años de edad y soy cadete del AOSA SP16 class del observatorio de Arecibo.Antes de yo entrar a la academia yo no podia hablar muy bien al frente de un publico.Yo tenia miedo de poder expresarme a las personas y nunca creia en mi,pero desde que yo entre al programa,mi vida entera ha sido impactada.He podido hacer cosas que la gente no podia imaginar que yo fuera capaz de hacer,mi confianza en mi ha subido y ahora me interesa la ciencia mas que nunca.A mi dolio mucho saber sobre el peligro que se encuentra el observatorio y yo y mis compañeros hemos decidido luchar hasta el final para que observatorio de Arecibo no cierre.Cosas como esas son las que inspiran los estudiantes a que tengan un amor y una pasion por las ciencias.Yo he sido testigo del efecto positivo que el observatorio de Arecibo ha tenido no solo en los estudiantes de Puerto Rico sino tambien en la poblacion puertorriqueña como tal.Yo hare lo que sea por que el observatorio de Arecibo siga funcionando,por que mi sueño mas grande es poder ver el impacto bien grande que el Observatorio ha tenido con todos nosotros,mas que quiero poder saber seguira impactando las vidas de muchos estudiantes y que su amor por la ciencia y el espacio vaya creciendo.A mi me da una pena saber que el gobierno de Puerto Rico no motiva mucho las ciencias a las escuelas Y de verdad no quisiera que cambiaran y eso y que implanten mas proyectos como estos aqui.</p> <p>Ps:Hay mucho talento en nuestra isla,por favor motiven a los estudiantes a querer aprender y implementen cosas como estas para que su conocimiento se expanda</p>	Against Closure	Email	6/7/2016	
20	Yeshary	Aviles		Apoyo que se mantenga en operación nuestro radiotelescopio	Against Closure	Email	6/7/2016	
21	German	Crespo		Please don't close our Arecibo Radar, it is a heritage to our students and scientific community.	Against Closure	Email	6/7/2016	

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
22	Katie	Eckert	UNC	<p>My name is Katie Eckert and I'm a graduate student at UNC. Below the signature, I have provided two abstracts from recent papers I have published using Arecibo data. The abstracts and titles have been simplified from their original forms to remove jargon and I have included links to the actual articles as well. Please let me know if you need any other information.</p> <p>1. Title: Calibration of a New Gas Mass Estimator with the RESOLVE Survey Authors: Kathleen D. Eckert, Sheila J. Kannappan, David V. Stark, Amanda J. Moffett, Mark A. Norris, Elaine M. Snyder, and Erik A. Hoversten</p> <p>Abstract: We use the RESolved Spectroscopy of a Local VolumE (RESOLVE) survey, a census of stellar, gas, and dynamical mass, to calibrate and test new galaxy gas mass estimators. Our estimators rely on the tight relationship between gas-to-stellar mass ratio and color to predict galaxy gas masses. The new calibrations can be used on the entire galaxy population - from massive galaxies that have small gas reservoirs to small galaxies that are dominated by their gas component. To accomplish this feat we have relied on the Arecibo telescope for sensitive observations of galaxies with the smallest gas reservoirs, key for estimating gas masses for the entire galaxy population. Our tests show that, while the most other calibrations systematically under or overestimate gas masses, our new calibrations perform well and can be used for larger surveys that lack complete gas information.</p> <p>NASA ADS link to the published paper: http://adsabs.harvard.edu/abs/2015ApJ...810..166E</p> <p>2. Title: RESOLVE and ECO: The Shape of the Galaxy Stellar+Gas Mass Function Authors: Kathleen D. Eckert, Sheila J. Kannappan, David V. Stark, Amanda J. Moffett, Andreas A. Berlind, and Mark A. Norris</p> <p>Abstract: In this work, we present the galaxy mass function, the frequency distribution of galaxies as a function of their mass, for two complete galaxy data sets that probe down to low-mass, gas-rich galaxies. These data sets are the RESolved Spectroscopy of a Local VolumE (RESOLVE) survey and the 40x larger Environmental COntext (ECO) catalog. While previous studies of the galaxy mass function have focused on the mass function using the galaxy mass in stars (stellar mass function), here we construct the mass function using the galaxy mass in stars+gas (stellar+gas mass function). Our gas masses include both new measurements from the Arecibo telescope and estimates using our color-based gas mass estimator whose calibration required Arecibo data. While the stellar mass function flattens at lower galaxy masses, the stellar+gas mass function rises steeply towards low galaxy masses as gas-dominated galaxies become the majority of the population. Thus, including the gas component, whether through direct measurements or estimates, is important for studies of galaxy mass and the galaxy population.</p> <p>NASA ADS link to arXiv version, accepted for publication in ApJ: http://adsabs.harvard.edu/abs/2016arXiv160403957E</p>	Against Closure	Email	6/7/2016	
23	Luz	Fontanez		We hope that the Radar in Arecibo continue open to the public, the students and to scientific community.	Against Closure	Email	6/7/2016	
24	Lilliam	Garcia-Barbon		NO QUEREMOS QUE CIERRE EL RADAR DE ARECIBO PR	Against Closure	Email	6/7/2016	
25	Min-Chang	Lee		This is Prof. Min-Chang Lee sending to you an ~200 word abstract together with a review paper by Lee et al. presented at the Arecibo Observatory 50th Anniversary Symposium in 2013, reporting our 20+ years' experiments at Arecibo Observatory. The Observatory has been proving a unique place for our study of space weather effects caused by whistler wave interactions with ionospheric plasmas and inner radiation belts above Arecibo. These experiments have supported a large number of MIT and BU graduate and undergraduate students for thesis research. We would greatly appreciate NSF's continuing support to the world class facility and research at Arecibo Observatory.	Against Closure	Email	6/7/2016	2016-NSF-A0 rev(Lee).pdf, AO-50th-Anniversary-Symposium-Paper (updated - June-2016).pdf
26	Bin	Lui	The SIGGMA Team	<p>We are a team that has been working on an astronomical survey project with the Arecibo telescope since 2010. Under excellent operation and maintenance from the Arecibo observatory, the telescope is always with its great capabilities, which keeps our project running smoothly and productively. Following is the details of the project.</p> <p>Title of the project: Survey of Ionized Gas in the Galaxy, made with the Arecibo telescope (SIGGMA).</p> <p>List of Authors: Bin Liu, Travis McIntyre, Yervant Terzian, Robert Minchin, Loren Anderson, Edward Churchwell, M. Lebron, and D. Anish Rosh</p> <p>Abstract: A Survey of Ionized Gas in the Galaxy, made with the Arecibo telescope (SIGGMA), uses the Arecibo L-band Feed Array (ALFA) to fully sample the Galactic plane observable with the telescope in radio recombination lines (RRLs). Processed data sets are being produced in the form of data cubes, archived and made public. The survey data will permit a wide range of science, including studies of: (1) H ii regions, planetary nebulae, and novae; (2) the Galactic temperature; (3) the large scale structure of the Milky Way; (4) carbon recombination line emitting regions; and, possibly, (5) the diffuse interstellar medium. With 3.4 arcmin resolution and a super high sensitivity of the telescope, SIGGMA will produce the most sensitive fully sampled RRL survey to date. Attachment: The first paper of the SIGGMA project.</p>	Against Closure	Email	6/7/2016	sigma.2013.aj.146 .80.pdf
27	Lourdes E.	Martinez		Saludos, es muy importante mantener esta joya científica para el beneficio de los experimentos e investigaciones internacionales. Apoyo que hagan lo posible por mantenerlo funcionando.	Against Closure	Email	6/7/2016	

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
28	Richard Soto	Matos		Please don't close this radar, we are very sad with the possibility of closing notice. For more than 50 years has been a tool of investigation.	Against Closure	Email	6/7/2016	
29	Gery	Mejias	Realty Consultants	Hello: I am sending you my email in support to the Arecibo observatory radar. If it is not obsolete them why closing it. This is a great scientific facility and very impressive	Against Closure	Email	6/7/2016	
30	Adriana Lorenzo	Meléndez		Apoyo en que se mantenga en operación el Observatorio de Arecibo.	Against Closure	Email	6/7/2016	
31	Andrea Lorenzo	Meléndez		APOYO A QUE SE MANTENGA EN OPERACIÓN NUESTRO RADIOTELESCOPIO DE ARECIBO!!!! 🗣️	Against Closure	Email	6/7/2016	
32	Sara	Merced		I write in this way, to benefit the radiotelescopio of Arecibo, Puerto Rico. I understand that forms a very important part in astronomical studies in the scientific community. It is not only important in the investigation, if not a laboratory study and preparation for future scientists in astronomy. Thank you	Against Closure	Email	6/7/2016	
33	Guillermo	Mundo		An icon for astronomy students and an opportunity of superior education.	Against Closure	Email	6/7/2016	
34	Jan	Peña		Apoyo que se mantenga en operación nuestro radiotelescopio	Against Closure	Email	6/7/2016	
35	Hillis	Pratt		Keep the observatory open.	Against Closure	Email	6/7/2016	
36	Rolando	Quiñones		Saludos, Fui profesor del Departamento de Educación, como educador entiendo que sería un error cerrar el radar. Hay que hacer lo que sea para que este monumento no lo cierren.	Against Closure	Email	6/7/2016	
37	Alejandro	Rivera		I write this e-mail giving my full support for the Arecibo radar, the times that I been it was a great experience and also and great adventure	Against Closure	Email	6/7/2016	
38	Lourdes	Rivera		APOYO QUE SE MANTENGA EN OPERACIÓN NUESTRO RADIOTELESCOPIO EN ARECIBO PUERTO RICO	Against Closure	Email	6/7/2016	
39	Faustino R.	Rodriguez		No,no por favor, no pueden cerrar ese telescopio radar, es muy importante para nuestro pais y el Mundo entero, Gracias	Against Closure	Website	6/7/2016	
40	Felix	Rom		Hello as well hear on the news of WAPA America that the Arecibo Observatory possibly close, I had the opportunity to share with my family and was an unforgettable experience and as the end of the same is possible when it is a very important tool for science and then if you close that we were ? . I support 100% the Arecibo Radio Telescope hope not close and if necessary will make a Facebook group No closure Telescope. Thank you!	Against Closure	Email	6/7/2016	
41	Ivette Ruiz	Ruiz	Maestra de Paternidad y Maternidad Responsable Programa de Educación a la Familia y el Consumidor (Economía Doméstica)	<p>En mis años universitarios tuve la oportunidad de visitar éste gran lugar al igual que mi sobrino. Mis humildes ideas:</p> <ol style="list-style-type: none"> 1. Telemaratón Anual de por vida, que cada ser humano done un dólar o la cantidad que desee. 2. Que el Departamento de Educación de PR ponga como ley o requisito dr graduación la visita de estudiantes y profesores de las disciplinas de ciencias (todas), y las matemáticas. Que ccobren la entrada. Que éstas visitas formen parte de los requisitos de graduación. 3. Que las Ferias Científicas, las preliminares y finales se lleve a cabo el evento desde ese lugar. 4. Que los que trabajan o colaboran en el Observatorio de Arecibo preparen un periódico, revista que la vendan, también que vendan anuncios (comercios) es decir que los comercios, compañías paguen por anunciarse en el periódico, revista del Observatorio. 5. Que el Observatorio de Arecibo hagan una Cumbre en PR, invitando al mundo entero para que conozcan las riquezas de éste lugar. A su vez que preparen especie de internados (temas bien planificados, de interés) para que personas...estudiantes se hospeden en PR, y a través del Observatorio sus facilidades sigan, mejoren sus investigaciones. Que la Compañía de Turismo, el Observatorio hagan Alianza con las diversas líneas aéreas para que en cada asiento esté una promoción del Observatorio para que sea visitado. 6. Que sea compulsorio para los estudiantes de 4.00 puntos de promedio en Física, Biología u otras ciencias, matemáticas; participen de unos campamentos,, o fines de semanas pagados por el DE, Empresas o sus Padres. 7. Preparar un calendario para 2017 12 fotos del Observatorio, venderlo a \$10.00. Yo lo compraría. Informar Breve Historia....no ponerla completa porque no van...que deje un interés a la persona que debe visitarlo para que complete (conocer) toda la historia drl lugar. 8. Preparar un sello del Observatorio para los automóviles y venderlo a \$1.00. 9. Que para el año escolar 2016-2017, el Calendario Escolar pongan una foto del Observatorio. 10. Que los estudiantes desde 6to grado comiencen a visitar el lugar. 11. Que siempre se tome un Registro de Visitantes. 	Alternative Consideration	Email	6/7/2016	

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
42	David V.	Stark	Kavli Institute for the Physics and Mathematics of Universe (IPMU) University of Tokyo	<p>Below, you will find a short abstract describing a recent project using the Arecibo telescope. The Arecibo observatory was instrumental for this study given its unmatched sensitivity. I would like this project summary to be considered for inclusion in the Draft EIS on the Arecibo observatory.</p> <p>The paper describing these results is currently submitted to the Astrophysical Journal and is undergoing peer review. However, this work has been presented at a number of conferences, including the American Astronomical Society meeting last January (http://adsabs.harvard.edu/abs/2016AAS...22731105S).</p> <p>Please let me know if you would like any further details. Title: The RESOLVE Survey Gas Census and Environmental Influences on Galaxy Gas Content</p> <p>Authors: David V. Stark, Sheila J. Kannappan, Kathleen D. Eckert, Jonathan Florez, Kirsten R. Hall, Linda C. Watson, Erik A. Hoversten, Joseph N. Burchett, David T. Guynn, Ashley D. Baker, Amanda J. Moffett, Andreas A. Berlind, Mark A. Norris, Martha P. Haynes, Riccardo Giovanelli, Adam K. Leroy, D. J. Pisano, Lisa H. Wei, Roberto E. Gonzalez, Víctor F. Calderon</p> <p>We present the gas mass inventory for the RESOLVE (RESolved Spectroscopy Of a Local VolumE) galaxy survey. We have obtained estimates of gas mass (or very strong upper limits) for nearly all ~1500 galaxies inside our survey volume, a feat which would not have been possible without the unmatched sensitivity of the Arecibo radio telescope. With this powerful data set, we investigate the influence of environment on galaxy evolution by analyzing the dependence of gas-to-stellar mass ratio on both galaxy group size as well as location within the large-scale structure of the universe. We find that satellite galaxies in Milky-Way sized groups are systematically gas deficient suggesting that mechanisms which have been proposed to drive gas deficiency in large galaxy clusters may be active in significantly smaller groups. Additionally, the mean gas content of galaxies varies significantly in different regions of large-scale structure, even when variations in other galaxy properties (e.g., mass) are accounted for. This finding supports a number of proposed mechanisms through which galaxy gas content is affected by environment on significantly larger scales.</p>	Against Closure	Email	6/7/2016	
43	Zoraida	Torrado		No al cierre del radar Arecibo	Against Closure	Email	6/7/2016	
44	Olga	Vazquez		I support one of the best observatory and sensitive of the world.	Against Closure	Email	6/7/2016	
45				Buenas.hace mucha falta este recursos para los estudiantes.universitarios...si lw sacan mucho provecho. ..gracias...	Against Closure	Text	6/7/2016	
46	Sael			As a student and a experienced scholar, I think you should not close this observatory.It is a very important place for science and astronomy. It can contribute to the work already done by us. It can help us decipher the unsolved mysteries of space. I hope you take this message into consideration when you are choosing decision and I hope you have magnificent day.	Against Closure	Email	6/7/2016	
47				Apoyo en su totalidad q este Radar se mantenga abierto,hay agenda abierta para estudios científicos en donde se encuentran miles de personas en espera de esos estudios.Hay estudiantes q estudian y contribuyen en las ciencias.Envien fondos pata q se mantenga abierto.Ustedes mismo saben lo importante que es para todos.	Against Closure	Email	6/7/2016	
48	Iris			<p>Por este medio quiero dejarle saber que el cerrar el Observatorio de Arecibo en PR sería viajar al pasado.</p> <p>El observatorio de Arecibo es el más sensitivo del mundo.</p> <p>Como es posible que decida cerrarlo?</p> <p>Por favor!!! Es el mejor y el único del mundo entero.</p> <p>Noooo!! No nos retiren su apoyo.</p> <p>Mi país y yo lo apoyamos.</p>	Against Closure	Email	6/7/2016	
49	Yvette	Aviles		<p>My name is Yvette Irizarry Arecibo Aviles and I do not agree that the Arecibo Observatory , located in the Esperanza neighborhood is closed. It is extremely important that this continue operations as it is frequented by students, engineers, air staff. In this radio telescope, the largest in the world, research is done from the simplest to the most complex. Arecibo is proud to have these facilities open to the public .</p> <p>In addition , it would bring negative consequences , because in that place working parents who are heads of families who have sustenance to their homes.</p>	Against Closure	Email	6/8/2016	
50	Melvin	Bleck		<p>Imposible que lo cierren .</p> <p>Es el telescopio mas sensible del mundo. Y todo el mundo lo usa principalmente Estados Unidos.</p>	Against Closure	Email	6/8/2016	
51	Herbert	Carlson		Approximately 20,000 K-12 students are attracted to the Arecibo Observatory every year, most from low income families. AO also upgrades the teaching capabilities of High School teachers through STEM learning plus has conducted a Saturday Space Academy for local High School students. This socioeconomic development of the under-privileged is not merely the right thing to do, it is investment in the long term growth of one of Puerto Rico's strongest natural resources, its natural brain power waiting to be unleashed on raising more fully to its potential. Loosing this would be a terrible waste of human resource and lost potential economic gain just waiting to be tapped by the Puerto Rican economy.	Against Closure	Email	6/8/2016	

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
52	Jose Luis	Escobar		I support here Puerto Rico radar stays in operations since it is very useful for scientists , teachers and students hope that they do not reduce the funds . It would be a shame that we lost a resource as important as it is the radar at Arecibo in Puerto Rico.	Against Closure	Email	6/8/2016	
53	Mario	Espinosa		Please dont close this magnific research tool. Its our probe into The Universe	Against Closure	Email	6/8/2016	
54	María	Feliciano		Apoyo al Radiotelescopio de Arecibo. No deseo que lo cierren. Gracias.	Against Closure	Email	6/8/2016	
55	Lawrence	Glasheen	Adirondack Skywatchers	Arecibo Observatory operations are still a vital part of man's exploration of the universe.Many universities are using the Observatory for scientific research. I feel the Observatory should be maintained and utilized fully now and in the future.	Against Closure	Website	6/8/2016	
56	Lawrence	Glasheen		Arecibo Observatory operations are still a vital part of man's exploration of the universe.Many universities are using the Observatory for scientific research. I feel the Observatory should be maintained and utilized fully now and in the future.	Against Closure	Website	6/8/2016	
57	Elizabeth	Kaufman	USA Citizen and resident of Puerto Rico	I am in favor to Continue the NSF investment and funding on the Arecibo Observatory. First for all, due to all the historic discoveries made at this Observatory. Without the previous funding none would have been made. It serves a social purpose and service by attracting many students, scientists, and general public interested in Science. How could anyone discontinued funding to the most sensitive radar in the WORLD!!! It also helps in the economy of Puerto Rico by being a touristic point of interest to thousands of tourists that comes to the Island. Notwithstanding, that it has been used in several Hollywood Movies, injecting money to our economy.	Against Closure	Website	6/8/2016	
58	María de los Ángeles Caballero	López		Please don't close the radar in Arecibo!	Against Closure	Email	6/8/2016	
59	Lourdes	Matos		My comment is in reference of the meetings you are conducting to reduce Observatory Telescope funds and eventually closeness of this facilities, the observatory is a respectable part of this Island, throughout years hundreds and thousands visited this fascinating facilities to feel the connection we have and the responsibility to search threads across the vast universe. As a resident I felt an almost romantically relation with the facility and is always for me and my family a regenestir experience visiting it. Please reconsider the shortness of these fund to the this important tool of exploration and what the importance means for all of our residents. Hope my letter help in this.	Against Closure	Email	6/8/2016	
60	J	Mendez		Please do not close the Arecibo Radiotelescope. This is an important tool for the whole world.Is the most sensitive of all.	Against Closure	Email	6/8/2016	
61	Olga	Mercado		Please reconsider the closure of this magnificent center of learning...	Against Closure	Email	6/8/2016	
62	Silvia	Morales		In union of many others I want to raise my voice for the Arecibo Observatory, which is so important not only for Puerto Rico, but for the rest of the world. And should remain operating, open and available for students, teachers, investigators, NASA. Let's provide all the necessary support so thus radar remains operating here.	Against Closure	Email	6/8/2016	
63	Jomary Rosa	Ortiz		As a resident of PR and, most of all, Arecibo, I found it very heartbreaking when I heard there were even just plans to close the observatory. I have been going to this place for ever: in different tours all through elementary, middle and highschool. I really enjoy this place, the view is amazing, there is information provided in every single corner of the radius of this place, overall I have always had the time of my life going to it. But, apart from my own joy and interest in going, this observatory has had a great part in the scientific (or practical) aspect of astronomy. It is, after all, the world's largest radio and radar telescope. It has helped in many things such as astronomy, planetary studies and amospheric sciences, which in my opinion is ENOUGH to cut that "closing" idea for good. Arecibo has discovered binary pulsars, found the first extrasolar planets and elucidated the Three Dimensional structure of the visible universe. This is the most capable telescope for worldwide precise discoveries. So, after all that hard work put into this place, to remodel, to have it stand as one of the greatest, why do you want to close it down? Is it because there's "no money for maintenance"? Please let this one pass and forgive my rude remark, but that is very unfair and just plainly dumb. There have been cuts made to the observatory's budget since a long while back. If there's SO MUCH money for polittics, how come there can't be any for IMPORTANT INVESTIGATIONS THAT HELP OUR SCIENTISTS ACHIEVE GREATER THINGS? I understand there are many things that go into this desicion, but I just need to get my voice heard by someone, so they understand the pride we have in this observatory, so they understand how much it has done. Sincerely, Jomary Rosa Ortiz; 18 year old, Biology student, filled with pride of what our people have discovered and done over the years and hoping that at least someone understands my views on this subject.	Against Closure	Email	6/8/2016	
64	Erik	Rivera		En apoyo a que el Radar de Arecibo permanezca abierto y reciba los fondo necesarios para sus operaciones. Gracias	Against Closure	Email	6/8/2016	

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
65	Raquel	Rodriguez		<p>Por favor no lo cierren!!!!🙏🙏🙏</p> <p>Nuestro radiotelescopio; que además de haber salido en varias películas y series.... Es mucho más q es eso!!!! Grax a él ustedes bien saben q se han realizados varios descubrimientos. Sabrá Dios q otros grandes descubrimientos estamos por recibir de este magnifico artefacto.</p> <p>Por esto y mucho más no podemos permitir que los cierren. Ustedes hablan del verano del 2017 por algo de unos fondos q tal vez le quiten... Pero si ustedes hacen eso nos arrancarían un pedacito de nuestra historia, de nuestro orgullo. Es un recurso valioso para nosotros los maestros. Y sufriríamos mucho por la acción. Espero q lo consideren 10 veces antes de q tomen una decisión.</p> <p>Además de eso es un lugar turístico indispensable donde yo llevo a mis amistades cuando vienen de visita a PR y soy del sur (Coamo). Por favor considérenlo muuuuuuchas veces....</p>	Against Closure	Email	6/8/2016	
66	Sara	Santiago		<p>Hello. My name is Lara and I live in San Juan...I saw some local news yesterday about the Arecibo Observatory..which is an icon, it generates jobs, kids, locals and from the state can do research...and tourists come here all the time. Puerto Rico is immersed in a 72 billion debt that had accumulated during decades..and the Arecibo Observatory is a hem, a hem of pride, it creates direct and indirect jobs, tourists come, it get's international coverage and it helps the economy. I am a science teacher...and I consider the Arecibo Observatory en emblem, a cultural pride, it helps the economy and you really do not give that much money to it...you should never even consider this again. We are in a big big economic crisis..and for the community: you should not even consider this..it is like spitting on us...it is just too important. Gracias again for getting it out of the list!!</p>	Against Closure	Email	6/8/2016	
67	María	Santiago		<p>Sería muy triste el cierre del observatorio de Arecibo. Puerto Rico va d mal en peor... NO al cierre. ☹️PR</p>	Against Closure	Email	6/8/2016	
68	Rosa			<p>Please continue to support Arecibo Observatory. It is unique in the world, the best...</p>	Against Closure	Email	6/8/2016	
69				<p>Saludos. Como Maestra de Ciencias en la Escuela Elemental, apoyo que siga en funcionamiento el Radiotelescopio de Arecibo. Soy puertorriqueña y como otros hemos sido partícipes de los grandes descubrimientos y las aportaciones que el Radar ha hecho a la comunidad científica mundial. Demás está decir que el visitarlo y participar de las actividades ha motivado a muchos de nuestros niños y jóvenes a interesarse en carreras relacionadas a la astronomía y otras ciencias relacionadas.</p>	Against Closure	Email	6/8/2016	
70				<p>APOYO QUE CONTINUE ABIERTO EL OBSERVATORIO DE ARECIBO DE PUERTO RICO. LA APORTACION CIENTIFICA Y,ASTROLOGICA NOS PERMITE NUEVOS E IMPORTANTES DESCUBRIMIENTOS QUE SOLO ATRAVES DE ESTE OBSERVATORIO SE PUEDE LOGRAR. ADEMAS DE SU IMPORTANCIA AL SER UTILIZADO POR MUCHOS CIENTIFICOS Y ASTROLOGOS PARA SUS EXPERIMENTOS Y OBSERVACIONES Y CENTRO DE DESARROLLO Y ESTUDIO PARA ESTUDIANTES LOS CUALES SOLO CUENTAN CON ESTE OBSERVATORIO COMO CENTRO DE ESTUDIO, GRACIAS.</p>	Against Closure	Email	6/8/2016	
71	Josean			<p>Please notice that by closing the Arecibo observatory it will stop high school students to do astronomy research, it will hurt tourism, and children becoming less interested in this matter. Please help us. Thank you.</p>	Against Closure	Email	6/8/2016	
72	Elvin	Figuroa		<p>please, save the Arecibo, Puerto Rico observatory</p>	Against Closure	Website	6/9/2016	
73	Carlos	Ramirez		<p>I made a petition for you that the Arecibo's Observatory do not close. It is very important to the island of Puerto Rico and to the world. It is important in the study of astronomy.</p>	Against Closure	Email	6/9/2016	
74	Yamilet			<p>I have a petition for not closing Arecibo's Observatory. It is very important to the island of Puerto Rico and to the world. It is the world's largest telescope that has many research in astronomy and science. With it there has been many discoveries and experiments that would not exist without it. In the island is important a place of tourism and films that invest money to the economy that is fragile in this days. It is important to maintain this facility open for the good of Puerto Rico and the world. Thank you.</p>	Against Closure	Email	6/9/2016	

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
75	Kalpana	Arun		<p>I came to Arecibo in 1988, newly married to the Head of the Computer Department, Arun Venkataraman, who had accepted a job offer from the world's largest single dish telescope in 1986 after completing his PhD from UCSD. I was 23 years old, had a degree in English literature from India and little idea of how I was going to make myself useful in a distant tropical island. However, within the span of a month I was fully occupied as a volunteer at the local Catholic school, Colegio Nuestra Senora del Carmen, where I was welcomed as an observatory wife who could enrich the school community with my cultural diversity. Another observatory wife, was the head of the English department at the school. She had taken over that position from yet another observatory spouse. I worked at the school for over twenty five years. A few other wives of observatory scientists joined in for short periods of time. My boss and I stayed long enough at the school to create an English language program on level with States side schools, to offer courses in advanced US history and history of Art, to secure the school's accreditation by the Middle States Association of Schools and Colleges and to persuade students to broaden their horizons by applying to universities outside Puerto Rico. The favorable reputation of the school's English program, encouraged employees at the observatory to enroll their children there. The presence of these observatory kids whose families had ambitious academic expectations further stimulated the performance of the local students. We soon saw students from the school being accepted in Harvard, Princeton, MIT, Cambridge University, and Stanford as well as several other prestigious schools. The school's performance in math olympiads, science fair competitions and other island wide competitions improved. Those students who reaped the benefits of the school's English and history programs will readily acknowledge that their lives and their career paths were infinitely enriched by the fortuitous presence of the Arecibo Observatory in the neighbourhood. The proud parents of these students do undoubtedly regard the observatory as instrumental in their children's extraordinary achievements. I am equally confident that if the observatory had flourished without the constant threat of funding cuts from the NSF, more families of employees at this world renowned centre would have had an even more enriching impact on the lives of the local families.</p> <p>As a high school English teacher, I have had the opportunity to interact with local students and to listen to their point of view regarding Puerto Rico's status as a commonwealth. In the years that the pharmaceutical companies in Barceloneta were shut down, a number of parents in the school community lost their jobs. The ensuing economic instability provoked resentment and a reawakening of the awareness that these companies as well as the naval bases established by the USA on the island were painful reminders of Puerto Rico's colonial status. The island's favorable location, the availability of cheap labor, the tempting tax exemptions, are listed in high school history books as the reasons for the establishment of the pharmaceutical companies and the naval bases. However, the history of the Arecibo observatory has been spared the taint of such colonial motives. It is a proud badge of distinction that the USA has bestowed on its last colony. It is the "world's largest"; it is the place where a Nobel prize was won; a scientist after a brief stint at barrio Esperanza was featured on postage stamps in a far away country. My students kept track of any news about "El Radar" and expressed pride over the geographic proximity of such great happenings. Any measure that cripples the scientific research done at the observatory would see the corruption of this proud confidence with a sceptical questioning of motives. It would be an undeserved disappointment to the world class scientists who have whole heartedly undertaken to adapt to a new country and culture for the sake of their scientific pursuits. It would create yet another unsavory taste of the way the USA does business in its last colony stripping it of its pride and integrity. I do not believe that adopting any of the Preliminary alternatives leading to the suspension of scientific research at the observatory would result in anything but a detrimental socioeconomic and cultural impact on an island whose future is already fraught with economic uncertainty.</p>	Against Closure	Email	6/10/2016	
76	Boris	Blagojevic		<p>My name is Boris Blagojevic,I'm born December 13.1986.in Arandjelovac in Shumadia in Serbia,I'm 29 years old and I'm an Orthodox Christian.I'm fully and completely supporting Arecibo Opservatory.I really love and like to work with them and for them I love and completely and really seriously most seriously enjoy to helping them and supporting them.And I won't permit you to shut them down.I won't let you do it.I love SETI@Home.I would love and it would makes me happy if I can live long enough to meet and hanging out and spending all my ree spare time with other species animals,peoples from other worlds,planets,galaxsyies,universes and even from alternate paralele realaties world.Maybe there I get a new friends,even a grlfriend who will be my future wife and first who will have my name Blagojevic.I would n't mind at all to married a grill from other planet,galaxyies and universe.And I would love to be there and for thouse people from other planets,galaxyies and universe outside our home planet Earth and our home galaxy Milkyway.MOST SERIOUSELY.I'm from Shumadia in Serbia I'm serbian citisen.MOST SERIOUSELY!!!And I would love most honestly to meet ascept and helping and protecting their families too and to supporting them to learn their customs and etc.And to work and live with them!!!Let's apsolutely perfectly clear one thing.Everywhere there is a good and bad people everywhere,innocents,criminals politicians,wars and etc.Somewhere far in the galaxy I'm sure that there is a intelligent life like us.WE are looking for them and I'm sure that they are looking for us too.And We all in the galaxy and in the entire universe don't know for each other existence we are all looking for the ame thing,same answers,same needs and so one.So please don't be suprised that if we someday find them and they find us that you realise that we are more or less the same or atleast we are the similar.Similar everyday normal life problems and so one.If we faind them someday and if I see that thouse people friom outside the our planet and our galaxy and universe are in any kind of the trouble I will be the first who will helping them,saving them,defending them and supporting them only if they are species of good,honest,fair,justice and the people who will do only the good and noble actions and deeds.Only what is right and good.The good deeds.</p>	Against Closure	Website	6/10/2016	
77	Marc	Lewis		<p>The nearly constant stream of astronomical data distributed from the Arecibo Radio Telescope is of very high importance to the scientific community and should not be stopped. In addition to the importance of the data, the fact that the Observatory is in the National Register of Historic Places must surely come under consideration.</p>	Against Closure	Email	6/10/2016	

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
78	Judy	Yates		Please, may we please have your support for the SETI Project, it is so very important for all of us here now and in our future explorations of contact of existence of life outside planet Earth, the SETI program is in dire need of your support President Obama even as I send this to you. Your help would be immensely appreciated by people from all over our planet Earth so very much. Any help, letter, etc... that could help keep the SETI program forth going would be so greatly appreciated.	Against Closure	Website	6/10/2016	
79	Sonia	Maldonado		Este mensaje es para apoyar al Observatorio de Arecibo, Puerto Rico. Debe continuar operando. Es el más SENSITIVO a Nivel MUNDIAL.	Against Closure	Email	6/11/2016	
80	Rachel	Grout		Closing the Arecibo facility comes down to economic responsibility. We are nearing \$20 Trillion in national deficit. Keeping an aged and dilapidated facility open does not make any sense. NASA has plenty of facilities that are able to monitor distant stars and so do other organizations. Puerto Rico is in economic distress. Those making a decision on the facility need to weigh in on the economy. I lived in Puerto Rico for 5 years and I have seen the facility. Please make a smart choice, this isn't about a handful of people, this is about accountability and what makes sense economically.	Support Closure	Email	6/12/2016	
81	Daliana	Rodriguez		This email is to express my support to the Arecibo Conservatory. The Observatory, as a research center, attracts some of the best scientists in the world and has a beneficial socioeconomic and cultural impact on its immediate neighborhood. The NSF would be hurting the community by withdrawing funding for research. Though I currently reside in Chicago, I was born and raised there, and benefited from the socioeconomic and cultural benefits that it brought to the neighborhood. A small example of this benefit was learning english (literature and grammar) from one of the best teachers in high school. She was the wife of a scientist in the Observatory. They were not from Puerto Rico but had moved to the area to work in the Observatory. Additionally, schools bring students to the Observatory to learn. It encourages the community to think far beyond their geography limits.	Against Closure	Email	6/12/2016	
82	Peter G	Tomasi III		I was recently reading the postings about the NSF trying to shut down Arecibo and I have to tell you I am appalled by your actions and the the actions of the National Science Foundation. I spouse I should not be shocked for if you really were a scientist you would see the benefits to keeping a facility like Arecibo(the largest most unique radio telescope of its kind) open. I suppose your part of the new farm it out to India and Chine mentally. I mean why bother to encourage american children to learn STEM if there will not be any place in the USA for them to work. THE NSF needs to tell out idiot Congress and President that money needs to spend on the NSF to help secure a promising future in the sciences. The fact that you even proposed this makes me sick to my stomach and makes me ask what sort of scientist / American you really are.	Against Closure	Email	6/12/2016	
83	Thad	Carlson		Please don't close down that big telescope. Thank you.	Against Closure	Email	6/13/2016	

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
84	Doug	Currie		<p>Although I don't live in Puerto Rico or United States but in Canada I have been inspired by the Arecibo radio telescope all my life. I was born in 1960 and continue to be quite fascinated by astronomy and space exploration including the leading part played by the United States through NASA and astronomical facilities such as optical and radio telescopes I think that would be funded by the NSF. I heard that the recent clear discovery of gravitational waves by the US LIGO facility could give some new potential for use and discovery of the Arecibo telescope that is capable of detecting gravitational waves and is still clearly the most sensitive radio telescope in the United States if not in the world and it seems a missed opportunity to start a process of closing Arecibo down or limiting its use at this time if it could more likely soon make a major contribution in this area among others. With more discoveries including closer to us of exoplanets including some potentially habitable ones I am sure Arecibo could continue to have a productive and inspiring role in learning more about them including their magnetic fields among other things if you allow it to continue to operate. After a second major meteorite impact in Russia in Cherybinsk after the Tunguska one in 1908 I think wouldn't it be good to keep funding the role of Arecibo to continue to detect and monitor near-Earth asteroids to better inform us and help us avoid or at least minimize any future problems with small asteroid or large meteors that could be on a collision course with Earth? I don't know if Arecibo has been specifically involved in these areas but I know it is in radio wavelengths that many molecules in space have been detected and that we can see better to places like the center of the Milky Way galaxy and tell more about these things from radio wavelengths. If Arecibo can detect these parts of the radio spectrum I am sure it would still be one of the most powerful and useful facilities in American territory and can find many more informative and important examples and information.</p> <p>Arecibo is also a very well known symbol of, especially leading American scientific ability, and is certainly illustrated in a number of my astronomy books including recent ones on astronomy including looking for life or habitable places in the universe and it would be a shame to have it only a symbol of past ability. This would especially be true if it is at the same time and the new comparable size and ability FAST radio telescope in China is opening. It is too bad that there isn't a larger budget for NSF that would make it easier for your department to continue funding Arecibo. I also follow Abel Mendez at University of Puerto Rico on Twitter and his excellent web site the Habitable Planet Laboratory and I am sure his leading work in extrasolar planets benefits from the continuing operation of the Arecibo radio telescope. Of course his last name indicates he is Hispanic and I have also heard that generally Hispanics in the United States are under-represented in science and technology professional positions and I think in university placements but that Arecibo and tours there for local Puerto Rican students has been a deciding factor in encouraging a significant number to study and get careers in astronomy or other science areas.</p> <p>Therefore for these and other reasons I encourage you and other people in the National Science Foundation to continue to find funding or allow some other mix of funding that would keep Arecibo open and operating for the foreseeable future so people on Earth, especially in American and its territories, can continue to learn more about our universe, protect our Earth and perhaps learn more about other habitable environments beyond Earth and their possible inhabitants.</p>	Against Closure	Email	6/13/2016	
85	Dr. Mark	Jackson	Founder and CEO, Fiat Physica	<p>I am a physicist who recently founded Fiat Physica, a crowdfunding platform devoted to the advancement of physics, astronomy and space exploration. Introducing an untapped channel for fundraising and engagement between scientists and individuals who support their work, campaigns on Fiat Physica bring awareness to these fields and important projects, and pave the way for future technology. For a summary of the many campaigns currently on our site, please visit https://www.fiatphysica.com/campaigns.</p> <p>I have been following the recent issue of NSF's proposed budget cuts of the Arecibo Observatory, and would like to suggest that the funds be raised on the Fiat Physica platform. This would not only allow the observatory to gain its much needed financial support, it would also gain visibility to the public for the incredible science happening there. I have already interacted with several of you in person about this new way to raise funds from the public, but wanted to send a single email summarizing this to all involved in this issue (based on Nadia Drake's recent National Geographic article and live-tweeting of the public discussion earlier this week).</p> <p>Rather than a single crowdfunding campaign, Arecibo could launch several campaigns corresponding to separate projects. I've created a partner page at https://www.fiatphysica.com/partners/arecibo-observatory to collect all such campaigns in one location, and you may begin setting up crowdfunding campaigns immediately by visiting https://www.fiatphysica.com/campaigns/new. For an example of a Partner which has run several successful campaigns on our platform, please visit https://www.fiatphysica.com/partners/astromers-without-borders</p> <p>There is also great opportunity for foundations and corporations to become involved. Our associated non-profit is the Science Partnership Fund, allowing us to collect tax-deductible donations on behalf of any crowdfunding campaign or scientific event, making it substantially easier for foundations and corporations to make charitable donations to scientific projects. We have already had great success for our first project, NASA SpaceApps NYC, in which we raised about \$40,000 from 13 sponsors including SpaceX, Microsoft, IBM, Amazon, and Wolfram (who personally appeared): http://www.sciencepartnershipfund.org/space/space-apps-nyc/. Since you are already partnering with the Breakthrough initiative, they might be interested in further donations or matching the gifts made by the public. Alternatively, the NSF may be interested in a similar program, allowing them to support the Observatory for less budget outlay.</p> <p>Our platform also features a blog to provide context for campaigns, and we may be able to tailor articles to your campaigns.</p> <p>I believe that Fiat Physica and the Science Partnership Fund could greatly help the Arecibo Observatory in raising funds, as well as engaging with the public. I have attached brochures about both organizations and would be glad to answer any further questions you may have. Please feel free to forward this to anyone else who you think may be interested.</p>	Alternative Consideration	Email	6/13/2016	FP brochure.pdf, SPF-brochure.pdf

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86	Sir Thomas W.	Kilburn	Hitcher's Guide to the Universe	keep it open. it will be needed for future research. don't send it down the path of the space shuttles.	Against Closure	Website	6/13/2016	
87	Patrick	ODell		<p>Please do not defund this project or shuffle it to its virtual demise. We need to look beyond this planet to find not only the objects coming our way that threaten our world with extinction, but to continue to seek for intelligent life that might lay elsewhere in our galaxy or universe.</p> <p>When Congress will pass pork legislation to fund other insignificant projects like studies of flies in Africa, then we seriously need to look at the scientific importance of saving our planet from an extinction level event!</p>	Against Closure	Website	6/13/2016	
88	Stephen	O'Rourke		<p>My name is Stephen O'Rourke and I am writing to argue strongly against the potential deconstruction or mothballing of the Arecibo Observatory. The reasons are numerous and I will offer just a few of them here:</p> <ol style="list-style-type: none"> 1. The search for potentially threatening near-Earth objects, 2. The ability to uniquely contribute to important new gravitational waves research, 3. It's contribution to atmospheric science and studies of climate, 4. The ability to inspire STEM research and interests in the population, 5. It's status as a landmark and tourism draw for Puerto Rico, and 6. Preservation of the karst landscape. <p>I encourage you to find the real answer to the problem. It's not to cut this program but rather get the NSF budget increased to the point where we don't have to choose which science projects win and which ones lose.</p> <p>Please feel free to contact me for any additional questions.</p>	Against Closure	Email	6/13/2016	
89	Dr. Joshua	Peek	Assistant Astronomer, Space Telescope Science Institute, Baltimore, MD, 21218	<p>I write to strongly urge that NSF choose alternative 1 of its "Notice of Intent to Prepare an EIS . . . ", namely "Continued NSF investment for sciencefocused operations (No-Action Alternative)."</p> <p>I have conducted astronomical research using the Arecibo Observatory since 2003, and the 10,000 hours of data collected for the GALFA-HI survey formed the backbone of my thesis. In this letter I will focus on three issues that may not have been directly brought to your attention previously, which make rather clear how critical Arecibo's continued existence is for the scientific community. While these don't relate to the natural environment, they are critical to the educational and scientific environment. Single dish instruments are natural world class teaching facilities. While facilities like ALMA will make great discoveries, it is nearly impossible for the next generation as astronomers to learn how to build new instruments and techniques with these machines. While interferometers are less sensitive, they are also far more complex, which makes using them in a hands-on way impossible for students. It is perfectly feasible for a student to deploy their own detector or correlator on Arecibo and do world-class research, as we did with GALFA-HI. Such a thing is completely impossible with world class interferometers. And while "teaching" dishes may exist, it is not possible to do world-class work without the sensitivity afforded by large dishes in the present environment. Arecibo is still the perfect tool for students to amplify their creativity and brilliance, and will train the next generation of radio astronomers. Arecibo is a crucial tool for public engagement. While radio astronomy can seem abstruse and strange, we know it is critical for our understanding of the universe. Our colleagues in optical astronomy have lovely Hubble images to show the public, but we often must rely on simulations or mockups to show why a particular pulsar or spectrum is important. Arecibo, with it's physical vastness, engages the public directly in a way that cannot be overstated. No one has stood at the visitor's center and not be overwhelmed by its awesomeness. In addition I, along with my GALFA-HI colleagues, have produced a visually compelling map of the Galaxy in Galactic hydrogen, will will serve to engage the public with radio astronomy and Arecibo for a long time to come.</p> <p>The future of strong gravity and the first instant of the universe lies with Arecibo. Arecibo's contribution to the history of strong gravity is well known — B1913+16, which earned Taylor and Hulse a Nobel Prize, was and is the first key to the confirmation of gravitational waves, long before LIGO. In addition, you are likely hearing much about the importance of the pulsar timing array as a critical tool in understanding gravitational waves and their origins. I am writing to you about a third way Arecibo can contribute to the study of strong gravity. The announcement of the detection of inflationary B-modes in the CMB was scuttled by the acknowledgment of strong polarized foregrounds from Galactic dust. Arecibo is poised to make a huge contribution to this field by measuring the structure of this polarized, dusty ISM using HI signatures. I refer you to the recent work by Arecibo REU graduate and current NSF Graduate Fellow Susan Clark on the topic, made possible by Arecibo observations with the ALFA instrument. In this way Arecibo is critical to the past, present, and future study of strong gravity.</p>	Against Closure	Email	6/13/2016	Arecibo_jpeek.pdf
90	Brendalee			No cieren el Radio telescopio de Arecibo	Against Closure	Email	6/13/2016	Do not close the Arecibo Radio Telescope

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91	William	Axson		<p>It would not be wise remove funding from Arecibo Observatory as thousands of Americans donate time to read results for free. Really it is a world wide free effort through Seti. Where else does our government get FREE effort for reading anything, especially science data?</p> <p>As a Country let us not defund important projects but rather support them.</p>	Against Closure	Website	6/14/2016	
92	Carlos	Catalano	AOSA SP16 Graduate	<p>I am a graduate of Spring 2016 class from the Arecibo Observatory Space Academy, held in such facilities. We learnt so much about space, physics, chemistry, engineering, maths, geology, biology, and, of course, about the Arecibo Observatory (AO) itself.</p> <p>This has been a unique experience in my life, since I was taught things I would never imagine I would like, and now, thanks to that, my future is to study Mechanical Engineering at the University of Puerto Rico at Mayaguez.</p> <p>The AO supports this amazing Academy, meant for us students to learn much about the space, since it needs us to explore it! We had talks and presentations from famous scientists from around the globe too: South Africa, Finland, Colombia, USA, Britain and many more! All of them came, since the dish is the BIGGEST is the world.</p> <p>It was such a shame that the biggest is on the headlines, not because of a new discovery (from the many it had have), but because it's about to shut down due to funds. I was baffled when I knew about it!</p> <p>How could it be that such a landmark of Puerto Rico is being threatened to close? What does this means to the scientific community, not only from the Island, but from the rest of the States and the World?</p> <p>In some of those speeches I said earlier, scientists were relaying their life as a profession, and how they were settling where the largest observatory was, since they needed the most keen technologies and infrastructure to study the ever-growing Universe. Now, they'll have to retrocede to former biggest-Observatories since the largest one is being closed down. Or even worse, leaving the country, USA, since the next one will be in China. However, no Observatory will beat AO's capacity of viewing the sky, since every each one of them is unique, and by shutting it down, the World will be loosing a unique Observatory (just like the GB in West Virginia).</p> <p>This science cradle means a lot for the local communities in PR, since it's one of the most advanced scientific center in the whole Island, it makes us proud, it's amazing to say "we have the largest Observatory in Earth". And you'll just be ripping it out from us.</p> <p>So, please, I pledge you, consider better the options, and don't shut down a center of education, discovery and professionalism to PR, USA, and the Globe itself.</p>	Against Closure	Email	6/14/2016	
93	Susan	Clark	NSF Graduate Fellow Columbia University	<p>Title: Neutral Hydrogen Structures Trace Dust Polarization Angle: Implications for Cosmic Microwave Background Foregrounds</p> <p>Authors: Susan E. Clark, J. Colin Hill, Joshua E.G. Peek, Mary E. Putman, Brian L. Babler</p> <p>Paper Reference: Physical Review Letters 115, 241302. Published 2015. ADS link: http://adsabs.harvard.edu/abs/2015PhRvL.115x1302C.</p> <p>Abstract: In the first trillionth of a trillionth of a billionth of a second after the Big Bang, the Universe is thought to have experienced a growth spurt – a period of rapid expansion known as inflation. Cosmological observations provide strong circumstantial evidence for inflation, but no direct detection thus far. The predicted "smoking gun" evidence for inflation is primordial B-mode polarization. These "B-modes" are a polarization pattern imprinted in the cosmic microwave background (CMB), the pervasive leftover radiation from the Universe's formation. Unfortunately, despite enormous experimental effort, the B-mode signal has yet to be detected because it is obscured by polarized dust in our galaxy. Galactic dust grains emit polarized light because they are aligned with the interstellar magnetic field, creating a signal that must be carefully measured and subtracted from CMB data in order to uncover the inflationary B-mode signal.</p> <p>This dust is a component of the interstellar medium – all the diffuse material between the stars in the Milky Way. The interstellar medium is also full of gas, much of which is neutral hydrogen. In this paper, we present the discovery that slender linear filaments of neutral hydrogen gas in the Milky Way, revealed by high-resolution Arecibo survey data, are extremely well aligned with the dust polarization. This means that structures in the gas are strongly aligned with the ambient magnetic field. We use a machine vision algorithm to measure the orientation of the Arecibo filaments. The shape of neutral hydrogen provides an entirely new way to constrain the dust polarization foreground obscuring the inflationary B-mode signal. Our work will allow astrophysicists to more precisely measure the foreground dust signal, improving our ability to uncover the signature of inflation.</p> <p>This work would not have been possible without Arecibo. The sensitive, high dynamic range Galactic Arecibo L-Band Feed Array (GALFA-HI Survey) revealed the slender, magnetically aligned neutral hydrogen structures.</p>	Against Closure	Email	6/14/2016	

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94	John	Mathews	Professor of Electrical Engineering FRAS, Fellow IEEE JDMathews@psu.edu (814) 777-5875	<p>This letter is in response to the Federal Register Notice of an EIS evaluating potential environmental effects of proposed changes to operations at Arecibo Observatory (AO). I find that AO is a scientifically and culturally unique institution that has amazing potential for a future positive impact in both arenas. The scientific contributions stemming from AO have been outstanding and the scientific future remains bright indeed. The cultural contributions to Puerto Rico and the world are incalculable and must remain so. I outline of few of these:</p> <ul style="list-style-type: none"> • AO primary and secondary contributions to STEM education are huge due to the visitor center but also via the large number of AO “graduates” who have entered careers in education both in Puerto Rico and worldwide. AO has always been an education-focused institution. • Over the life of AO many students and scientists have lived in Puerto Rico for various extended periods. Several have spent their entire careers at AO—one of the original scientists from the early 60’s still lives in Ramey. Their children were born in Puerto Rico (as was my daughter), went to school in Puerto Rico, and left the island as Puerto Ricans to attend, for example, Stanford, Cornell, Harvard, and Cambridge Universities. These AO families have made a major socio-economic impact on Puerto Rico. • AO is culturally unique in that it brings together many fields of endeavor and many cultural “ideas” that encourage global thinking—a mix of both cultural and scientific tools and concepts. It has and will continue to attract visitors and users in many fields from around the world. Longer-term users of AO capabilities have come from EU countries, Japan, India, Brazil, Australia, etc. As AO has always provided a de facto institution of higher education in Puerto Rico. 	Against Closure	Email	6/14/2016	JDMathews_AOEIS comments.pdf
95	John	Mathews	Professor of Electrical Engineering FRAS, Fellow IEEE JDMathews@psu.edu (814) 777-5875	<p>I suggest making AO the central component of a degree granting graduate and post-graduate research and education institution that would be unique to Puerto Rico and to Latin and South America. This proposed institution has been discussed elsewhere as the Puerto Rican Institute for Advanced Studies (PRIAS). PRIAS would greatly leverage the already firm cultural impact that AO has made across many communities and further enable many more decades of multi-disciplinary science and engineering at AO. I recommend that a mix of NSF and partner funding support this future.</p>	Alternative Consideration	Email	6/14/2016	JDMathews_AOEIS comments.pdf
96	Greg	Roelofs		<p>Arecibo’s instrument suite and frequency range mean it won’t even be matched in many respects for a decade or more; it’s still making dramatic and surprising discoveries even about our own backyard (e.g., the M33 galaxy next door). At \$12 million a year it’s _cheap_ compared to almost any other astronomical science mission you could name: for the price of Opportunity on Mars, you could fund it for another half-century(!), and virtually all manned missions are vastly more expensive than even that.</p> <p>This is a national treasure in more ways than one. Let’s treat it like one.</p>	Against Closure	Website	6/14/2016	
97	Kerry	Lyons		<p>How can this be shut down?? So many people, so much time, has been used toward the search for extraterrestrial life, finding ways to combat ebola, aids, the zika virus... this is a meaningful amount of research!!!!</p> <p>How can you shut this down??</p>	Against Closure	Website	6/15/2016	
98	Carlos S.	de Jesús		<p>This radio telescope is an icon of Puerto Rico. There’s people from around the world which comes daily to visit it because is the biggest in the world at the moment; something difference. It is an excelent resource and an inspiration for future sciences students.</p>	Against Closure	Email	6/16/2016	
99	Carlos S.	de Jesús		<p>We just need more marketing and promotional material to promote the visit of the people around the world to be sustainable.</p>	Alternative Consideration	Email	6/16/2016	
100	John	Gosselin		<p>Please DO NOT initiate changes which would downscale, or eliminate, the current Arecibo Observatory Operations schedule.</p>	Against Closure	Website	6/16/2016	

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101	Phil	Kronberg	Lifetime Prof. Emeritus, Dept. of Physics, University of Toronto philkronberg@gmail.com 505-310-8077	<p>Among the five options listed for the AO's future in the recent Federal Register notice, I highly recommend the first two: – Continued NSF investment for science-focused operations, and simultaneously pursuing collaboration with other interested parties. If this is done, the widespread benefits to education and culture will automatically follow.</p> <p>This World-unique Arecibo Observatory, with its impressive multi-million dollar upgrades, has yet to achieve the appropriate return in science and education on the money invested. Why?— Because, like any entity of physical plant, adequate ongoing support is needed to produce a commensurate yield on the invested money. This support needs to be designed-in, and steered over time. Men and women of the Congress appreciate that a major capital investment using taxpayers' money requires careful and strategic planning, along with needed budget support, and enlightened and expert management.</p> <p>The investment made in the AO upgrades now makes the AO capable of spanning the entire radio spectrum up to ca. 15 GHz (2cm wavelength). The underlying mechanical structure upgrades permit the AO to exploit a host of computer software, electronic, radar, and feed-antenna refinements. These can also greatly expand the power of the AO.</p> <p>One example, already demonstrated, is to promote Earth-Earth and Earth-space long baseline radio interferometry. In another context it has been demonstrated how the non-real time combination of the AO 305m aperture with a precision-imaging, multi-element interferometer (at the NRC Canada DRAO) can enhance the angular resolution of the Arecibo telescope – in this case from a 305m- to the equivalent to a 1000m-diameter single dish (see e.g. Kronberg, Kothes, Salter, and Perillat, Astrophys.J. v659, 267, 2007).</p> <p>The author of this letter has served on, or chaired many senior US committees and panels on radio astronomy and plasma astrophysics (NSF, AUI and NRAO, AO, NASA and APS), and including all major NSF-supported radio astronomy facilities.</p>	Against Closure	Email	6/16/2016	Arecibo Continuation_Support.pdf
102	Nathan	Leaflight		<p>Whilst the Arecibo Radio Telescope has much relevance as a historical object - and is worthy of preservation as such - its real importance lies in its utility. It may be old, but in numerous regards it is unsurpassed. Similar new facilities are coming on line, it is true. However, they do not render Arecibo redundant.</p> <p>The telescope's unique ability to broadcast helps us to detect dangerous asteroids which may cross Earth's orbit. All astronomers agree that there is no question that such an event will happen again. Forewarning is therefore indispensable to our planet's defense.</p> <p>Not only does Arecibo have unique capabilities which the other telescopes will not duplicate, but it will be part of a greater network. Vital research requires a massive instrument, which can only be provided by multiple dishes making linked observations. Remove one, and our ability to do research will diminish.</p>	Against Closure	Email	6/16/2016	
103	Nathan	Leaflight		<p>I realize that NSF is having terrible budgetary issues, and maintenance of the Arecibo facility is costly. However, the dismantling of the telescope dish, and subsequent restoration of the site, would be crushingly expensive. May I recommend that some other agency take over administration of the Arecibo dish? This will both free up substantial monies for other NSF programs, and keep an important research tool alive.</p>	Alternative Consideration	Email	6/16/2016	

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104	Joan	Schmelz		<p>Environmental Baseline Study of Arecibo Observatory that CH2M Hill</p> <p>Re this paragraph: "Surveys for RTE species or detailed habitat assessments were not included in this effort to determine if these species or the RTE species located in the Rio Abajo State Forest are present or are likely to use the subject property. Impacts to RTE species are unknown but are not anticipated because activities would be generally limited to previously disturbed areas within the subject property."</p> <p>This paragraph misses an essential point. The critically endangered species, the Puerto Rican Parrot (<i>Amazona vittata</i>), was reintroduced in the Rio Abajo forest in 2006 as part of an aggressive conservation program to save the species from extinction. It had previously gone extinct in the region due to habitat loss in the 1920s, and survived only in the El Yunque National Forest. This reintroduction was done well after the last observatory upgrade, which took place from 1993-97. It is thus impossible to conclude that the Puerto Rican Parrot population would not be impacted because the areas have been disturbed previously.</p> <p>Information on the Puerto Rican Parrot from Bird Life International http://www.birdlife.org/datazone/speciesfactsheet.php?id=1666</p> <p>The Puerto Rican Parrot (<i>Amazona vittata</i>) is a critically endangered species. Once abundant, there has been a drastic decline, which reduced the population to an all-time low of 13 birds in 1975. It has been confined to the El Yunque National Forest since the 1960s. Conservation action has prevented the parrot's extinction, although recovery has been slow and the population remains tiny.</p> <p>In 1989, Hurricane Hugo cut the wild population from 47 to about 23. By the beginning of 1992, there were a minimum of 22-23 parrots in the wild and 58 in captivity. In 2000, the parrot numbered 40 wild birds, plus 10 recently re-introduced birds and 100 in captivity. In 2001, thieves broke into an aviary and stole a number of captive adults. In 2004, the wild population was 30-35 individuals.</p> <p>In 2006, 20 birds were released in the Rio Abajo State Forest marking the beginning of a second population in the wild. 26 additional birds were released in December 2007 and 19 more were released in December 2008, with the first two successful nests recorded in the wild at Rio Abajo in 2008.</p> <p>In 2013 there were 64-84 wild birds and 16 chicks at Rio Abajo and 15-20 wild birds at El Yunque, and the first known natural nest in 42 years was recorded in Rio Abajo.</p> <p>At least three captive bred birds that were released in the Rio Abajo Forest were found to be flocking with approximately 150 Orange-winged Amazons (<i>Amazona amazonica</i>) away from the original release site. In May 2014, two young birds were discovered in a natural nesting hole outside the boundary of a national park.</p>	Resource Considerations	Email	6/16/2016	
105	David A.	Smith	CNRS Senior Staff Scientist	<p>The future of our technology-based society depends crucially on instilling scientific culture in today's youth and in the general public. Arecibo is a universally recognized icon of Science. I give public science lectures to a broad variety of audiences, including school children, teachers, people interested in Science and, importantly, people who think that Science doesn't concern them. I give these talks in France, Italy, Greece as well as (more occasionally) in the United States. I nearly always include a photograph of Arecibo – people know it, and it grabs their attention. Like Hubble or the Space Station, people associate Arecibo with "good" Science, as distinct from more controversial fields. Thus, Arecibo is a "spark" that we use to ignite people's interest in the underlying basis of engineering and technology.</p> <p>As an American living abroad, I also clearly see that Arecibo projects a tremendously positive image of the United States. Amongst the reasons that people around the world love us is our ability to create and perpetuate dream-inspiring inventions.</p> <p>Last, but definitely not least, Arecibo is a science-tool unmatched by any other. To lose it would be a horrible loss for science and thus for society. The rate of scientific breakthroughs is accelerating continually – we live in one of the most exciting periods for Knowledge since the dawn of history. One of the causes is the increasing number of fantastic scientific instruments in all fields. But a major cause is the synergy of the different instruments and fields. The sum of our technological, scientific wealth is much greater than the sum of its individual parts. Arecibo on its own is great. Arecibo as a tool meshed into a network of all the other scientific tools is much greater.</p> <p>America's strength and greatness comes from our ability to transform dreams into practical devices and knowledge. America's wealth is a result of continued investment in dreams that may not be obviously useful in the short term. To perpetuate a strong America that continues to be loved by the family of nations, I strongly encourage you to continue to support Arecibo generously.</p>	Against Closure	Email	6/16/2016	AreciboSupport-signed.pdf

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Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
106	Donald F.	DuBois	Los Alamos National Laboratory Fellow (retired)	<p>In 2015 the Arecibo Observatory (AO) resumed experiments involving the transmission of high power, high frequency (HF), electromagnetic waves, into the ionosphere. Arecibo is the premier facility for studying the plasma turbulence induced by these HF waves because of its powerful and very sensitive 430 Mhz incoherent scatter radar. I am writing to emphasize the importance of continuing this unique capability as an interdisciplinary research tool that can produce detailed understanding of nonlinear physics also vital to laser-plasma interactions in the large national inertial fusion programs.</p> <p>Past HF heating experiments*, utilizing the ultra-sensitive 430MHz radar, in the smooth, well-characterized, ionosphere over Arecibo, have produced the most detailed, reproducible, and quantitatively predictable, data concerning the induced turbulence, available from any venue. Such detail is not available in current laser-plasma experiments where much of the same physics operates on vastly smaller space and time scales. Continuation of this line of research at the Arecibo Observatory promises to increase physical understanding essential to both fields.</p> <p>In both the laser regime and the HF heating regime the driving beams trigger certain "parametric instabilities" that drive the plasma into a nonlinear turbulent state. The computer simulation modeling successful in the HF heating regime, scales to the laser driven regime with simple, physically obvious, changes. An important physical effect, in both regimes, is the acceleration of electrons to suprathermal energies by the plasma turbulence. These so called "hot electrons" can pre-heat the imploding core, hindering ignition, in inertial compression laser fusion applications. Kinetic hot electron modeling methods developed for the laser regime are readily applicable to the HF-ionosphere regime.</p> <p>A controlled, well-characterized, source of suprathermal electrons produced by HF heating would significantly improve aeronomy studies of collisional effects outside the heated volume, including studies of electron transport, energy loss, and energy balance in the upper ionosphere. The very sensitive 430Mhz radar at the AO is unique in its ability to measure the velocity distribution of hot electrons streaming out of the HF-heated layer of the ionosphere. Hot electrons have been observed in many laser experiments.</p> <p>Laser experiments, such a those at the Omega laser at the University of Rochester and the multibillion dollar National Ignition Facility at Livermore are severely restricted, compared to the HF heating capabilities, in the range of diagnostics possible for these nonlinear processes. The lasers produce the plasma and also drive the instabilities that, in turn, drive the nonlinear processes. Disentangling the plasma production - in very complex geometries- and the nonlinear excitation requires many uncontrolled assumptions.</p> <p>In the HF heating experiments, in the so-called low duty cycle regime, the ionospheric plasma is smooth and can be completely characterized and is unaffected by the HF beam. The theory can then be applied to this known initial state without uncontrolled assumptions needed in the laser case. But most importantly, the unique combination of the HF heating capability and the extremely sensitive 430 Mhz radar at the AO can measure the properties of the enhanced turbulent fluctuations and hot electrons in far more physical detail than any diagnostics available in the laser regime.</p> <p>*F.T. Djuth and D.F. DuBois, Earth, Moon and Planets, DOI 10.1007/s11038-015-9458-x</p>	Against Closure	Email	6/17/2016	
107	Dr. BJ	Howerton	Northwest Regional Office Environmental Services Mgr. 911 N.E. 11th Avenue Portland, OR 97232-4169 Telephone: (503) 231-6749 Fax: (503) 231-2275	<ul style="list-style-type: none"> • Is there a budget for continued operations? • Is technology out of date? If so, at what cost to make technology current? • What is the quality of science received from project? • Is project cost effective to operate? • Has project achieved its goal or mission? • Has a Lessons Learned report been generated from Project operation? • Does Project still provide acceptable solutions? • Should new procedures/processes be developed for future operation? • Are there any new research possibilities for project? • Educational value as Science Technology, Engineering, and Math (STEM) tool? • What is impact to environment as built and operated, i.e., will operation increase environmental impacts? • Any opportunities for operational improvement? • Questions concerning: Mothballing of facilities (suspension of operations in a manner such that operations could resume efficiently at some future date). • What is annual cost to mothball facilities? • Does operational value outweigh mothballing costs? • Deconstruction and site restoration. • Cost of deconstruction and site restoration vs benefit to public of operation? 	Decision Process	Email	6/17/2016	
108	Dr. BJ	Howerton	Northwest Regional Office Environmental Services Mgr. 911 N.E. 11th Avenue Portland, OR 97232-4169 Telephone: (503) 231-6749 Fax: (503) 231-2275	<ul style="list-style-type: none"> • Have project needs been meet? • Have all deliverables been met? • What earned value management (EVM) data is available to review? • Where is the project information developed archived? Is it available to the public? • Are there future requirements for project information? 	General	Email	6/17/2016	

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
109	Wes	Patterson		<p>Title: Bistatic Radar Observations of the Moon using Mini-RF on LRO and the Arecibo Observatory</p> <p>Authors: G.W. Patterson1, A.M. Stickle1, F.S. Turner1, J.R. Jensen1, D.B.J. Bussey1, P. Spudis2, R.C. Espiritu1, R.C. Schulze1, D.A. Yocky3, D.E. Wahl3, M. Zimmerman1, J.T.S. Cahill1, M. Nolan4, L. Carter5, C.D. Neish6, R.K. Raney1, B. J. Thomson7, R. Kirk8, T. W. Thompson9, B.L. Tise3, I.A. Erteza3, C.V. Jakowatz3</p> <p>Author institutions: 1The Johns Hopkins University Applied Physics Laboratory, 11100 Johns Hopkins Rd., Laurel, MD 20723, USA, 2Lunar and Planetary Institute, 3600 Bay Area Boulevard, Houston, TX 77058, USA, 3Sandia National Laboratories, Albuquerque, NM 87815 USA, 4Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ 85721, USA, 5NASA Goddard Space Flight Center, Greenbelt, MD 20771, USA, 6University of Western Ontario, 1151 Richmond Street, London, ON, N6A 5B7, Canada, 7 Center for Remote Sensing, Boston University, 725 Commonwealth Ave., Boston, MA 02215, USA, 8 Astrogeology Science Center, U.S. Geological Survey, Flagstaff, AZ 86001, USA, 9Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA 91109, USA</p> <p>Abstract: Mini-RF/Arecibo Observatory observations of the Moon show an opposition surge for portions of the floor of Cabeus that are not in permanent shadow. The unique nature of the response may indicate the presence of near-surface deposits of water ice.</p> <p>Link to manuscript: http://dx.doi.org/10.1016/j.icarus.2016.05.017</p>	Against Closure	Email	6/17/2016	
110	Bryan	Strom		Please do not shut down Arecibo. The telescope has a historical and cultural value as well as a future value for scientific discovery.	Against Closure	Email	6/17/2016	
111	Dr. Joeri	van Leeuwen	ERC Laureate, Associate Professor ASTRON, University of Amsterdam	<p>I write this letter to strongly urge the NSF to choose "Continued NSF investment for science-focused operations (No-Action Alternative)", in the Arecibo EIS. I do this in my role of as a global astronomical outreach leader, as exemplified by e.g. my 2016 De Graaff astronomy outreach prize.</p> <p>Astronomy is a uniquely visual means of drawing our wider society in to science. Outreach on the sky is an especially effective way of explaining the place of Earth in the Universe.</p> <p>Results obtained with Arecibo continue to power this outreach. Our 2015 discovery, with a team of US and ex-US astronomers which I led while at UC Berkeley, of a pulsar disappearing in bent space-time is just one example. It allowed us to explain some of the wonders of the Universe we live in, for an extremely broad audience. This research made the front pages (!) of e.g. Yahoo.es, El Diario de Santiago, El Siglo de Torreón, CNET.es and RT in Spanish, and CNN, the Wall Street Journal, the Huffington Post in English. Much popularization of this work came from the beautiful, yet scientifically correct, animations which tallied over 200,000 youtube views within days, and were trending on space.com -- outlets that uniquely captivate a wide, eager, and young audience.</p> <p>Arecibo thus puts Puerto Rico in the vanguard of scientific exploration and its dissemination to current and future tax payers: in the Spanish speaking world, on the US main land, and even globally. I urge you to treasure that unique capability, and include this important visibility and education factor in your EIS.</p>	Against Closure	Email	6/17/2016	EIS_Response_20160617.pdf
112	David	Bloxham		please keep the radio telescope known as ARECIBO operational. I believe that the SETI program is important to the advancement of humankind.	Against Closure	Website	6/18/2016	
113	Daniel	Kellett	Miami University 2016 Electrical Engineering Major Physics Minor College of Engineering and Computing IEEE Student Branch Vice President	I write to urge that NSF choose alternative 1 of its Notice of Intent to Prepare an EIS . . . , namely Continued NSF investment for science-focused operations (No-Action Alternative). During my junior year of college, I had the privilege to not only work with data collected by the observatory, but also spend 4 days there, getting to see the facilities and an explanation of the function of each part of the observatory. I look back on this as a very enriching experience and believe that Arecibo Observatory still has much to offer, both in terms of unique research use and in terms of educational value for students.	Against Closure	Email	6/18/2016	
114	David	Porter		Please do not remove support for Arecibo.	Against Closure	Website	6/18/2016	

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
115	Emily	Altieri	University of British Columbia	<p>I am writing in response to the notice of intent to produce an Environmental Impact Statement regarding the future of the Arecibo Observatory. As an undergraduate student Bryn Mawr College, I undertook research using the Arecibo Observatory for studies of pulsar astrophysics as part of a summer research internship at Bryn Mawr. During my research program, I visited and made observations with the telescope. Through this project I learned skills in computer coding and algorithm development, in addition to astrophysics itself. This project was the first stepping stone in my development as a researcher and provided me with inspiration and excitement to continue my journey at my present position as a graduate student in physics.</p> <p>I hope that the Observatory can remain in operation with a science-focused research program, and that it can continue to provide such valuable experiences for future students.</p>	Against Closure	Email	6/19/2016	
116	Sarah	Henderson	Physics & German A.B., Mathematics minor Lafayette College Class of 2016	<p>I am writing in response to the notice of intent to produce an Environmental Impact Statement regarding the future of the Arecibo Observatory. As an undergraduate student at Lafayette College, I undertook research using the Arecibo Observatory for studies of pulsar astrophysics as part of a summer research internship and senior thesis at Lafayette. During my research program, I made observations with the telescope. Through this project, I learned skills in computer coding and algorithm development, in addition to astrophysics itself. This experience was a significant part of my development as a researcher and was an important step leading to my current position at Google and future astrophysics graduate student this fall. By having this opportunity to utilize Arecibo data, I developed as a scientist, and my passion for astrophysics was really solidified. I am truly thankful that I was able to work alongside top-notch scientists and observe pulsars directly thanks to the Arecibo Observatory. It would be a shame if the observatory had to be closed; I can only hope that the NSF recognizes how valuable of a resource Arecibo is for professors, students, and the public alike.</p> <p>I hope that the Observatory can remain in operation with a science-focused research program and that it can continue to provide such valuable experiences for future students.</p>	Against Closure	Email	6/19/2016	
117	Patricia A.	Henning	Interim Associate Vice President for Research Professor of Physics and Astronomy University of New Mexico	<p>I would like to note the following comment in the Draft EIS: Surveying the Zone of Avoidance with the Arecibo L-band Feed Array</p> <p>P.A. Henning (University of New Mexico), W. van Driel (Paris Obs.), Monica Sanchez (UNM), R. Minchin (NAIC), E. Momjian (NRAO), J.L. Rosenberg (GMU), S. Schneider & Z. Butcher (UMass), L. Staveley-Smith & E. Viaz (UWA), C. Springob (ICRAR), B. Koribalski (CSIRO)</p> <p>Abstract: Galaxies are hard to see behind our own Milky Way. There is a "Zone of Avoidance" for optical astronomy there, but radio waves from neutral hydrogen gas in optically-obscured galaxies are easily detected by the Arecibo radio telescope. With the unparalleled sensitivity of Arecibo, and its state of the art receiver system, we have found about 500 galaxies, and we're on track to uncover ~1500 more. This discovery will shed light on motions of galaxies in the nearby Universe, and how galaxies flow at larger distances through space, pulled by important gravitational sources, some of which are hidden behind the Milky Way. Our survey is able to make a three-dimensional map of the distribution of hidden galaxies, and will be unsurpassed for years to come.</p> <p>We have published several refereed papers: Henning et al. 2010 Astronomical Journal, 139, 2130 McIntyre et al. 2011, Astrophysical Journal Letters, 739, 26 McIntyre et al. 2015, Astronomical Journal, 150, 28</p> <p>Ph.D. thesis: McIntyre 2015 Ph.D. Thesis, University of New Mexico</p> <p>Further, we have published numerous conference proceedings and American Astronomical Society abstracts (BAAS): Henning et al. 2006, BAAS, 38, 133, Henning et al. 2008, in The Evolution of Galaxies Through the Neutral Hydrogen Window, AIPS Conf. Proc. 1035, 246 Lamm, R. et al. 2007, BAAS, 39, #132.22 McIntyre et al. 2011, BAAS, 43, #409.08 McIntyre et al. 2011, BAAS, 43, #246.18 McIntyre, T.P., Minchin, R., & Henning, P. 2012 AAS meeting 219, #410.03 Springob et al. 2006, AAS Meeting 209, #95.04, BAAS, 38, 1034 Springob et al. 2008, in Dark Galaxies and Lost Baryons, Proceedings of the International Astronomical Union, IAU Symposium, Vol 244, 383 Truebenbach, A. et al. 2012, AAS Meeting 219, #252.18</p> <p>These Arecibo data have figured in public outreach. Henning has given five public lectures featuring the survey in the United States and Australia. Further, note over the course of this project, 11 students have been involved, 7 of whom are women.</p>	Against Closure	Email	6/19/2016	

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
118	Anthony	Post	Rensselaer Polytechnic Institute	<p>I am writing in response to the notice of intent to produce an Environmental Impact Statement regarding the future of the Arecibo Observatory. As an undergraduate student at Lafayette College, I undertook research using the Arecibo Observatory for studies of pulsar astrophysics as part of a summer research internship and senior thesis.</p> <p>During my summer research program, I visited and made observations with the telescope. For my senior thesis, a large part of the data I used was gathered from Arecibo. Through both of these projects I learned skills in computer coding and algorithm development, in addition to astrophysics itself. This experience was a significant part of my development as a researcher, and was an important step leading to my present position as a graduate student in physics.</p> <p>I hope that the Observatory can remain in operation with a science-focused research program, and that it can continue to provide such valuable experiences for future students.</p>	Against Closure	Email	6/19/2016	
119	Dr. Julio	Urbina	Associate Professor (814)-863-5326 E-mail: jvu1@psu.edu Communications and Space Sciences Lab Department of Electrical Engineering The Pennsylvania State University	<p>I can only envision high impact citation impact that is typically greater when research groups collaborate, as indicated in the article Collaborations: The fourth age of research by Jonathan Adams, Nature 497, 557–560 (30 May 2013), doi:10.1038/497557a. The science applications of AO with the new HF-radar are unique and include meteor aeronomy and physics applications as well as radio science investigations. In these applications major issues include exploring the recently discovery—using Arecibo V/UHF observations—that the vast majority of meteoroids visible as radar meteors fragment rather than simply ablating. This process is likely a source of considerable aeronomically important nanometer “dust” in the 80-130+ km meteor zone. Other important science areas include studies of mid-latitude spread-F, sporadic-E instabilities, quasi-periodic echo (QPE) structures, low-altitude quasi-periodic echo (LQPE) structures, and detection of the D-region ionization enhancements associated with lightning-related elves using the radar in wave-interaction and/or partial-reflection modes. These types of research can only be conducted at AO.</p> <p>I grew up in a very poor suburb of Lima, Peru, but was fortunate enough to study and complete my undergraduate education in Peru. I was also fortunate to have great mentors in Peru, whom guided and encouraged me to go an extra mile and pushed me to pursue an advanced degree in the United States. I did my Ph.D thesis at AO and I can attest of the impact that AO has had in my career and it continues to be a source of inspiration to underrepresented students. Undoubtedly AO has strong broader impact in reaching out to minority students and engaging them in pursuing a career in STEM fields. AO has also been a steady source of engineers and scientists. Many of my graduate students did their research at AO and are working at SpaceX, Jet Propulsion Lab, DoD, and several national laboratories.</p> <p>College of Engineering The Pennsylvania State University 121 Electrical Engineering East University Park, PA 16802-2705 (814) 865-2212 (814) 865-7065 (FAX)</p>	Against Closure	Email	6/19/2016	Urbina-Letter-NSF-EIS.pdf
120	Dr. Julio	Urbina	Associate Professor (814)-863-5326 E-mail: jvu1@psu.edu Communications and Space Sciences Lab Department of Electrical Engineering The Pennsylvania State University	<p>I write this letter in response to the Federal Register Notice of an EIS evaluating potential environmental effects of proposed changes to operations at Arecibo Observatory (AO). I strongly request NSF to choose alternative 1 of its "Notice of Intent to Prepare an EIS . . . ", namely "Continued NSF investment for science-focused operations (No-Action Alternative)."</p> <p>AO is a unique institution that has incredible potential to continue: making scientific discovery, training future scientists and engineers, cultivating international collaboration, and perhaps transform higher education if AO becomes a degree granting graduate and post-graduate that would be truly remarkable to Puerto Rico and Latin America. The proposed higher education approach has been discussed elsewhere as the Puerto Rican Institute for Advanced Studies (PRIAS). With this avenue, there is an amazing opportunity to make stronger links between the United States and South America, a component that is missing; despite the fact that South America is not too far from the mainland.</p>	Alternative Consideration	Email	6/19/2016	Urbina-Letter-NSF-EIS.pdf

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Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
121	Garrett	Wiens-Kind		<p>I don't know if you know this, but there is an amazing opportunity to crowdfund Arecibo.</p> <p>In every millennial's mind there a fondness for the Nintendo 64 title GoldenEye, a video game based on the Bond movie of the same name. What's interesting is that GoldenEye became even more popular than the movie and is considered a classic game up there with Super Mario Brothers.</p> <p>Why would anyone who's played GoldenEye care about Arecibo? The millennials know it by a different name, "Skyhook." This is what the facility is called in the film, and also the name of the level in the video game.</p> <p>All you have to do is name the campaign. "Save The GoldenEye Skyhook" and then make a slight nod to the fact that the facility was used in the bond movie and the game. Of course talk about all the great science and the benefits for Arecibo regionally.</p> <p>The internet will go nuts. I promise. You'll get on all of the millennial tech blogs. If you get the rewards right, you could easily raise 12 million dollars.</p> <p>Do you know how badly I want a "I saved the Skyhook" t-shirt? Badly.</p> <p>Actually scratch that, the t-shirt I really want is "Make Skyhook Great Again." Think about that on a t-shirt and awesome that would be!</p> <p>Look the Smithsonian raised substantial funds for their museum. "https://www.kickstarter.com/projects/smithsonian/reboot-the-suit-bring-back-neil-armstrongs-spacesu" They did it!</p> <p>You never know if you don't try.</p>	Alternative Consideration	Email	6/19/2016	
122	Fronefield	Crawford	Associate Professor of Astronomy Faculty Don of Weis College House Department of Physics and Astronomy Franklin and Marshall College P.O. Box 3003 Lancaster, PA 17604-3003 USA email: fcrawfor@fandm.edu office: (717) 358-4499 fax: (717) 358-4474	<p>I am writing in support of the continued operation of the Arecibo Observatory for astronomy. A number of undergraduate students that I have supervised and I have used Arecibo for various pulsar-related projects in recent years.</p> <p>One of these projects is a search for new pulsars in another spiral galaxy, the Triangulum Galaxy. To date, no pulsars have been discovered outside of our Galaxy with the exception of pulsars located in dwarf satellite galaxies, the Magellanic Clouds. Arecibo is the only telescope capable of possibly detecting such pulsars owing to its exquisite sensitivity (this is since it has such a big collecting area). In addition, new instrumentation recently commissioned at the telescope (the so-called PUPPI backend) has vastly increased the bandwidth available for low frequency observations. This combination makes our search for pulsars in the Triangulum Galaxy the most sensitive ever undertaken.</p> <p>I note that the new instrumentation is a key piece of this project: it is a mistake to think that Arecibo is outdated just because the dish is old. With new technology being developed, such as PUPPI, the telescope remains at the forefront of pulsar astronomy.</p>	Against Closure	Email	6/20/2016	M33_letter_to_AST_for_Arecibo.pdf

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
123	Jonathan S.	Friedman		<p>I am a long-time (24 years) employee of and scientist at the Arecibo Observatory, where I currently hold a ½-time position while serving as the Director of the Puerto Rico Photonics Institute (PRPI) at the Universidad Metropolitana.</p> <p>I write with respect to the Environmental Impact Statement under preparation for the Arecibo Observatory, in consideration of a range of prospective futures for the astronomy, planetary science, and space and atmospheric science institute. Although not all I have to say is directly relevant to the EIS, I believe the EIS cannot be separated from the need for a positive, pro-active approach by the NSF in assuring a secure and certain future for Arecibo, open and productive. I am conscious of the pressures NSF faces, given flat budgets and the urgent need to advance science in response to the scientific community and national interest. I am also conscious that responsible stewardship of facilities you operate should include plans for decommissioning. I do not object to the NSF taking steps to address its life-cycle responsibilities for Arecibo just as it should do with all of its facilities. My objection comes from the perception of, after nine years of implied threats to the existence of the Arecibo telescope without taking a pro-active approach towards alternatives, when it finally appears the first steps were taken with the Dear Colleague letter, the NSF proceeds on a path that implies closure.</p> <p>What do I mean? In my view, rather than piecewise taking your legally required steps along with other actions designed towards defining Arecibo's future, a more positive and progressive approach is called for. This would start by laying out a series of steps that the NSF will take. Then, meetings such as the EIS public comment meetings held in San Juan and Arecibo on June 6 would be seen as steps in such a process. By not having a published and publicized process, NSF has inadvertently created a situation where the public image is negative: termination.</p> <p>As to the future of Arecibo: Under the new management structure, Arecibo is for the first time closely integrated into the Puerto Rican community, both publicly and in its institutes of higher education. Under this paradigm, I was able to connect Arecibo research and development to its Puerto Rico partner university by founding the Puerto Rico Photonics Institute (PRPI). PRPI is only one of a number of initiatives underway to enhance Arecibo's science by much more profound involvement from Puerto Rican universities and researchers.</p> <p>With the recent evolution of Arecibo, I see option 2 as the only viable future for Arecibo. Continued funding under the current model is clearly not sustainable by the NSF and only leaves the Arecibo staff facing the constant pressure of its uncertainty, and thus unable to plan for the future, thus dooming Arecibo to decline. Option 3 is also not viable, nor is option 4, and mostly for the same reason. Whether to mothball it with the idea of opening in an undefined future or maintaining minimal operational levels for the purpose of education and tourism requires a budget of many millions each year. I recall that a study completed in the final years under Cornell administration estimated that this cost would exceed \$6M, just to keep the telescope safe. Even if the number is less, it is not unsubstantial, and it is unlikely that there would be close to sufficient income under Option 3, or available funding for Option 4.</p> <p>Option 5 is also not viable, as the cost of deconstructing the telescope, even minimal deconstruction, must be too much to consider. My suggestion is simple: The NSF will have a major interest in Arecibo science, as long as there is science to do there. As the current major stakeholder, NSF should host a conference and invite the responders to the Dear Colleague Letter along with other</p>	Decision Process	Email	6/20/2016	Letter to the NSF- EIS 10 June 2016.pdf
124	Patryk	Giza	Electrical Engineering Miami University	<p>I write to urge that NSF choose alternative 1 of its "Notice of Intent to Prepare an EIS . . .", namely "Continued NSF investment for science-focused operations (No-Action Alternative)." During my time as an undergraduate at Miami University, I had a chance to work and collect data with the staff at Arecibo National Observatory. During my time at the Observatory, I learned about the ionosphere as well as different topics in astrophysics, plasma physics as well as radio telescope. With the data I collected and a group of my peers, we analyzed the data and ended up getting our first scientific publication ever! This was a major event in my life, and I'm definite it helped within my job search. In short, the work I was able to conduct and the subsequent paper published allowed to be a successful electrical engineer, so I urge the committee to allow Arecibo to operate with the NSF.</p>	Against Closure	Email	6/20/2016	
125	Dr. Yun	Gong	Postdoctoral fellow Electrical & Computer Engineering Department 260D Garland Hall Miami University Oxford, Ohio 45056	<p>I write to urge that NSF choose alternative 1 of its "Notice of Intent to Prepare an EIS . . .", namely "Continued NSF investment for science-focused operations (No-Action Alternative)."</p> <p>The Arecibo incoherent scatter radar (ISR) is the most powerful instruments in observing the ionosphere in the world since its operation in 1963. Thanks to this powerful radio wave detector, I have done many interesting works in studying the fascinating ionosphere and obtained my PhD degree. I have been to the Arecibo Observatory. Natural Karst terrain, large limestone sinkholes, cat-walk, and the dome caught my eyes. Folks in the facility are very nice.</p> <p>This amazing place should not be shut down. I believe that for many researchers and college students, the Arecibo Observatory is irreplaceable. Great works cannot be done without the Arecibo Observatory!</p>	Against Closure	Email	6/20/2016	

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
126	Kristina	Kaldon		<p>I was fortunate enough to be selected for the summer 2014 Arecibo Observatory REU (Research Experience for Undergraduates) program. It was a life changing experience in which I really discovered what it meant to be a scientist. The employees and scientists at Arecibo Observatory are the most welcoming, intelligent, and passionate people I have ever met. They moved their lives to rural Puerto Rico for this telescope and the scientific advancements it promises. My current position at MIT Lincoln Laboratory is due largely to the work I did at Arecibo Observatory. I have never felt so tangibly close to the cosmos and future of astronomy and planetary science. It truly saddens me to think the future funding of Arecibo Observatory is even up for question. My dream career, ever since my first day at the observatory, is to end up working there. My experience, and the experiences of the others in the program, has led us all to more passionately and aggressively follow our hearts and reach for what we once thought was unreachable, especially in a scientific and educational sense. After working with concrete data and hardware, we take things seriously now knowing first-hand there is a future for all science. To think that future students, scientists, and the general public will not be able to visit and see the great things that come from this telescope is a national disgrace.</p> <p>The structure of classes and the way we learn at most universities is broken. Undergraduates need to gain hands-on experience and see how things work. We learn how to analyze but not where data come from or how it is collected or processed. At Arecibo Observatory, I learned how data are collected, how radars work, how signals are generated and received, how environmental aspects play a factor, why fast Fourier transforms matter, how one has to process signals, the equipment and manpower needed to process the signals and run the hardware, the preciseness of measurements and clocks, the cooling mechanisms needed for the machinery to work, how images are produced, how to code programs, how to break signals into different data streams, and so much more. Before my time at Arecibo Observatory, I only saw data in the form someone else had uploaded it, had one way to process it, and analyzed what I saw. After working at Arecibo Observatory, I see the beauty in how everything comes together to work; I realize how science is so much greater when you learn the engineering and hands-on aspects of data collection and when you can first-hand see how much work goes into collecting data. It means a lot to learn it in person; there are images in my head of the observatory that I will never forget. When I learn from doing, I remember so much more vividly than in a classroom. The fact the USA owns this masterpiece of science and could possibly let it go to waste is a silly idea that needs to be forgotten. This place is everything STEM in America needs to be and how to make our students the best. I have personally benefitted, watched other students benefit, watched Puerto Rican citizens smile and revel at the size of the dish at the visitors center, read blog posts of visiting scientists and how much they loved their time at the observatory, and personally boasted every chance I got. I have not spoken with one person who would say bad things about this observatory and the scientists and faculty that work there.</p> <p>As a committee chair for the Hispanic Latino Network at work (a position I received as a non-Hispanic because of my general love of Puerto Rico due to my time there), I find Arecibo Observatory a great asset for Hispanic minority expansion in STEM. Puerto Ricans can come to the visitor center and see first-hand how groundbreaking science is happening in their backyards. This tangibility, along with the space academy program and REU, allows them to develop a passion for science and astronomy. This is so important because we see a lack of interest in STEM among minorities. I hope you all realize the severe impact this would have on continental US students, Puerto Rican students, scientists around the world, personal lives, and how we are viewed by the scientific community. Research needs to mean more. We need more people exposed to it and we need to take a stand and find permanent methods of funding for this amazing observatory that I am proud to have called home. I strongly advocate for option one, where the observatory stays running the way it is and science-focused operations continue as before. This is the best option and allows all to benefit. In terms of future funding, issues may come up frequently again and I would not enjoy having to express how ridiculous it is that funding is an issue every year so I understand how this option might not be viable.</p>	Against Closure	Email/mail	6/20/2016	Aoletter-finalKaldon.pdf

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
127	Kristina	Kaldon		<p>Option two is possibly realistic but should target Federally Funded Research and Development Centers (FFRDCs). I suggest checking with FFRDCs such as MIT Lincoln Laboratory as a potential source of funding. Line funding is used for internal research and development, which often involves outside collaborations. FFRDCs normally have funding like this available for science expansion programs, to which Arecibo Observatory sounds like a perfect candidate. Also, from a national security standpoint, I cannot see how we would even consider letting China have the capabilities of Arecibo Observatory while we decommission ours.</p> <p>The third option, transitioning to education-focused operations over research operations, is a horrible idea. The entirety of the observatory's status and educational value lies in the research. To cease research, everything I've already mentioned goes to hell: the experiences of students would be terrible and the experiences for scientists would be nonexistent.</p> <p>The fourth option, temporary suspension of operations, is a clear cop out. When can we foresee the scientific community getting so much extra funding that the observatory would be up and running again in a non-set time period? There would still be significant maintenance costs and if you chose to not maintain the dish, it would be useless in a few months. I don't see this as a feasible option at all: high costs with no return. Option five, is the most sickening but hopefully the least likely. Deconstruction would be expensive and stupid. Think of all the amazing things that have been discovered using this dish. Think of the life, both plants and animals, that has grown and lived here and how that destruction would affect the environment and ecosystem. Think of all the raw and organic side effects, all the science and education the observatory offers, the diversity, the wildlife, and the coquis!</p> <p>The observatory has brought so much knowledge, happiness, diversity, and biology over the years. We need to find a viable option to keep it running with the science and education it now offers. Please do not change my old home for the worse; I want to remain as proud as I am today.</p> <p>Please feel free to contact me for any more information or clarification. I have specific people I can also refer to if need be.</p>	Alternative Consideration	Email/mail	6/20/2016	Aoletter-finalKaldon.pdf
128	Amy	Lovell	Professor of Astronomy Agnes Scott Department of Physics & Astronomy alovell@agnesscott.edu 404-471-6265	<p>I am writing in response to the invitation for public comments on environmental impacts of the Arecibo Observatory, and regret that I cannot be present at either of the public scoping meetings. I am offering comments related to the impacts of Arecibo Observatory on cultural resources, health and safety, and socioeconomics.</p> <p>As a national facility located in the US territory of Puerto Rico, the Arecibo Observatory is a major cultural resource on the island. The facility attracts large numbers of tourists, both from the island and from the rest of the world, forming part of Puerto Rican cultural identity and a strong point of pride. Even more importantly, the Arecibo Observatory is a very important part of STEM education on the island: thousands of school children visit the facility to learn about the scientific and engineering accomplishments made there and become inspired about their own futures.</p> <p>Hispanic STEM professionals are still vastly underrepresented: in spite of being 20% of the college-age population, only 5-9% of physical sciences, mathematics, and engineering degrees (https://www.aps.org/programs/education/statistics/hispanicmajors.cfm) are awarded to Hispanic college graduates. The Arecibo Observatory educational programs get children interested, and the student research programs (summer and Saturday) have a huge impact in recruiting and retaining talented Latino/as into the STEM workforce. This is a cultural as well as socioeconomic impact that extends way beyond the island itself. Finally, it is probably a larger, bigger-picture safety impact than is often considered in the Environmental Impact Statement, but the Arecibo Planetary Radar plays a pivotal role in the investigation and characterization of potentially hazardous asteroids (PHAs). This highly sensitive capability is not matched anywhere else in the world, and without this radar, we will be significantly less able to assess asteroid impact hazards, which affects the health and safety of the entire planet.</p> <p>I urge you to consider these factors as you prepare the EIS for Arecibo Observatory: in addition to being a unique scientific facility which has served as an international model for interdisciplinary scientific and technical accomplishment, it has important cultural, safety, and socioeconomic importance in PR and across the Earth.</p>	Against Closure	Email	6/20/2016	AreciboEIScomments.pdf
129	Sergio Colon	Medina		Por decadas el Radar de Arecibo a sido el oido del planeta para escuchar el Universo , seria una trajedia para la Ciencia si dejase de funcionar	Against Closure	Email	6/20/2016	

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Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
130	Marjan	Tibbe	<p>Office Manager Liesbet Elpenhof Secretary Radio Observatory Division and Astronomy Group</p> <p>ASTRON Oude Hoogeveensedijk 4 7991 PD Dwingeloo The Netherlands www.astron.nl</p> <p>Tel: +31 (0)521 - 595776 (Marjan) Tel: +31 (0)521 - 595790 (Liesbet) Fax: +31 (0)521 - 595101 e-mail: secretaryobservatory@ astron.nl and secretaryastronomy@as tron.nl</p>	<p>As chairman of the Consortium board of Directors of the European VLBI Network (EVN), I write to express our deep concern about the continued availability of Arecibo Observatory for the astronomical community in general, and for Very Long Baseline Interferometry (VLBI) observing as an associated member of the EVN in particular. Radio Astronomy is an important tool in basic scientific research to provide answers to fundamental questions in the minds of many members of the general public: where did the world around us come from, what does it consist of, how did it form? Exposure to astronomy, perhaps more than any other science, is able to capture the imagination of youngsters and draw them into an education in science or engineering. Radio Astronomy requires highly sensitive telescopes to receive and study the very faint natural emissions from celestial bodies and physical processes occurring in the remote Universe. Time and again, sophisticated techniques, instruments, and (increasingly) software algorithms and ICT or Big Data applications first designed for Radio Astronomy find their way to societal applications not dreamt of originally. The collecting area of the Arecibo Observatory 1000 ft dish is nearly ten times larger than that of any other radio telescope in the world. I expect that other concerned members of the astronomical community will address how, in and of itself, the resultant exquisite sensitivity to faint radio waves brings fantastic scientific opportunities. Here, I wish to emphasize the important and irreplaceable role of Arecibo Observatory in VLBI networks, and in the EVN in particular.</p> <p>The EVN offers ultra-high resolution imaging of faint celestial objects. The greater the distances between the participating telescopes, the finer the details of the resultant celestial images. The EVN is a partnership between prominent independently operated radio observatories on several continents. The EVN Consortium Board of Directors is continuously focused on expanding the capabilities of the network, in order to offer cutting-edge capabilities for high-impact science projects. The EVN is accessible indiscriminately by astronomers world-wide, based on rigorous peer-review of observing proposals; many regular users of the EVN are based in the USA. Arecibo specifically extends across the Atlantic the EVN network of large-diameter telescopes in Europe and Asia (perhaps superfluously: Arecibo's position in the EVN cannot be supplanted by the Chinese EAST telescope, now under construction, which should have a similar effective collecting area at zenith, but is located nearly on the opposite side of the globe). Since the VLBI technique spreads out the already faint radiation from celestial objects into progressively more "pixels", it is crucial to achieve the greatest possible sensitivity on the longest distances in order to see the finest details. Arecibo's great collecting area, extending the longitude range of the EVN array of telescopes, is therefore vital to the most demanding high-resolution high-sensitivity studies.</p> <p>Just a few of the most prominent application areas include pulsar astrometry (beacons which for example allow timing and measuring the geometry of the Galaxy with profound importance for the study and interpretation of gravitational waves), cosmic maser kinematics (shedding light on the formation and evolution mechanisms of stars and planets), and deep studies of distant starbursting and active galaxies (which harbor highly energetic supermassive black holes in their nuclei). Arecibo's share just a few years ago in the resolution of the "Plelades distance controversy" was an important landmark in the establishment of consistent yardsticks to measure the cosmos, and an excellent illustration of the vital role of this extremely large telescope in fundamental VLBI studies.</p> <p>Please allow me to conclude, therefore, by expressing my fervent hope, as chairman of the EVN, and also as a concerned researcher in astronomy personally, that the means will continue to be found that will allow Arecibo to retain its prominent position in radio astronomy, and in particular to remain with us as an irreplaceable partner in the EVN.</p>	Against Closure	Email	6/20/2016	Arecibo Observatory 200616.pdf
131	Huib Jan	van Langevelde	<p>Director of the Joint Institute for VLBI ERIC (JIVE) Professor Galactic Radio Astronomy at Leiden University</p>	<p>On behalf of the scientists and technical staff, as well as the international partners who collaborate in JIVE, I write you to express our concerns on the future of the Arecibo Observatory.</p> <p>The Arecibo Radio Telescope plays an indispensable role in Very Long Baseline Interferometry (VLBI) studies as the world's single-most sensitive radio astronomy instrument. Over the past four decades it has provided unique capabilities for a broad range of cutting-edge studies in fundamental and applied disciplines. The users of the JIVE research facility remain very keen to use the Arecibo telescope in their high-resolution observations, for example of interstellar masers, Fast Radio Burst or future gravitational wave events.</p> <p>The recent addition of a 12-m parabolic dish to the suit of instruments of the Arecibo Observatory opens up new perspectives of even more efficient advanced phase-referencing VLBI experiments. Moreover, the imminent commissioning of the large Arecibo-like radio telescope FAST in China probably makes Arecibo's VLBI role even more important: we are looking forward to have both super-sensitive elements in the VLBI array for "relay" observations with unsurpassed sensitivity.</p> <p>We are convinced that with the progress of analogue and digital electronics, the Arecibo telescope will continue to be the prime science tool for most sensitive radio astronomy investigations at least until the Square Kilometre Array (SKA) becomes operational (in mid 2020s) and very likely beyond that. Denying the Arecibo telescope to progress further will have detrimental effect on the development of world radio astronomy, and science in the region specifically.</p> <p>We hope for many more years of exciting collaboration with the Arecibo Observatory staff.</p>	Against Closure	Email	6/20/2016	supportAO.pdf

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Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
132	Yong	Zheng	Columbia	<p>The Accretion of Star Formation Fuel onto a Nearby Spiral Galaxy Y. Zheng, J. E. G. Peek, J. K. Werk, M.E. Putman</p> <p>It remains puzzling how a galaxy can sustain star formation over the age of the universe. The search for the accretion of star formation fuel onto a galaxy has continued in order to construct a clearer picture of galaxy evolution and our project is the first to clearly detect gas accretion toward the disk of the nearby Triangulum Galaxy (M33). We accomplish this by analyzing neutral hydrogen spectra from the Arecibo Galaxy Environment Survey and the Galactic Arecibo L-band Feed Array survey, together with ultraviolet spectra from the Hubble Space Telescope. With the Arecibo spectra as the reference point, we are able to show that there exists a disk-wide ionized gas inflow which can be kinematically modeled as an accreting layer above the galaxy's disk. The data from Arecibo Observatory also provide a critical measurement of the neutral hydrogen content in the accreting layer; based on which we quantify the metal enrichment of the accreting gas. This directly hints that the detected gas inflow is material that has been recycled through previous generations of stars and may be gas that was once inside M33. Our M33 project is among the first to clearly reveal the existence of an ionized gas inflow onto the disk of a galaxy beyond the Milky Way.</p>	Against Closure	Email	6/20/2016	
133	Dr. Marina	Brozovic		<p>I write to strongly urge that NSF choose alternative 1 of its "Notice of Intent to Prepare an EIS . . .", namely "Continued NSF investment for science-focused operations (No-Action Alternative)." As a scientific user of Arecibo Observatory for almost 10 years, I can attest to its unique role in the planetary sciences. Arecibo is the world's most powerful planetary radar and it is 20 times more sensitive than the next best instrument – Goldstone Solar System Radar in Mojave Desert, California. Only Arecibo can obtain ranging measurements of the Galilean satellites of Jupiter (Io, Europa, Ganymede, and Callisto) that are 50 times more precise than the best optical measurements. These precise measurements of the satellites' line-of-sight positions are needed to detect orbital changes due to tidal dissipation within Jupiter or the satellites themselves. Tidal dissipation is one of the few constraints available on Jovian interior models. The tidal responses of the satellites are of particular interest since this is directly related to heat dissipation that causes volcanism on Io and can keep sub-surface oceans from freezing on Europa. We started this observing program in the winters of 2015 and 2016, and we hope to continue in 2022 when Jupiter comes back into the declination window of Arecibo for another 6 years. The long data arc is essential for this study.</p> <p>We used Arecibo to obtain the very first radar images of the satellite Io that is famous for its volcanic activity. The radar images obtained in February of 2015 displayed some tantalizing evidence that the volcanic activity could be detected by this technique. If this gets confirmed in the future Arecibo data, this will be incredibly exciting news for many planetary astronomers. The combination of optical and radar data could provide completely new insights into the solar system volcanism. Arecibo is the only observatory in the world that has a radar capability to conduct this type of research.</p> <p>I could cite several other examples of the role that Arecibo alone can play in my other research (near-Earth asteroids), and many others can and will do so.</p> <p>The telescope is the state-of-the art and one-of-a-kind. Thus, I urge NSF to continue to fund Arecibo.</p> <p>Thank you for reading this letter.</p>	Against Closure	Email	6/21/2016	

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Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
134	Dr. Helen M.	Burt	Executive Assistant to Dr. Helen Burt, Vice President Research & International pro tem Office of the Vice President Research & International The University of British Columbia Old Administration Building 111 – 6328 Memorial Road Vancouver, BC Canada V6T 1Z2 Phone 604 822 0233 Fax 604 822 6295 fred.woo@ubc.ca research.ubc.ca	<p>I am writing to encourage renewed support for the Arecibo Observatory from the National Science Foundation. This telescope is essential to the research program of Dr. Ingrid Stairs, who is a Full Professor at UBC and a Senior Fellow of the Canadian Institute for Advanced Research's Program in Cosmology and Gravity. In her 14 years at UBC, Prof. Stairs has mentored 10 trainees on the use of Arecibo data, seeding the next generation of Canadian and international radio astronomers. Prof. Stairs studies the radio-emitting neutron stars known as pulsars, and has been awarded hundreds of hours of Arecibo time to search for new pulsars and to test the predictions of Einstein's theory of General Relativity. In particular, she is a founding member of the North American Nanohertz Observatory for Gravitational Waves (NANOGrav), which monitors the fastest-spinning pulsars with the aim of making a direct detection of gravitational waves. I understand from Prof. Stairs that NANOGrav will be sensitive to gravitational waves from pairs of supermassive black holes in distant galaxies, making it a perfect complement to the Laser Interferometric Gravitational Wave Observatory (LIGO) experiment which has recently enthralled us all with the identifications of black-hole binaries of tens of solar masses. This is indeed an exciting new field of astronomy, and I am pleased that UBC has an opportunity to play a leading role.</p> <p>I understand that the NSF is preparing an environmental impact statement to aid in deciding the future of Arecibo. Since Arecibo is the most sensitive radio telescope in the world, its loss would be a severe blow to Prof. Stairs' research program and to the NANOGrav collaboration, delaying the anticipated time of detection of gravitational waves and limiting the collaboration's ability to conduct follow-up astrophysical studies. I understand from Prof. Stairs that, while there are potentially suitable alternative telescopes on the horizon, the FAST telescope in China has open questions with regard to its accessibility to worldwide scientists, while the planned Square Kilometre Array in South Africa is years from completion.</p> <p>I therefore urge you to maintain support for the Arecibo Observatory until a telescope with similar sensitivity is available for use by the NANOGrav collaboration. This will ensure a bright future for a research program that has the potential to join LIGO in providing an expanded view of black holes in our universe.</p> <p>I appreciate the investment that the National Science Foundation has made in supporting leading astronomers around the world, such as Dr. Stairs.</p>	Against Closure	Email	6/21/2016	Arecibo Observatory Support Letter.pdf
135	John M.	Cannon	Associate Professor and Chair Department of Physics & Astronomy Macalester College 1600 Grand Avenue Saint Paul, MN 55105 (651) 696-6798 jcannon@macalester.edu	<p>I write to strongly urge that the National Science Foundation chooses alternative #1 of its "Notice of Intent to Prepare an EIS . . .", namely "Continued NSF investment for science-focused operations (No-Action Alternative)."</p> <p>As a scientific user of Arecibo Observatory for over 10 years, I can attest to its continuing importance for studies of galaxies. Its enormous collecting area (the largest in the world) has been and continues to be crucial in studies of faint objects, such as low-mass galaxies. Most importantly, although the facility is over fifty years old, it has undergone two major upgrades, each of which created an essentially new, far more powerful telescope. Consequently it remains in the prime of its scientific life, still able to make important and impactful scientific discoveries.</p> <p>While many radio astronomers (including myself) use multiple-dish interferometers for high angular resolution observations, there remains an important need for large single dish telescopes such as Arecibo. As the ALFALFA blind HI survey (Giovannelli et al. 2005, AJ, 130, 2598) demonstrates, Arecibo has a unique capability to catalog the faintest HI sources at a variety of distances. My own research program at Macalester College leverages this capability in a fundamental way. The faint galaxies discovered by Arecibo are subsequently observed with interferometric instruments to determine physical characteristics such as rotational velocity, neutral gas surface densities, etc. It is important to stress that these types of galaxies can only be discovered by Arecibo; the Sloan Digital Sky Survey and interferometric observations do not provide the same discovery potential.</p> <p>As a demonstration of the power of the synthesis between Arecibo and other observatories, consider that ALFALFA observations conducted with Arecibo have now discovered two of the five most metal-poor galaxies known in the local universe: Leo P (Skillman et al. 2013, AJ, 146, 3) and Leoncino (Hirschauer et al. 2016, ApJ, 822, 108). Given the decades-long quest to discover more of these sources via optical searches, this is especially meaningful. As the best analogues of the metal-poor first galaxies, these local systems offer optimal environments in which to test fundamental parameters of the big bang cosmological model (e.g., the primordial Helium abundance).</p> <p>I can cite more than a dozen peer-reviewed scholarly manuscripts that stem from ALFALFA observations that involve Macalester College undergraduate students. Arecibo plays a critical role in the professional and scientific development of these students. The telescope thus remains a unique, powerful, flexible, and pedagogically central instrument for the 21st century.</p>	Against Closure	Email	6/21/2016	

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Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
136	H. Thankful	Cromartie	PhD Candidate The University of Virginia Dept. of Astronomy	<p>In light of the Environmental Impact Statement being prepared for the Arecibo Observatory (AO), I am writing in adamant support of the no-action alternative; that is, to keep the observatory running normally.</p> <p>During the summer of 2013, I conducted research at AO as an NSF Research Experience for Undergraduates (REU) student. My time in Puerto Rico was pivotal for me both scientifically and personally. As an undergraduate student at the University of North Carolina at Chapel Hill, I had abandoned my passion for journalism to pursue physics and astronomy. Though I had fallen in love with astrophysics, I was exceedingly unsure of my ability to continue in the discipline. I applied for the REU program at Arecibo simultaneously hoping to get a taste of academic science using world-class facilities and wanting to explore whether I felt truly passionate about astrophysics as a career. I left Arecibo in August feeling absolutely transformed — confident in my scientific abilities and sure of my desire to apply to graduate school in astrophysics and continue seriously in the discipline.</p> <p>As a summer student, I used the Arecibo telescope to search for new Millisecond Pulsars (MSPs) in unidentified gamma-ray sources cataloged by the Fermi telescope. I learned how to observe using AO, and how to reduce and analyze data. As a result of my REU research, I discovered a total of 11 new MSPs. The results of my AO discoveries are detailed in a paper, Cromartie et al. 2016 (http://arxiv.org/abs/1601.05343).</p> <p>My time in Puerto Rico was more than scientifically transformative, however. Living at the observatory and interacting with its scientists, engineers, and support staff on a daily basis made me understand what an incredible and vibrant community exists in order to keep the telescope in operation. The group of REU students of which I was part was a diverse group of men and women from both Puerto Rico and mainland US institutions. We all conducted research that excited and inspired us; I know that many of the students in my program have continued in astronomy and atmospheric sciences, and I suspect that our experience at AO is significantly responsible for this. Living with the other students on-site, traveling around the beautiful island as a group and tackling scientific problems together was an experience that I could not imagine having anywhere else. Puerto Rico, and AO especially, is a truly magical place. The REU program was a catalyst for lasting friendships and scientific collaborations (for me, this included meeting my current PhD advisor).</p> <p>AO is an investment the value of which must not be underestimated. Clearly, the telescope is still among the best in the world, especially for pulsar science. With the recent detection of gravitational waves by the LIGO collaboration, a new window into the Universe has been opened. As a graduate student at the University of Virginia, I am working as a member of the North American Nanohertz Observatory for Gravitational Waves (NANOGrav), which absolutely needs AO to stay open in order to continue conducting state-of-the-art research observing MSPs in the effort to detect gravitational waves. AO still has many productive years of science left in its life, and it would be an absolute shame to reduce the capabilities of its world-class facilities. Not only is AO a hotspot for scientific discovery, but it is a beacon for underserved students and those for whom scientific achievement was not accessible. I implore you to consider the children who are awe-inspired by visiting the telescope and museum, the high-schoolers who are given the unique opportunity to use a world-class telescope, and the college students who are given the chance to conduct real, publishable science and who are inspired to pursue a career in STEM fields because of their time at AO. The telescope is a place of multicultural exchange and scientific innovation that is unique among US-run facilities. The closure of AO would be a huge loss to American science, and especially to the thousands of underrepresented students who may never have access to another scientific facility so inspiring as Arecibo.</p>	Against Closure	Email	6/21/2016	Cromarti_Arecibo.pdf

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137	Carl	Heiles	Professor of the Graduate School VOICE PHONE: 510 280 8099 Campbell Hall Astronomy Department University of California Berkeley, CA 94720-3411 FAX: 510 642 3411	<p>I write this letter in response to the Federal Register Notice of an EIS concerning proposed changes to operations at Arecibo Observatory, in particular regarding the alternatives listed therein. I strongly request NSF to choose a combination of alternatives 1 ("Continued NSF investment for science-focused operations"), 2 ("Collaboration with interested parties for continued science-focused operations"), and 3 ("Collaboration with interested parties for transition to education-focused operations"). AO is a unique institution that already makes great contributions in these three areas and has tremendous potential to do even better—if only it were imaginatively and properly organized, managed, and funded. The Arecibo Observatory is a premier facility that serves public education and STEM activities; a worldwide icon representing "can-do" science and big-project engineering that stimulates intense worldwide fascination; and a high-level, forefront research instrument. As such, it ideally serves NSF's dual missions of research and education.</p> <p>Ever since AST/NSF formed the Senior Review Committee more than a decade ago, it has focussed exclusively on the research aspect. This is myopic vision at its worst, because Arecibo's research areas involve forefront mature science, which is not so "exciting" as the fashionable newest game in town, whatever it happens to be this year. Concentrating on the current short-term excitement at the expense of long-term detailed understanding makes it easy for NSF to bring Arecibo down—literally. NSF has steered grad students away from topics in which Arecibo excels; has tightened Arecibo's budget to eliminate its ability to maintain its widespread technological leadership; and selected the obviously unpromising triumvirate managing organization—SRI, USRA, and UMet—whose combination of incompetence, disinterest, marginal or unwilling technical ability, poor intercommunication, and—let's face it—budget-sapping maximization of internal overhead transfer has been very unhelpful. All this has turned Arecibo's focus from forefront technological innovation to just limping along, which makes it an easy target for NSF's axe.</p> <p>If you want to talk about environmental impact, here's what the impact will be when AST/NSF finally realizes its dream of ripping down the telescope and turning it back into rainforest and agricultural land: (1) Elimination of a major worldwide stimulant of young people's interest in pursuing science and engineering education and careers; (2) Elimination of a major source of public education, particularly in the Caribbean basin; (3) Elimination of a major piece of scientific infrastructure that enables inquiry-based unique research in several areas. I'm sure that NSF high-level bureaucrats will be rewarded and self-satisfied for their achievement of eliminating "old, outdated" facilities—while the world watches and counts yet another example of the United States' decline from its past worldwide leadership in science, technology, and related education.</p> <p>As a research facility, Arecibo serves three scientific areas: radio astronomy, planetary and near-earth-object radar, and aeronomy (both radar and lidar). My own research area is radio astronomy in aspects ranging from the study of Mira variable stars to the Galactic interstellar medium. In these topics I have worked closely with dozens of graduate students, postdocs, and career scientists in both the academic and the broader research world. This includes people from the US, Europe, Australia, China, South America, and India. As Arecibo users, they get turned-on by not only the technical excellence, but also the grandeur of what is probably the most widely-recognized iconic scientific facility in the world.</p>	Against Closure	Email	6/21/2016	envltr_21jun2016.pdf

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138	Fredrick	Jenet	<p>The ARCC Network Executive Team: Fronefield Crawford, Franklin and Marshall College Timothy Dolch, Hillsdale College Robert Ferdman, University of East Anglia (UK) Alma Guerrero-Miller, University of Texas-Rio Grande Valley Fredrick Jenet, ARCCNET Chair, University of Texas-Rio Grande Valley Volker Quetschke, University of Texas-Rio Grande Valley Xavier Siemens, University of Wisconsin-Milwaukee Tristan Smith, Swarthmore College Kevin Stovall, University of New Mexico Leslie Wade, Kenyon College Madeline Wade, Kenyon College</p>	<p>We are writing this letter in support of the continued operation of the Arecibo Observatory, an instrument that continues to impact the scientific community not only by delivering world class scientific results, but also by its unique ability to inspire students, especially underrepresented minority students, to pursue careers in STEM fields. The Arecibo Remote Command Center (ARCC) program, developed in South Texas at what is now known as the University of Texas Rio Grande Valley, is a highly successful integrated research/education environment that, at its heart, utilizes the unique nature of the Arecibo Radio Telescope to attract, train, and retain students in physics, computer science, engineering, and related fields (see paper attached from the proceedings of AO's 50th anniversary). The model was so successful that it has now expanded to several other colleges and universities throughout the United States. This collaboration, known as the ARCC Network, now includes the University of Wisconsin--Milwaukee, Franklin & Marshall College, Hillsdale College, Swarthmore College, and Kenyon College. Over the last eight years, 14 ARCC students have gone into PhD programs. This includes 7 underrepresented minority students in the last five years. In that same time, hundreds of high school and undergraduate students have been able to use the telescope to search for exotic stars known as radio pulsars. More than 60 new pulsars have been found to date by ARCC students. Now, we are ramping up efforts for ARCC students to be involved not only in the pulsar search efforts, but in the follow-up timing efforts as well.</p> <p>The existence of the Arecibo Observatory made it possible for the ARCC program to be created and impact the lives of so many people. Given the observatory's unique capabilities together with its "lets do it now!" management style that fosters creativity, no other observatory would be able play the same role.</p>	Against Closure	Email	6/21/2016	ARCCPaper_v2.pdf

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139	David	Nice	Associate Professor Physics Department, Lafayette College niced@lafayette.edu +1-610-330-5204 http://sites.lafayette.edu/niced	<p>I wish to strongly encourage you to pursue with all vigor any option which maintains the continued scientific operation of the Arecibo Observatory.</p> <p>The scientific capabilities of the telescope are unmatched by any other observatory in the world. Although the basic telescope structure is several decades old, the surface, optics, receiver systems, and data acquisition systems have all undergone upgrades, and it is only since 2012 that the full receiver bandwidth of the telescope has been usable for core science operations – in other words, this can realistically be thought of as a telescope that is only 4 years old! (Technically this refers to the combination of Gregorian optics, L-wide receiver, and “PUPPI” data acquisition instrument, which roughly tripled the sensitivity of the telescope for many pulsar observations.) This ongoing development seems not to have been understood or appreciated by past telescope review committees. Further upgrades are planned to keep the receiving equipment at the cutting edge.</p> <p>The telescope holds a very promising future formany areas of studies, including highprecision millisecond pulsar timing. Work at Arecibo in this field has already yielded the first indirect evidence of gravitational waves (1993 Nobel Prize in Physics to Russell Hulse and Joseph Taylor), the first discovery of planets outside our solar system (Alex Wolszczan), and many other exciting discoveries. We have every expectation that pulsar studies at Arecibo will directly detect gravitational waves within the next few years. This discovery will be highly complementary to the recent direct detection of gravitational waves by the Laser Interferometer Gravitational Observatory (LIGO); the pulsar work done at Arecibo probes an entirely different part of the gravitational wave spectrum – waves with periods of years, instead of periods of milliseconds as at LIGO.</p> <p>Arecibo Observatory is uniquely powerful in its ability to measure and characterize near-Earth asteroids using its radar system. The environmental impact of such asteroids on Earth could be truly catastrophic, and continued work in this area is absolutely crucial. The educational mission of the Observatory is critical for several reasons. As the most prominent scientific research facility on the island, it contributes greatly to the education of Puerto Rican students, a large fraction of whom visit the telescope. The socioeconomic impact of the telescope on Puerto Rican students cannot be overestimated. The Observatory is an exciting and inspiring place for physics and astronomy students at all levels – from high school through postdoctoral scholars – to visit. Unlike most observatories, observers get real “hands on” experience observing at Arecibo, rather than having observations made by professional telescope operators. Further, because of the nature of the data products collected at the observatory, many such students receive extensive education in computer programming, algorithm development, data analysis methods, and electronics, which they simply would not get were it not for this facility. This is a critical socioeconomic impact, affecting dozens or even hundreds of students a year.</p> <p>The Observatory also plays a prominent tourism role in Puerto Rico, a source of further socioeconomic impact.</p> <p>Radio telescopes are being developed elsewhere around the globe—most notably in China and South Africa—which may eventually meet or surpass the Arecibo telescope’s capability. However, it will be many years before any of these telescopes are in full operation and proven to be capable competition to the Arecibo telescope. Further, all are likely to have severely restricted access for astronomers from the United States (no “open skies” policies), and surely none will match the educational impact of the Arecibo telescope.</p> <p>For all these reasons, I urge that the scientific operation of the Arecibo Observatory not be curtailed.</p>	Against Closure	Email	6/21/2016	aecibo_eis.pdf

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
140	José Humberto Andrade	Sobral	PhD Cornell University, 1973	<p>I am writing this letter as a former user and presently a scientific collaborator to the Arecibo Observatory-AO and also as a member of the "Arecibo Science Advocacy Partnership-ASAP".</p> <p>I visited the Arecibo Observatory-AO, for the first time, for a stay of approximately one month in June 1970 as a PhD student of the department of Electrical Engineering-EE of Cornell University, under the academic orientation of EE Professor D. T. Farley. My major PhD field of study was "Electrophysics", as it was called at that time, and my major research activity focused on the study of the ionosphere/thermosphere dynamics. Then I came back again to the AO, still as a Cornell PhD student, to the Arecibo Observatory for a longer stay, namely, from mid-1971 to February 1973, to carry out the ionospheric experiments necessary to my thesis.</p> <p>At that time in the early 1970 decade I was lucky enough to be a contemporary at the AO of some of the present ASAP and ASAP/Board members.</p> <p>In a later time, I performed a series of ionospheric experiments at the Arecibo Observatory in 1986, with a Grant from the National Science Foundation and local support from the AO and the Puerto Rico University/ Colegio Universitario de Humacao. This experimental campaign rendered to my former Puerto Rican junior research assistant Sixto Gonzalez, then an undergraduate student at the Colegio Universitario de Humacao –CUH, located at Humacao city, Puerto Rico inland, the first place prize in the United States/NSF sponsored MARC (Minority Access for Research Careers) science contest for undergraduate students in field of study in Physics. At that time I was a Professor at the Physics Department of the CUH and also I got a prize of US\$ 2,500 from the University of Puerto Rico – UPR in recognition of that student orientation and research carried out at the AO. A few years later Sixto became a scientist at the AO and the local Director.</p> <p>In addition, in the present time, two other staff scientists at the AO that have been my graduate students.</p> <p>Perhaps I should mention also that I have been kindly invited by AO staff members to the ceremonies of celebration of the 40th and 50th anniversary of the AO. I was present at both events.</p> <p>Therefore, my scientific involvement with the AO has been clear in the last 46 years.</p> <p>At present, I have plans to continue doing research at the AO in a collaborative scientific effort in the field of study of Space Weather focusing on the ionosphere-thermosphere-magnetosphere system with the collaboration of the Brazilian Institute for Space Research – INPE and possibly with other Peruvian or Argentinean Aeronomic observatories. Such effort will comprise AO Senior Researchers and both Latin American and US students, including the Puerto Rican university Universidad Metropolitana de Puerto Rico.</p> <p>I may mention that in the last few decades, I visited the AO very frequently and in the last decade I visited at least once a year for scientific/academic purposes.</p>	Against Closure	Email	6/21/2016	
141	David J.	Thompson	Fermi Large Area Telescope Multiwavelength Coordinator	<p>Since its launch in 2008, the Fermi Gamma-ray Space Telescope has actively pursued multiwavelength studies with a wide variety of telescopes, because we learn so much more about the Universe by looking at cosmic objects in a variety of ways. Surprisingly, gamma rays, the most energetic form of light, and radio waves, the least energetic form, are frequently produced in the same extreme astrophysical environments. The combination of radio and gamma-ray observations reveal where and how powerful energy releases take place throughout the Universe.</p> <p>As a specific example, the unique capabilities of the Arecibo Radio Observatory have been crucial in our cooperative studies of pulsars, the rapidly rotating neutron stars representing endpoints of stellar evolution. The overwhelming majority of gamma-ray "stars" in the Milky Way are pulsars – understanding the high-energy nature of our home galaxy is hopeless if we do not first master the pulsars. Unidentified Fermi gamma-ray sources have become prime targets for radio pulsar searches, revealing many new black widow/redback pulsars, a 'missing link' in the evolution of millisecond pulsars. We have also found a new pulsar with radio, gamma-ray, and optical emission, and millisecond pulsars stable enough to be valuable additions to pulsar timing array searches for nanoHertz gravitational waves. Many of these discoveries were only possible with the extreme sensitivity of Arecibo.</p> <p>The Fermi observatory will continue operations for several more years, making use of the improved performance introduced last year, but it does have a finite lifetime. We look forward to continuing the ongoing cooperative projects with Arecibo, convinced that important scientific discoveries involving the synergy between Fermi and Arecibo will be made. Retaining the scientific capabilities of Arecibo is clearly essential to this process.</p>	Against Closure	Email	6/21/2016	AreciboLetter_final.pdf

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Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
142	Dr. Mark	Walker	Director Manly Astrophysics 3 / 22 Cliff St, Manly 2095, Australia www.manlyastrophysics .org	<p>As a scientific user of the Arecibo Observatory I ask that NSF choose alternative 1 of its "Notice of Intent to Prepare an EIS ...", namely "Continued NSF investment for science-focused operations (No-Action Alternative)."</p> <p>Much of my own research is outside the field of radio astronomy, but I have been an occasional user of Arecibo, and the other nationally-funded U.S. radio telescopes (VLA, VLBA, GBT). In each instance where radio data are important to one of my own projects, the scientific needs dictate the appropriate telescope to use, and in several instances that is Arecibo: it is in some respects simply the best telescope in the world.</p> <p>My understanding is that the EIS is not concerned with science per se. However, I think you cannot ignore the socio-economic consequences of the various possible alternative futures for the observatory, and there the scientific vitality of the observatory is crucial - any sort of downgrade would be detrimental. Although I haven't visited Arecibo Observatory myself, from the Australian counterparts (Parkes and Narrabri) I'm familiar with the impact that a world-class radio observatory has on its surroundings. Locally it imbues the community with a sense of pride, and provides pathways to employment at the state-of-the-art in various science and engineering disciplines. In the society more broadly it inspires people - it is a focus of technological achievement for the host community, who feel, in a way, that the telescope is theirs.</p> <p>If you were to downgrade the observatory in some way, then my guess is that the effect on the local community would be quite serious. No longer could there be pride in their world-class "temple of science", and there is a danger that they would be led to the idea that science and technology is not what they're good at.</p> <p>I do hope that NSF can maintain Arecibo as a world-class research facility.</p>	Against Closure	Email	6/21/2016	
143	Douglas	Arenberg	University of Michigan	Please do NOT allow this important scientific and National Security (asteroids anyone) resource to fall victim to misguided and ill-informed attempts at "saving" money.	Against Closure	Website	6/22/2016	
144	Daniel	Balch		<p>I am writing to urge the NSF to choose alternative 1 of its "Notice of Intent (NOI) to Prepare an Environmental Impact Statement and Initiate Section 106 Consultation for Proposed Changes to Arecibo Observatory Operations, Arecibo, Puerto Rico and Notice of Public Scoping Meetings and Comment Period," namely "Continued NSF investment for science-focused operations (No-Action Alternative)."</p> <p>I visited Arecibo Observatory this past January as part of a study abroad program led by Dr. Qihou Zhou, when I was an engineering undergraduate at Miami University of Ohio.</p> <p>During my time at Arecibo, I was very impressed by the facility and various types of research taking place there. With my classmates and Dr. Zhou, I toured the dish itself, the control room, the learning center, and a few other locations. I had the opportunity to hear a scientist and former coworker of Dr. Zhou deliver a 20-25 minute talk on how the radio telescope and radar are used, along with some technical details on how signals are processed and data is analyzed at the control room. I also attended a few lectures on how incoherent scatter radar works and its use for studying the ionosphere, with some specific information pertaining to Arecibo. Lastly, I participated in a project to analyze data that was collected at Arecibo while we were there. Based on the technical details I learned about Arecibo and the research taking place there, I am convinced that Arecibo Observatory is among the most valuable assets in the world for radio astronomy and the study of the ionosphere, and firmly support alternative 1 to continue funding for science-focused operations and avoid any fundamental changes to the nature of operations at Arecibo Observatory.</p>	Against Closure	Email	6/22/2016	
145	Keith	Boehler	ARCC	I am a Physics student who works with professors in Astrophysics. To me this observatory is more than a source of inspiration and material for dreams; it gives me a way to put my skills to the test while in school. It would be as if taking a class about riding a bicycle purely out of a textbook, but never actually riding one until I graduate. Many of my peers who do research with Arecibo will not remain in academia in order to pursue careers in industry. The skills we will learn are more than a ribbon to distinguish ourselves; they will be the material for the prestige of the nation. With this I ask that Arecibo be given another chance.	Against Closure	Website	6/22/2016	

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
146	Casey	Brinkman-Traverse		<p>I write this letter in anticipation of the NSF's upcoming Environmental Impact Survey regarding Arecibo Observatory. The Observatory is beloved by radio astronomers and science enthusiasts alike, but its importance stretches beyond science and intersects with social and economic plights, and the safety of our species. I urge the committee to consider all of these factors when determining the value and impact of this great Observatory.</p> <p>The United States government has been abusing and taking advantage of Puerto Rico to the extent where the Island cannot afford necessities like electricity in hospitals. To close Arecibo's doors would deny Puerto Rico of the revenue generated from those traveling to the Observatory, and the relative fame that the observatory brings. More importantly than this, it would deprive the Island of a world-class educational resource. Arecibo provides an opportunity for more Latino/a people to receive STEM education: education that could allow them to rise above impoverished conditions and begin to help their island. Without Arecibo Observatory, one of the last great resources will be taken away from Puerto Rico at a time when they need it most.</p> <p>The destruction of Arecibo will have many environmental impacts, some more obvious than others. Beyond the immediate impacts on the local forests and wildlife, the Observatory plays a large role in atmospheric science and asteroid monitoring. Atmospheric science is vital to the health of our planet, and will only become more critical in the coming years and decades as our climate continues to change. Additionally, asteroid monitoring has the potential to save our planet from a disastrous ending. The Island of Puerto Rico and the world as a whole would be much safer with Arecibo Observatory.</p> <p>I understand that the NSF lacks the means to fund every valuable project and that compromise must be made somewhere, but the decision to defund Arecibo would be shortsighted. It may save the NSF money today, but this gain is far overshadowed by the lasting devastation that it will have on the astronomy community, the people of Puerto Rico, and the island itself. The Observatory is not in a position to be temporarily defunded, and picked back up once we have the money to do so. I implore the NSF to invest in the future of radio astronomy and atmospheric science, so that the next generation of scientists can continue Arecibo's legacy. I promise, as a young astrophysicist, that the possibilities afforded by keeping Arecibo open and funded will be well worth it.</p> <p>Scientific progress represents the best of humanity: the pure curiosity to know the world from which we developed, and then the desire to use that knowledge to help fellow humans, animals, and the planet. If we as a nation and a planet wish to continue pushing toward a future bright with possibilities, toward the future scientists and humanitarians alike have envisioned, we need to invest in the scientific equipment to get us there.</p>	Against Closure	Email	6/22/2016	
147	Carlos	Dorta-Quinones	Senior Engineer, Cavium Networks Cambridge, MA cid2@cornell.edu 787-356-6192	<p>I am writing to urge the NSF to maintain the current arrangement for the Arecibo Observatory in Puerto Rico. As a native of Arecibo, the observatory was instrumental in my learning experience as a child. Not only did it peak my interest in science but it also introduced me to a vibrant international community that inspired me to pursue higher education in the United States. In particular, one of my high school teachers who was affiliated with the observatory encouraged me to apply to MIT, an opportunity I never would have been aware of otherwise. The advice I received from that mentor changed the course of my life. I went on to obtain a bachelor's degree from MIT followed by a doctoral degree from Cornell University.</p> <p>Having an institution like the observatory is especially critical during the challenging economic crisis that Puerto Rico is currently facing. Brain drain is rampant on the island, and the observatory offers an opportunity to keep and attract new talent that can make an important contribution to the scientific community.</p> <p>The observatory has made a significant difference in the lives of many Puerto Ricans such as myself, and it is a point of great pride for the island. It would be tragic to lose this valuable asset, and I strongly encourage the NSF to maintain the existing arrangement to continue the legacy that the observatory has established. Thank you for your consideration.</p>	Against Closure	Email	6/22/2016	
148	Dale C.	Ferguson	Lead for Spacecraft Charging Science and Technology Air Force Research Laboratory Kirtland Air Force Base, New Mexico 87117	<p>In my opinion, the US Air Force has a strong need to know the ionospheric environment, for GPS propagation and other purposes (over the horizon radar for example), and should be kept in mind when divestment of Arecibo is being considered. As far as the local environment is concerned, Air Force regulations will enforce its protection.</p>	Against Closure	Email	6/22/2016	

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Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
149	Manuel J.	Fernos		<p>I am writing to strongly underscore the importance of the Arecibo Observatory to Puerto Rico and in particular to Inter American University of Puerto Rico.</p> <p>Arecibo Observatory is a strong contributor to the STEM education in Puerto Rico. Each year 20,000 school children visit the Observatory. The Arecibo Observatory Visitor Center introduces students to a broad range of science and engineering topics, far beyond what they are exposed to in school, and motivates many to consider continuing on to higher education, including education in Inter American University's science and engineering programs. In addition, the Arecibo Observatory Space Academy offers a summer camp and programs in pre-college research for students, and teacher training workshops for high school teachers. These programs are highly inspirational to participants, and contribute significantly to the participation of Puerto Ricans in STEM fields. No other national laboratory or observatory does more for underprivileged students.</p> <p>More broadly we support the increased integration of Observatory activities into our island economy and educational system. We support the development of new initiatives such as sharing of seminars and lectures between Arecibo Observatory and Inter American and other local universities via live webinars; expanded collaborative student and faculty internship programs; and cooperation between Inter American University, Arecibo Observatory, and island electronics and aerospace industries, the latter which has recently been experiencing exponential growth.</p> <p>Within the Inter American School of Engineering we have two major projects leveraging atmospheric science research at the Observatory. Inter American University's Bayamon campus is the lead institution on the Puerto Rico CubeSat project, whose major sponsors are the Puerto Rico Industrial Development Corporation (PRIDCO) and Puerto Rico Space Grant. The Puerto Rico CubeSat will carry an ion density instrument from NASA Marshall Space Flight Center, and a high-frequency radio instrument from Malardalen University in Sweden. These instruments are intended to collaborate with and complement the capabilities of the Arecibo Observatory 430-MHz atmospheric radar and the new Arecibo Observatory high-frequency radio transmitter.</p> <p>In addition, Inter American University is in the midst of a project to install a high-frequency radio array on the Inter American Aguadilla campus in northwest Puerto Rico. This array will produce the first images ever made of the radio emissions from the ionosphere which are stimulated during the types of experiments made possible by the new Arecibo high-frequency transmitter. The array will also produce the first wide-field bistatic radar images of the ionosphere over Arecibo Observatory, complementing the capabilities of the atmospheric radar and of other Observatory instruments including optical images and the Observatory laser radar (lidar).</p> <p>Through their collaborative use of multiple detectors, the Puerto Rico CubeSat and the Inter American radio array implement a multimessenger approach to atmospheric research, echoing the multimessenger approach to astronomical research which you highlighted on May 6 as one of nine big ideas for NSF. Both projects promise to contribute to breakthroughs in our understanding of processes related to space weather and its effects on space-based communications and navigation and human space travel. And, very importantly, both projects emphasize student participation in related research and development.</p> <p>The unmatched sensitivity of the Arecibo Observatory atmospheric radar allows breakthrough research not possible at other observatories. One of our engineering faculty, Professor Brett Isham, has told me how the most recent upgrades to the radar electronics allow stunning observations of ionospheric ion and electron waves over their entire frequency ranges, throughout the day and night, and over a previously unimagined 1000 kilometers in altitude. According to Professor Isham, these recent observations echo the excitement of the initial groundbreaking measurements made by the Arecibo radar after its inauguration in 1963. These new capabilities promise to lead to new as-yet-uncontemplated discoveries.</p> <p>I ask you to support continued operation of the Arecibo Observatory as a critical contributor to education and research in Puerto Rico. Inter American University, as always, stands ready to collaborate and participate.</p>	Against Closure	Email	6/22/2016	201606211545.pdf
150	Mary	Fillmore		<p>I understand that you are considering the possibility of "mothballing" or even dismantling the renowned Arecibo Observatory in Puerto Rico. As someone who has visited the Observatory several times, I wonder how much you have considered the importance of the cultural resource it represents – to the people of Puerto Rico in particular, to US citizens more broadly, and to the world. Astronomy is not confined to any one nationality. It is a global endeavor. The U.S. has been a leader in all kinds of astronomy virtually from colonial times. Why would we consider shutting down ("temporarily" or permanently) the world's largest and most sensitive radio telescope, which scientists around the world use as an essential part of their work? I question whether you have really inventoried the range of invaluable discoveries to which Arecibo has been critical, much less its potential for the future. These are cultural resources not only to us in the US, but to all of humanity. If the US wishes to maintain our status as a world leader in science, why would we consider giving up a major resource which is significant worldwide?</p> <p>Even if the Observatory were not of cultural value just on the basis of its past and future contributions to science, it is a landmark which every Puerto Rican I have ever spoken with recognizes and speaks of with pride. Every time I have been at the Observatory, school groups have been going through. Even a Puerto Rican taxi cab driver in New York has heard of it. On that island which is so beleaguered by financial problems at this time, having a world class Observatory to which Puerto Ricans can point with pride is of inestimable value.</p> <p>I hope you will put the same energy and ingenuity that built the Observatory into maintaining its cultural and scientific value for the future.</p>	Against Closure	Email	6/22/2016	

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151	Dr. Nectaria A. B.	Gizani	Ph.D Radioastronomy, Jodrell Bank Observatory, Univ. of Manchester Assistant Professor Coordinator & Tutor of MSc Modules Hellenic Open University, School of Science & Technology, Parodos Aristotelous 18, Building 'E' Office No 103 26335 Patra Greece tel: +30-2610-367521 mobile: +30- 6972709435 Physics Labs: +30-2610- 367537 fax no: +30-2610- 367528 email: ngizani@eap.gr web: http://ngizani.weebly.c om/index.html and <a href="http://www.eap.gr/vie
w.php?artid=1292">http://www.eap.gr/vie w.php?artid=1292	<p>I am very sad to hear that Arecibo yet again, like other major old radio telescopes (e.g. Lovell, UK) has to prove how much it contributes to present science. I hope that whom ever takes financial decisions and is not a scientist really listens to what the scientific community has to say about Arecibo.</p> <p>We have observed Hercules A with EVN + Arecibo recently (2014, project EG072) at 6 and 18 cm for 12 hours, in order to detect the weak core of the powerful radio galaxy, and register the jet position for a reliable spectral index image. The central engine of this radio galaxy is very weak and previous EVN observations confirmed that, although the phase reference technique did not work back in 2002. So this time, we have re-observed the AGN with an improved EVN, but also using Arecibo to take advantage of its great sensitivity as we needed our observations to have high sensitivity. The paper of these observations should be published by the end of this year.</p> <p>Please keep Arecibo up and running</p>	Against Closure	Email	6/22/2016	
152	Timothy H.	Hankins	Emeritus Professor of Physics, New Mexico Tech	<p>I write this letter is in response to the Federal Register Notice of an EIS evaluating potential environmental effects of proposed changes to operations at Arecibo Observatory (AO). I strongly advocate that NSF choose alternative 1 of its "Notice of Intent to Prepare an EIS . . .", namely "Continued NSF investment for science-focused operations (No-Action Alternative)."</p> <p>In 1970 I was one of the first external users of the Arecibo Observatory soon after its support was transferred to the National Science Foundation. I have continued to use the Observatory throughout my career and far into my formal retirement. I have served on its scientific staff twice and once as the Site Director.</p> <p>Throughout my career I have had the opportunity to use all of the other major radio telescopes in the world. These observations have been successful, but none so productive as my work at the Arecibo Telescope. I attribute this success to the welcome attitude for trying new techniques there. Other installations have their specialties, but they lack the flexibility and supportive attitude that I have always enjoyed at the Arecibo Observatory. My point here is that the loss of the Arecibo Telescope would mean a loss of a vital capability in science — the versatility and adaptability of the largest and most sensitive radio telescope in the world.</p> <p>There are many other arguments to support the continued funding of the Arecibo Observatory — educational, economic, cultural, environmental, etc. — which I leave to others to make. The Arecibo Telescope now works better than it ever has, it is the most sensitive, and supports the most diverse arenas of science. I strongly urge the National Science Foundation to support the Observatory at a level at which it can thrive, rather than starve.</p>	Against Closure	Email	6/22/2016	

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153	Martha P.	Haynes	Goldwin Smith Professor of Astronomy 530 Space Sciences Building Cornell University Ithaca, NY 14853 USA	<p>I write in response to the Federal Register Notice of an EIS evaluating potential environmental effects of proposed changes to operations at the Arecibo Observatory (AO) in Puerto Rico.</p> <p>I strongly support Alternative #1 given in NSF's "Notice of Intent to Prepare an EIS . . .", namely "Continued NSF investment for science-focused operations (No-Action Alternative)."</p> <p>I am both a scientific user of the Arecibo Observatory and an educator who regularly and continuously incorporates use of the Observatory facilities into the education and training of both undergraduate and graduate students at my home institution as well as others. I also frequently showcase the Arecibo Observatory in public talks and events addressing a wide spectrum of audiences and venues.</p> <p>My own personal introduction to professional scientific research came when I spent a summer as a research student assistant at the Observatory. The experience of being present at the Observatory inspired me scientifically and also introduced me to the many challenges and thrills of observatory operations. A student (like myself) can learn many things in a classroom, but there is so much more to being a scientific researcher, especially one who knows how to design, construct, commission and operate facilities and instruments. The hands-on training that I received during that first short summer experience, before I entered graduate school, hooked me on a scientific career that melds together instrument/software/technique development with the achievement of forefront scientific goals. Exposure to such training and experience at an early career stage is both motivating and beneficial to insure a continued population of students with research skills that are not likely to be honed in a classroom.</p> <p>Throughout my career, access to Arecibo has played a fundamental role in my own studies of the gas content of galaxies and its evolution over the history of the universe and in the use of the 21 centimeter line from neutral hydrogen for cosmological studies. Beyond my own personal gain, observational data acquired with the Arecibo telescope has served as the basis for the research of the 20 graduate students (13 women) whom I have supervised plus more than 50 undergraduate students who have worked for me on independent research projects. This kind of research on gas in galaxies and nearby universe cosmology is uniquely dependent on the physical size (collecting area) of the Arecibo telescope and the advanced state of its instrumentation and computational systems. Because of my familiarity with the telescope and the intrinsic straightforward data path offered by a single dish radio telescope, I am able to give students AT ALL LEVELS exposure to how the telescope works and how radio astronomical data is gathered and processed. I work very closely with a group of faculty and students at principally undergraduate teaching colleges across the U.S. and Puerto Rico to engage their undergraduate students in research using Arecibo. During the last few years, the observations that I need to conduct for my research have been performed either by undergraduates at my own institution or by faculty and undergraduate students at these collaborating institutions. I know that this experience has been transformational for many of these faculty and students in enabling them to conduct scientific research and in motivating the students to further their education especially in STEM fields.</p> <p>As part of my educational mission, during the last two weeks, I have given lectures to two separate groups of undergraduate students on career options and outcomes for students receiving bachelor's degrees in physics/astronomy and related fields. I use as an example of the huge variety of career options the operation of an observatory like Arecibo. It has scientific users, but it also employs scientific managers/designed/engineers, people who understand the scientific aims and drivers but also have an interest and the background to deal with issues associated with the telescope location, legal aspects, contracts and purchasing, engineering requirements, technology developments, data acquisition, transmission and processing, observing strategies and so many others. These talks have reminded me just how critical to my own career my experiences at Arecibo over the last 40 years have been: as a summer research assistant, conducting my PhD research, as a postdoctoral research associate and as a professional research astronomer as I rose through the faculty ranks. Conveying this message, that there is more to learn and more to do, beyond the traditional walls of academia is a critical message to encourage more students from the broadest possible backgrounds to study STEM curricula to be ready to enter employment in a wide range of sectors, crossing academia, industry, the federal agencies, management consulting, journalism and communication and many others. Many students want to pursue careers in research and need to hear from senior faculty like me that research really remains exciting over a 40-year career. Many other students are not so sure of their direction. Our nation needs them to hear that there are other possible paths that an education in STEM fields will make open to them.</p> <p>Arecibo's location in the interior of Puerto Rico offers obvious advantages to students on the island. In fact, just a month ago, students and a faculty member from the University of Puerto Rico, part of our collaborative research team, conducted our observations at the Observatory. Visiting and spending time in Puerto Rico has been an enormously valuable culture experience to students visiting on the mainland. Friends are made, experiences are exchanged, creating long-lasting connections. Again, Arecibo provides the experiential learning that cannot be gained in a classroom.</p> <p>Wherever I travel, everyone -- scientists and laypeople alike -- know of the Arecibo Observatory. It is a unique facility for scientific research and perhaps even moreso for the education and hands-on training of future generations of scientists, engineers and software developers and scientifically-rooted lawyers, managers, journalists, consultants and perhaps, politicians. Such a platform for knowledge gathering, inspiration and education would be a terrible thing to lose.</p>	Against Closure	Email	6/22/2016	

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154	Dr. Jason W.T.	Hessels	Associate Scientist - ASTRON, Netherlands Institute for Radio Astronomy Associate Professor (Universitair Hoofddocent) - University of Amsterdam Mobile Tel: +31 (0)610260062	<p>This letter is in response to the Federal Register Notice of an EIS evaluating the potential environmental effects of proposed changes to operations at the Arecibo Observatory. I strongly request NSF to choose Alternative 1 of its "Notice of Intent to Prepare an EIS...", namely "Continued NSF investment for science-focused operations (No-Action Alternative)." In fact, I strongly believe that NSF should research an option in which funding to Arecibo is increased, as I detail below.</p> <p>As background, I have been an active scientific user of the Arecibo telescope for the last 15 years, and have visited the observatory many times.</p> <p>Arecibo is a unique and world-famous scientific facility, as well as a cultural icon and powerful educational tool. In the last half century, it has inspired hundreds of thousands of visitors and delivered jaw-dropping scientific results beyond the reach of any other telescope on Earth. While Arecibo has an illustrious history of Nobel-prize-winning scientific discoveries, it also remains to this day on the cutting edge of astronomy, atmospheric and space science - with a huge potential for the future. Arecibo is a cultural icon in Puerto Rico, and an amazing tool for local STEM education, which is a vital part of improving the socio-economic situation on the island. In short, the Arecibo telescope is a sterling example of what humanity can achieve through the power of our minds and imagination. Mothballing or closing the facility would have a disastrous impact on the local economy, ongoing educational programs, and would waste the scientific potential of the instrument moving forward.</p> <p>Tens of thousands of school children visit Arecibo every year, and the telescope represents a rare opportunity for Puertorican students to come into contact with a cutting-edge scientific instrument. Keeping Arecibo funded as a purely educational facility or "landmark to visit" does not make sense in my mind. The power of the facility to inspire and educate - in a way that cannot be done in a classroom - stems from the fact that there is ground-breaking research being done at the telescope. The sense that "this is where things are happening and discoveries are being made" is electrifying for students and motivates them in a way no textbook or classroom lecture can. I find this critical, because I strongly believe that improving the quality of education, challenging young students to think critically, and fostering their innate curiosity can go a very long way to building a better society. Puerto Rico has suffered many socio-economic setbacks in recent years; education is a key ingredient to building a more positive future.</p> <p>At the same time, Arecibo continues to deliver world-class science. To give one example from my own research: the discovery of the first repeating Fast Radio Burst source, which our team recently published in the journal Nature (Spitler et al. 2016, Nature, 531, 202). This discovery was only possible using Arecibo's unparalleled sensitivity and its multi-pixel receiver system; it represents a major step forward in the field, and Arecibo will continue to play a leading role in deciphering the mystery of this phenomenon, which is currently one of the hottest topics in astronomy.</p>	Against Closure	Email	6/22/2016	
155	Dr. Jason W.T.	Hessels	Associate Scientist - ASTRON, Netherlands Institute for Radio Astronomy Associate Professor (Universitair Hoofddocent) - University of Amsterdam Mobile Tel: +31 (0)610260062	<p>In summary, Arecibo is priceless and the short-term savings that could be made through closure are greatly outweighed by the long-term cultural, educational and socio-economic impact for Puerto Rico. The telescope is also Puerto Rico's scientific calling card, and options should be investigated to see how Puertorican universities and Arecibo can form a center for excellence in education on the island. This proposed institution has been discussed elsewhere as the Puerto Rican Institute for Advanced Studies (PRIAS). It would greatly leverage the already firm impact that Arecibo has made across many communities.</p>	Alternative Consideration	Email	6/22/2016	
156	David	Jacob		<p>I write to urge that NSF choose alternative 1 of its "Notice of Intent to Prepare an EIS . . . , namely "Continued NSF investment for science-focused operations (No-Action Alternative)."</p> <p>I had the opportunity to travel to Arecibo Observatory and study for a brief time as a college student at Miami University. This allowed me to study our natural world and improve as a researcher and scientist. The information about Radar technology was fantastic and I look back on this formative experience as one of the most important in my educational development. In addition, I believe that Arecibo is important to the local economy and the shutdown will have a major negative impact on Puerto Rico especially with the current issues the island faces.</p>	Against Closure	Email	6/22/2016	

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
157	Dr. Rebecca A.	Koopman	Professor and Chair Department of Physics and Astronomy Union College Schenectady, NY 12308 (518) 388-6786 Email: koopmanr@union.edu Web: http://minerva.union.edu/koopmanr/	<p>I write to urge strongly that NSF choose alternative #1 of its "Notice of Intent to Prepare an EIS . . .", namely "Continued NSF investment for science-focused operations (No-Action Alternative)."</p> <p>As a scientific user of Arecibo Observatory for over 12 years and as director of an NSF-sponsored undergraduate consortium for research using Arecibo data, I have witnessed first hand its potential not only for ground-breaking science, but also its impact on over 270 undergraduates from across the nation.</p> <p>My own research is in the field of extragalactic gas and star formation and, thanks to the large collecting area of its dish, Arecibo is unique in its ability to study the faintest, low mass galaxies that are key to understanding galaxy formation and dark matter in the Universe. The large size of its dish also makes it possible to pinpoint the location of the galaxies at much higher resolution than is possible with smaller single-dish telescopes. These two properties make Arecibo indispensable to my extragalactic research.</p> <p>Here I would also like to emphasize the invaluable role of Arecibo in training the next generation of U.S. radio astronomers with one specific example. For the last 9 years I have led the NSF-sponsored Undergraduate ALFALFA Team, a consortium of 19 undergraduate-focused institutions from across the U.S. (list available at http://egg.astro.cornell.edu/alfalfa/ugradteam/ugradteam.php). Through this program, undergraduates, graduate students, and faculty collaborate with the ALFALFA (Arecibo Legacy Fast ALFA, where ALFA refers to the Arecibo L-band Feed Array detector) consortium (PI, Riccardo Giovanelli, Cornell) on a major legacy astronomical survey and associated followup of neutral hydrogen gas in the nearby Universe. This program has impacted more than 270 students (~40% women and members of underrepresented groups) and 24 faculty.</p> <p>Arecibo Observatory has been critical to the success of this program. It has hosted annual undergraduate workshops (8 to date, with 148 student attendees) and welcomed student (74 to date) and faculty observers for extended onsite observing runs. Data acquired by the project has led to more than 280 significant undergraduate research projects. The value of student experience at Arecibo Observatory goes beyond the physical instrument and their development as scientists as they recognize and discover the great vision and effort required for building and maintaining the observatory. Their understanding is not limited to specific ALFALFA training, but also extends to an appreciation of other research fields, as well as the geology and culture of Puerto Rico. It cannot be overstated how important a role the reality of Puerto Rico and the Arecibo Observatory is in their experience. More than 80% of the student attendees to date have completed undergraduate research projects within ALFALFA and many cite their visit to Arecibo as the major factor in their participation.</p> <p>Faculty and students trained onsite return to their campuses prepared to carry out remote observing. In this way students and faculty contribute to the ALFALFA survey while extending observing opportunities to students, staff, and faculty on their local campuses, many of whom would never have an opportunity to experience an astronomical observing run. Undergraduate ALFALFA Team training has had a positive, and often defining, impact on student development, as judged by their career paths to date. The majority of students involved in the project have completed or are still enrolled in an undergraduate STEM program. Of 174 students who have completed their undergraduate degrees and have known status, more than half are enrolled in graduate school, almost half of them women. The majority of those not in graduate school are pursuing careers in STEM fields, including teaching and engineering/industry.</p> <p>Thus, the partnering of Arecibo Observatory with the ALFALFA consortium has resulted in a model of undergraduate education in which a large number (>270) undergraduates contribute directly to the most extensive, deepest, most sensitive large scale 21cm survey of a cosmologically significant volume to date, and its associated followup. The undergraduates experience the workings of a major national observatory and the way that a science collaboration functions through their interactions with their faculty mentors, their peers, Arecibo Observatory staff, and the leaders of the ALFALFA project. Transformative research experiences develop student skills not only within ALFALFA, but also with other astronomical tools such as SDSS, NED, and programming. They present and publish their results in the astronomical community. Faculty at a wide range of U.S. schools contribute their expertise and improve their scholarly collaborations.</p> <p>The effectiveness of the program is especially relevant in the era of large astronomical surveys. The model we have developed will apply to future surveys by the next generation of Arecibo instruments, including the proposed 40-beam Phased Array Feed, AO40. Continued support of Arecibo will thus ensure the success of countless researchers and also provide meaningful experiences to very bright minds early in their careers, a contribution vital to the long term success of science in this country.</p>	Against Closure	Email	6/22/2016	

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Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
158	Jonathan	Ladd		<p>As an American citizen, a traveller of the world, and an amateur astronomer, I am responding to the Federal Register Notice of an EIS evaluating potential environmental effects of proposed changes to operations at Arecibo Observatory. As an American, I am proud of the engineering and scientific uniqueness and value of Arecibo. To reduce Arecibo would be to reduce American prominence in astronomy. Please do not join the shameful deterioration of American infrastructure. As a traveller, visiting Arecibo has inspired me and I have observed dozens of other wealthy and well-educated travellers be similarly inspired.</p> <p>As an amateur astronomer, I have come to understand the cosmos better from the innumerable publications based on observations that can be made only at Arecibo. Furthermore, I know that the Arecibo facility has been the inspiration for hundreds of our youthful students to pursue astronomy professionally.</p> <p>With continued funding, Arecibo can maintain its status as a very significant contributor to astronomical science; remain a vigorous destination for travellers and thus be an economic driver for the region; and be a fundamental impetus to the next generation of astronomers.</p> <p>Frankly, the other alternatives suggested by the Notice of Intent to Prepare and Environmental Impact Statement strike me as travesty for the scientific community, for the American and Puerto Rican people, and for the environment. I strongly urge the NSF to choose alternative f, which is "Continued NSF investment for science-focused operations."</p>	Against Closure	Email	6/22/2016	Arecibo EIS Response 6 22 16.pdf
159	Michael	Lam	Cornell University	<p>I am writing in response to the Federal Register Notice of an EIS evaluating potential environmental effects of proposed changes to operations at Arecibo Observatory (AO). Arecibo Observatory has been and remains a unique institution nationally and internationally. It remains unique on a culture, scientific, and educational level and is economically important for the Commonwealth of Puerto Rico. You have undoubtedly received many similar letters outlining its importance in these areas.</p> <p>Arecibo has been of personal importance to myself and my research. I have traveled down to Arecibo on numerous occasions, the first being for the "NAIC/NRAO Single Dish School" as a summer REU student. Today, I am involved as an active member of the North American Nanohertz Observatory for Gravitational Waves (NANOGrav) after completing my PhD dissertation a month and a half ago. AO is absolutely critical for not only making NANOGrav competitive in pulsar timing array efforts internationally, but making it the reason we have the most sensitive low-frequency gravitational wave detector ever developed. My thesis work has involved characterizing the performance of this detector, and having lead international projects, the data quality from AO is both unparalleled and necessary for providing the sensitivity necessary for detecting and studying low-frequency gravitational wave sources.</p> <p>Arecibo is not simply a 50-year-old facility. It's upgrades, both past and continued, make it a modern institution capable of achieving a unique set of scientific goals. No other observatory can compete. And with improved funding, instrumentation, and support, it could continue to thrive for many years to come. I implore you to consider the broad impact of damaging the US single-dish radio astronomy community, and crippling radar astronomy, extragalactic hydrogen astronomy, and pulsar timing array astronomy, especially on the very recent opening of the gravitational wave Universe.</p> <p>A primary environment principle is to use well and not waste—in this case waste its scientific, educational, economic and cultural value. AO has enormously greater value than the cost of its support. It is unique in the world in all three of its science areas. AO is hardly 20 years old since its Gregorian renovation, still very much in its prime years. It could multiply, 2-3 times, more important and productive with adequate, rather than starvation, support. Replacing AO would take years and many times the cost of dismantling it. All such facilities/institutions have finite lifetimes, but crippling the Observatory before it become outdated would indeed be an environmental crime Arecibo was.</p> <p>Arecibo's attributes have been cultivated over many years, are interconnected and mutually supportive, and can cannot readily be separated. The Observatory's contributions in all four areas continue to be very strong, and they could multiply in future with a more appropriate level of support. The scientific contributions from AO have been outstanding, and its scientific future remains very bright indeed. The Observatory's cultural contributions to Puerto Rico and the world are beyond reconning. Here are a few examples:</p>	Against Closure	Email	6/22/2016	

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				<p>☐ In my experience, Arecibo is the most exciting observatory for students on the planet. Students sometimes describe their experience at AO as “life changing” and this can be traced in the lives of students who visit for scientific work.</p> <p>☐ Arecibo is a work of art and is often apprehended in this manner by visitors. It is understood as a supremely elegant mechanical and electronic monument to the iThe Observatory is iconic nationally and internationally. Its very existence has raised consciousness about science, to say nothing of its several prominent movie roles!</p> <p>☐ AO is almost certainly the single best known and influential scientific institution in the Spanish speaking US and Caribbean basin. Puertoricans are very very proud of their “El Radar” and its presence has entered the culture and consciousness in a very deep and positive manner.</p> <p>☐ In Puerto Rico, the Observatory is of very considerable economic value and could be much more so. Its staff salaries are highly important in the Arecibo Town region. Its educated staff has significantly contributed to building up a further generation or two of educated people in the area, and the tens of thousands of tourist visitors are also important to the overall island economy. Withdrawal of support now would compound what is already a difficult situation for Puerto Rico and is citizenry.</p> <p>☐ Educationally, the Observatory is of key importances at every level: For the island high school students who visit AO in conjunction with their science classes. The Arecibo Institute students who go on to excel in STEM disciplines. Training programs for teachers in PR and elsewhere in Latin America. Graduate students in science and engineering both from PR and the mainland. Postdocs. As a facility for visits by US college students to do research with their mentors.</p> <p>A primary environment principle is to use well and not waste—in this case waste its scientific, educational, economic and cultural value. AO has enormously greater value than the cost of its support. It is unique in the world in all three of its science areas. AO is hardly 20 years old since its Gregorian renovation, still very much in its prime years. It could multiply, 2-3 times, more important and productive with adequate, rather than starvation, support. Replacing AO would take years and many times the cost of dismantling it. All such facilities/institutions have finite lifetimes, but crippling the Observatory before it become outdated would indeed be an environmental crime.</p>				
160	Loris	Magnani	Professor of Astronomy Dept. of Physics & Astronomy University of Georgia Athens, GA 30602 USA	<p>I am writing this letter in response to your request for public comments on the environmental impacts of the Arecibo Observatory. I am interpreting "environmental" in its true sense of the word; i.e., the aggregate of surrounding things, conditions, or influences; surroundings; milieu.</p> <p>Thus, I will address first how the Observatory influences the people and island of Puerto Rico, and then, how it affects all of us.</p> <p>I was a postdoc and staff scientist at Arecibo for 4 years (1987-1991) and have first-hand knowledge of the impact the Observatory has on the people of the island. While some Puerto Ricans are unhappy that the Observatory is mostly in the hands of "gringos", everyone is proud that this scientific and technological marvel is in Puerto Rico. Although the island is a marvelous place, there are severe problems for its inhabitants; education and work opportunities being some of the most difficult ones. I have heard horror stories about the educational state of the public elementary, middle, and high-schools on the island. It is difficult for children from mid- to lower-economic households to get the type of education that will help them prosper both on the island and in the United States. Tens of millions of dollars can be and have been spend in trying to inspire kids to stay in school and take up STEM disciplines there. The lack of role models is something that is difficult to appreciate if you are white and from upper-middle class backgrounds. Many Puerto Rican school children visit the Observatory every year. It is hard to assess the impact that the place has, but I have seen with my own eyes the excitement on children's faces as they toured the facility (this was back in the days before the Visitors' Center). My career in astronomy was inspired by a fifth-grade trip to the (then) Hayden Planetarium in New York City. I had a world class facility a short subway ride away. Take away Arecibo from the island and the children there have no opportunity to be inspired by real science. The first time I saw the telescope when I was 29, I was awestruck; I can only imagine what that impact would be on some youngsters who see the place for the first time.</p> <p>The hills around the Observatory are surprisingly populated. Aside from the dairy industry, there are no factories or large-scale work opportunities there. In its heyday, about 100 local families were supported by one or more people who worked at the Observatory. It is hard to see how many of those families could find local jobs once the Observatory is gone. And I am not factoring in the ancillary effects on the local economy that having the Observatory nearby provides.</p> <p>Those are local factors. and you are likely to hear others voice the points I have made above. I can't help but feel that if Puerto Rico had two Senators in Congress you would be "convinced" a little bit more forcefully on how important these things are. Too many people don't know that Puerto Rico is part of the United States; I know you do, but in the absence of Congressional representation, it is far too easy to ignore the plight of the people on the island. They are Americans and deserve all the opportunities that are available to all Americans, regardless of historical technicalities.</p> <p>There is one other thing I would like to mention that affects us all as humans on Earth. The Arecibo 305-meter radiotelescope is one of the engineering wonders of the world. Again, I think back to the first time I saw it. The visual impact was perhaps the most striking of my life. No-one talks about dismantling the Pyramids because of maintenance costs. They are part of our cultural heritage regardless of boundaries or ethnicity. The Arecibo radiotelescope is not far behind. As one of the very few structures that can be seen from Earth orbit, there is a majesty to it that transcends what cutting edge science may or may not be doable from there. There are some things that don't have a dollar value and that transcend budgets.</p>	Against Closure	Email	6/22/2016	

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161	Loris	Magnani	Professor of Astronomy Dept. of Physics & Astronomy University of Georgia Athens, GA 30602 USA	If there is a real movement to dismantle the Observatory and bring the site back to its "original" state, I would first consult with the Department of the Interior. Even if scientifically it can no longer be supported by the NSF, the place should at least be a National Monument.	Alternative Consideration	Email	6/22/2016	
162	Allison	Matthews		<p>I am writing in response to the notice of intent to produce an Environmental Impact Statement regarding the future of the Arecibo Observatory. As an undergraduate student at Lafayette College, I undertook research using the Arecibo Observatory for studies of pulsar astrophysics as part of a summer research internship and continued senior thesis at Lafayette. During my research program, I visited, and made observations with the telescope. This was an incredibly influential experience, so much so that I included it in a future Goldwater Scholarship application under the category of "Motivation for Research Career." I paste this excerpt here:</p> <p>Throughout my studies, it has been the aspects of science that remain unseen and literally out of this world that are the most thrilling. Doing research in pulsar astronomy this summer allowed me to do more than simply conduct remote observations from the largest telescope in the world, Arecibo Observatory. I finally had the chance to actually control the telescope on site. As I sat down to calibrate the telescope for recording signals, my mind whirled with the task at hand; I had to insure that the power levels were properly set, to calibrate the receivers and to enter the coordinates of the pulsar into the telescope. I watched as the telescope moved into position and started recording. After adjusting the oscilloscope, pulses began appearing like clockwork on the screen. With a rush of adrenaline, my heart rate seemed to sync with the pulsar, an object that spins at almost inconceivable rates. That moment I cemented my future as a collaborator, investigator, and scientist. Through this project I learned skills in computer coding and algorithm development, in addition to astrophysics itself. This experience was a significant part of my development as a researcher, and was an important step leading to my present position as a graduate student in astronomy.</p> <p>I hope that the Observatory can remain in operation with a science-focused research program, and that it can continue to provide such valuable experiences for future students.</p>	Against Closure	Email	6/22/2016	
163	David D.	Meisel	SUNY Distinguished Professor of Computational Astrophysics	<p>I am writing to provide my comments on the environmental impact of Arecibo Observatory in Puerto Rico. This unique facility has served since the 1960's as a scientific institution of wide notoriety sited in a fairly remote part of the island. It is remarkable that over the years that it has grown into one of the most important tourist destinations in western Puerto Rico. During that time, scientific activities of extraordinary interest have been carried out with the cooperation of a dedicated staff of both island-born and mainland born employees. Since its beginnings the construction and operations have always been planned to make the installation compatible with both the cultural and natural settings of the region and while there have always been logistic challenges in maintaining its scientific and engineering standards, working there as a visiting scientist was always a pleasure as well as scientifically rewarding.</p> <p>I find it quite ironic that after all these years this environmentally friendly facility nestled so carefully in its setting that thousands of school children trustingly enjoy repeated visits there, is being reviewed for environmental impact and being compared with other more recent facilities of a similar nature that have leveled entire mountains and built long access roads just to be constructed.</p> <p>Sure Arecibo has had its share of mishaps over the years, but institutions that have a constant flux of visitors ranging from summer students to visiting scientists are bound to have unforeseen incidents that could not be planned for in advance.</p> <p>As for the health effects of the radar and radio transmitter operation, in an age when virtually everyone is exposed to aircraft landing radars, cell phone or computer radiation etc., it cannot be ascertained whether the stray radiation from this facility is a significant health risk or not.</p> <p>I hope that this investigation will be fair to all concerned and not muddled by the irrelevance that seems to be the trend of such things these days.</p>	Against Closure	Email	6/22/2016	

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Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
164	Dr. Robert	Minchin		<p>On reading over the Environmental Baseline Study performed for the NSF by CH2M, I came upon the comment: "Surveys for RTE [rare, threatened, or endangered] species or detailed habitat assessments were not included in this effort to determine if these species or the RTE species located in the Río Abaja State Forest are present or are likely to use the subject property. Impacts to RTE species are unknown but are not anticipated because activities would be generally limited to previously disturbed areas within the subject property." (p. 24).</p> <p>I would like to point out that the major disturbance to the area was in the period of the Observatory's construction, 1960-1963. There has been plenty of time for recovery of wildlife and for endangered species to move into the area since then. In particular:</p> <ul style="list-style-type: none"> The endangered Puerto Rican parrot was re-introduced into the Río Abajo forest, adjacent to the Observatory, in 2006, having gone extinct in the area in the 1920s.[https://www.nwf.org/News-and-Magazines/National-Wildlife/Birds/Archives/2015/Puerto-Rican-Parrot-Comeback.aspx] The logic that the species already survived disruption in the 1960s and so will survive again is clearly false. According to the Cornell eBird website, two adult broad-winged hawks have been reported as regularly seen at the Observatory.[http://ebird.org/ebird/view/checklist/S28471271] This may well be a rare breeding pair of this endangered species. <p>For both of these species, the situation now is not the same as it was when the Observatory was constructed – the Puerto Rican parrot, in particular, was not found in the region at the time. It is clear that the argument of the EBS that no impact is expected as the only disruption would be to previously disturbed areas is not applicable to the Puerto Rican parrot and is probably also not applicable to the Puerto Rican broad-winged hawk. Given this situation, it seems absolutely necessary that a full assessment is carried out of the potential impact on the Puerto Rican parrot and the Puerto Rican broad-winged hawk of large-scale physical changes at the Observatory (e.g. decommissioning of the site).</p>	Resource Considerations	Email	6/22/2016	
165	Dr. Dipanjan	Mitra	Associate Professor On Sabbatical to University of Vermont, USA	<p>I write this letter to strongly request that NSF choose alternative 1 of its "Notice of Intent to Prepare an EIS . . .", namely "Continued NSF investment for science-focused operations (No-Action Alternative)."</p> <p>The radio telescope at Arecibo in Puerto Rico is the finest example of cutting-edge technology, excellent research and a symbol of the "most innovative scientific facility in the world". I have worked in Arecibo Observatory as staff during my sabbatical, and have closely witnessed the unique role the Observatory plays culturally, educationally, scientifically and economically in Puerto Rico, the rest of the United States as well as internationally.</p> <p>Puerto Ricans are tremendously proud and respectful about the Arecibo Observatory. There is full acknowledgement of the fact that Arecibo telescope is a supremely powerful instrument, that has made Puerto Rico internationally renowned.</p> <p>The staff of the Arecibo Observatory are highly educated and skilled, and a large number of acclaimed scientists visit the Observatory. The ambience and intellectual activity that is generated, has a very positive effect on the Puerto Rican society. More people in the island are educated and a new generation of highly intellectual society is being developed.</p> <p>The visitor center in Arecibo Observatory is pivotal in educating every young student in Puerto Rico. These young minds find a sense of pride, dignity, and are exposed to forefront scientific research. The educational value also makes strong impact in the nearby Carrabian Island. Many Graduate and college students in the Mainland US visit AO as a part of their science curriculum. The observatory receives tens of thousands of visitors every year, and clearly contributes to the overall economy of Puerto Rico.</p> <p>It is also amazing to see how the Arecibo Observatory impacts students and researchers internationally. The high excellence of the Arecibo telescope in all fronts sets standards for studies related to telescope structural design, radio astronomy, ionosphere etc. The telescope continues to make fascinating scientific discoveries and nurture international collaboration.</p> <p>I am a user of the Arecibo radio telescope for the last 15 years, and my study requires studying extremely faint radio signals from pulsars and I am entirely convinced that the sheer sensitivity and precision of the data obtained is par excellence. The observatory has over the years been modernised with state of art receivers and backends, and continues to play a pioneer role in all aspects of radio astrophysics. I firmly stand behind the fact Arecibo is the most important facility in radio astronomy in the world and will continue to hold its premier position for at least a decade, if not more.</p>	Against Closure	Email	6/22/2016	

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166	Kim	Morán-Irizarry	Doctor of Jurisprudence, 2016 Indiana University Maurer School of Law 787-240-0889 k Moranirizarry@gmail.com	<p>My name is Kimberly Morán Irizarry, I'm 25 years old, and I grew up in Hatillo, a town adjacent to Arecibo, Puerto Rico. I'm writing to express my discontent with the upcoming budget cuts facing the Arecibo Observatory. Having lived in the Arecibo District for 18 years of my life, I can attest to the invaluable contributions the Arecibo Observatory has had in our community over the years. In addition to the value of the remarkable scientific discoveries, the Observatory has been an element of national pride, giving Puerto Ricans, and especially Arecibo locals a sense of ownership in a Nobel Prize winning institution. This may seem like a trivial concept, but in times where the Puerto Rican economy is in constant decline, having the best and largest radio telescope in the world is a morale boost for the entire Puerto Rican community.</p> <p>I still remember the impression the observatory had on me when I first visited it. I must have been about eight years old, and I was filled with excitement to think of all the amazing scientific research that was taking place there, in my own backyard. As a little kid, that gave me a sense of importance; a sense that one could achieve so many things, even when you come from a small town in PR.</p> <p>As it did for me, I am confident that the Arecibo Observatory continues to impact the lives of the people around it, whether it may be by instilling scientific interest in the students that visit it throughout the year, or by being a symbol of pride as the excellent world class research facility that it is.</p> <p>As the NSF continues to consider different options for the Observatory, I request that they continue with the present arrangement. Additional budget cuts would be very detrimental to the proper functioning of this excellent facility, and to the communities of Arecibo and Puerto Rico. As the Puerto Rican government struggles to pay its massive bond debt and continues to close schools, please do not deprive us of the opportunity to provide the world with a proper functioning observatory, one that fills us with pride, and that, with your help, will continue to contribute to the scientific community for years to come.</p>	Against Closure	Email	6/22/2016	
167	Jade	Morton	Colorado State University	<p>I write to strongly urge that NSF choose alternative 1 of its "Notice of Intent to Prepare an EIS . . .", namely "Continued NSF investment for science---focused operations (No---Action Alternative)."</p> <p>As a scientific user of Arecibo Observatory for over 30 years, I can attest to its historical and continuing importance for studies of ionosphere. Its enormous collecting area (the largest in the world) has been and continues to be crucial in studies of structures in the ionosphere. Most importantly, although the facility is over fifty years old, it has undergone two major upgrades, each of which created an essentially new, far more powerful telescope. Consequently it remains in the prime of its scientific life, still able to make important and useful scientific discoveries.</p> <p>While there have been a number of instruments including new, distributed sensing capabilities to study ionosphere in recent years, the Arecibo Incoherent Scatter Radar remains an important, trusted system that provide un---disputed observations and measurements. For example, when developed a new algorithm to map the ionosphere total electron content based on GPS receiver's measurements, we turned to Arecibo ISR for validation of the algorithm accuracy. In fact, I am in the process of deploying an array of multiple constellations of global navigation satellite systems receivers around Arecibo to support development of various algorithms development using both ground---based and LEO satellite---based measurements. I could cite several other examples of the role that Arecibo alone can play in my other research, and many others can and will do so. The telescope remains a unique, powerful, and flexible instrument for the 21st century.</p> <p>I would also like to point out that China is building FAST, the Five---hundred---meter Aperture Spherical Telescope. FAST is based on the Arecibo telescope concept. Clearly, single dish large radio telescopes are still recognized for its unique merits elsewhere in the world.</p>	Against Closure	Email	6/22/2016	Arecibo Support Letter_Morton.pdf

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168	Mary Crone	Odekon	Professor and Chair, Department of Physics Skidmore College	<p>This letter is in response to the Federal Register Notice of an EIS evaluating potential environmental effects of proposed changes to operations at Arecibo Observatory (AO). I hope this statement about the value of the AO helps inform any decisions for the future of the observatory.</p> <p>As a member of the NSF-funded "Undergraduate ALFALFA Team" (PI: Koopmann) I have seen the benefits of the AO for both scientific progress and for inspiring students to pursue and value science. At my home institution of Skidmore College alone, 38 undergraduates have been involved in research using the AO over the past eight years. Many of them have operated the Arecibo telescope on site or remotely, or have presented at national conferences. Some have co-authored refereed articles, for example Odekon et al. 2016, "The HI Content of Galaxies in Groups as Measured by ALFALFA," ApJ, in press.</p> <p>The impact of this project extends far more broadly than the students who have used the data directly. The results of these projects are presented to large groups on campus, through campus-wide research symposia, department presentations, and educational modules designed for introductory astronomy courses. Dozens of other educational institutions are part of this collaboration, and have similar stories to tell. The Undergraduate ALFALFA Team model, and the importance of the AO facility in particular, has been described in two recent articles, in Mercury magazine and the CUR Quarterly:</p> <p>☞ Parker Troisht, Rebecca Koopmann, Aileen O'Donoghue, Mary Crone Odekon, and Martha Haynes, "The Undergraduate ALFALFA Team: A Collaborative Model for Undergraduate Research in Major Legacy Projects," 2016 CUR Quarterly on Undergraduate Research Collaborations: Partnering for High(er) Impact</p> <p>☞ Mary Crone Odekon, 2015, "Harvesting ALFALFA," Mercury, Vol. 44, No. 3</p> <p>An important lesson for us has been the power of integrating a major legacy survey from a world-class facility with undergraduate research. I hope this role for the AO is fully recognized.</p>	Against Closure	Email	6/22/2016	Aerocibo 2016.pdf
169	Jeff	Ouellette	Cornell University, Class of 2017 CERN Summer Student	<p>I would like to respond to the invitation for public comments regarding the investigation into the environmental impacts of the Arecibo Observatory in Puerto Rico. Unfortunately, I will be out of the country and unable to attend the public meetings, but I would still like to offer my own comments on the concern over this issue.</p> <p>First and foremost, I would like to say that the presence of the Arecibo Observatory has helped the scientific community gain a substantial amount of knowledge since its completion in 1963. It has been, and still is, among the world's foremost radio telescopes. This fact cannot be understated in the slightest – Arecibo is one of the most powerful resources available to astronomers.</p> <p>On the island itself, the prominence of Arecibo has both contributed to the Puerto Rican cultural identity as a source of pride and, as it is reasonably close to San Juan, stimulated the local economy by attracting not only tourists to the island, but scientists from around the globe. This makes Arecibo not only a world-class research facility, but also an educational institution, as it motivates interest in STEM to those who visit. But Arecibo has a profound impact on the local population too. Thousands of local children routinely visit the telescope to learn about astronomy and stimulate their interest in STEM fields. Unfortunately, Hispanic professionals are still underrepresented in the hard sciences. By providing local children with an environment to explore scientific interests, this underrepresentation should gradually disappear over time. On a larger scale, Arecibo is an important resource in the search for potentially hazardous asteroids (PHAs). Searching for asteroids on potential collision trajectories with the Earth is critical in ensuring the planet's future security. PHAs are, minimally, national security threats and should be treated accordingly. Most importantly, I advise that you consider the impressive scientific history and future of Arecibo Observatory. For instance, the telescope enabled research of a binary pulsar system that led to the 1993 Nobel Prize in Physics. From my own background in pulsar astrophysics, I know that Arecibo has been one of the most important telescopes to study such objects, having led to the discovery of many pulsars, as well as contributing to ongoing American efforts to detect very low frequency gravitational waves – a line of research that mandates the use of the Arecibo telescope.</p> <p>I urge you to consider these remarks on the educational, cultural, and scientific impacts of the observatory in making a decision. The telescope, in my opinion, has significantly benefitted not only the island of Puerto Rico, but the scientific community at large.</p>	Against Closure	Email	6/22/2016	AreciboEISResponse.pdf

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
170	Dr. Tim	Pennucci	Columbia University	<p>I am writing with some dismay in response to the Federal Register Notice of an EIS evaluating potential environmental effects of proposed changes to operations at Arecibo Observatory (AO). As one of the many scientists who use Arecibo every month, I implore the NSF to take the No-Action Alternative. I trust that after hearing the landslide of feedback from all those who would be affected by a change in Arecibo's operations away from (1) doing pioneering science that cannot (and will not) be done elsewhere and (2) offering a veritable dream of an educational outpost for privileged and under-privileged individuals alike, and after realizing the lasting, propagating effects on those who will not be providing feedback to the NSF (that is, the much more numerous population of individuals who will not get a chance to be influenced by the telescope's activities and existence, either directly or indirectly, as well as the tax-paying individuals who value investment in basic R&D in science), the NSF will realize that no action is the best of the given choices.</p> <p>Without loss of impact, I encourage the reader to review the emails that have come before, instead of rereading here the same list of obvious talking points having to do with:</p> <ul style="list-style-type: none"> -Arecibo's direct impact on countless individuals from grade school through grad school through professional retirement -Arecibo's grandeur on the international stage as an icon for human scientific achievement -Arecibo's continued contributions to basic astrophysical research and atmospheric science by way of ***unique capabilities that will not be replaced by any current, planned, or imagined telescope, including FAST, the GBT, Parkes, and MeerKAT*** -Arecibo's future potential, given the recent upgrades, the minimal upkeep, and the anticipated science to be probed (Nobel prizes are involved!) -the positive economic and scientific return on every dollar invested in Arecibo -the loss of American leadership in science when we willingly strangle our own world-class facilities -etc. <p>What I will add is my own "environmental" analogy. Arecibo belongs to the endangered species of large single dish radio telescopes. Not only does it belong to this small group of powerful, yet economical and prolific scientific facilities, but it is the poster-child. It is the white rhino that everyone knows about, and it should not only be preserved and protected, but allowed to flourish. The kinds of science it can do are unique to it and other large single dish telescopes (at the very least, it is cheapest to do with a single dish), and yet there are only a handful of such facilities on the planet. It would be one thing to suggest that such facilities don't contribute significantly in terms of science or in terms of tax dollars invested, but this is just not true -- and especially so for Arecibo. Thus, the uniqueness of Arecibo alone should force NSF to trim the fat elsewhere, because there is no fat here. If for nothing else, we need to keep our science diversified; this is the most powerful and versatile single-dish telescope in the world (with the GBT as a close second), and to choke or eliminate its capabilities would be a crippling mistake. Don't go after the endangered species! Choose No-Action!</p>	Against Closure	Email	6/22/2016	
171	Carolyn	Raithel	Graduate Student University of Arizona / Steward Observatory	<p>I am writing in response to the proposed changes to Arecibo Observatory. Arecibo Observatory (AO) is an important US institution for scientific, cultural, and educational, purposes.</p> <p>On the scientific front, AO has been central to many exciting radio astronomy discoveries. It was the instrument used to discover the very first binary pulsar system (for which the discoverers were awarded the 1993 Nobel Prize in Physics) and has been critical in follow-up of that and countless other astronomical objects since. Just this past month, yet another paper was published on that particular binary system, using over thirty years of data collected at AO (Weisberg & Huang, Astrophysical Journal, in press). AO also plays a critical role in detecting and studying potential asteroid-based threats to life on Earth with the Arecibo Planetary Radar lab. While not the usual sort of environment concern that the EIS is likely accustomed to considering, the potential consequences of ignoring asteroid-based threats to the Earth could be severe. AO is a premiere single-dish radio telescope that remains the largest in the world; as such, it has unique capabilities and is a point of national pride.</p> <p>On the cultural front, AO provides vital scientific outreach programs to the often under-served island community. Not only does AO provide scientific and technical jobs for many Puerto Rican natives at a time when the local economy is deeply struggling, it runs many school programs and attracts thousands of student visitors every year, many of whom are low-income and come from under-funded schools. AO is a point of pride for island natives and it continues to inspire a whole generation of new, diverse students to pursue the sciences.</p> <p>Beyond the educational programs it provides to the local community, AO also serves as a hands-on facility for countless graduate and even undergraduate students. In an era where science is growing ever larger, it is of critical importance to maintain facilities where students can achieve first-hand experiences with the scientific equipment they are using. AO has a long tradition of providing such experiences, and the experiences I myself gained while visiting AO as an undergraduate are a large part of why I am in graduate school today.</p> <p>In conclusion, AO remains a unique, educational, and scientifically productive telescope.</p>	Against Closure	Email	6/22/2016	

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Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
172	Dr. Timothy	Robishaw	Dominion Radio Astrophysical Observatory	<p>I write to strongly state my opinion that the NSF should choose alternative #1 of its "Notice of Intent to Prepare an EIS", namely "Continued NSF investment for science-focused operations (No-Action Alternative)."</p> <p>I have been a regular scientific user of Arecibo observatory for 17 years and can attest that the telescope is a unique device for measuring astrophysical phenomena. It makes little sense to me to shutter a facility that has many unique capabilities when there is no plan in sight to provide a replacement for these capabilities.</p> <p>To make a succinct case for its continued support, a telescope's collecting area dictates its ability to see faint light from the distant reaches of the universe. The 305-meter Arecibo telescope is the largest collecting area in the world (and is larger than its NSF-funded runners-up by a factor of many). By shuttering the Arecibo observatory, the NSF is making an active decision to black out a substantial window to the universe.</p> <p>To draw attention to a particular topic that can only be studied with the Arecibo observatory, I will briefly describe objects called megamasers. These objects are galaxies very far away that are undergoing an intense burst of star formation and in the process producing laser light at microwave frequencies. These megamaser galaxies are producing laser light millions of times brighter than similar laser light that we see in our own Milky Way galaxy, hence the "mega" in their name. In a coincidence of nature, the molecule that produces this laser light (known as hydroxyl, consisting of one oxygen atom bonded with one hydrogen atom) is very sensitive to magnetic fields. When the laser light is produced a fingerprint is embedded in the light telling us how strong the magnetic field was in the distant galaxy and what direction the magnetic field was pointing. This information travels millions and millions of light years and can only be measured using the Arecibo telescope. I am the world's observational expert in the study of magnetic fields in these megamaser galaxies. I used Arecibo as a PhD student in 2007 to make the world's first direct in-situ detection of a magnetic field inside a distant galaxy. I have recently used Arecibo in conjunction with three of America's largest radio observatories to make the very first high-resolution mapping of magnetic fields in a galaxy outside of our own Milky Way. No other observatory in the world has enough collecting area to detect the signature of magnetic fields in these distant galaxies. The study of cosmic magnetism in the universe would be directly affected by the decision to close this unique telescope.</p> <p>I will allow my colleagues to provide more examples of the unique observational astrophysical endeavors that are in peril by the NSF's potential decision.</p>	Against Closure	Email	6/22/2016	
173	Sumanta	Sarkhel	Indian Institute of Technology Roorkee	<p>I strongly request NSF to choose alternative 1 of its "Notice of Intent to Prepare an EIS . . .", namely "Continued NSF investment for science-focused operations (No-Action Alternative)."</p> <p>I worked at the Arecibo Observatory (AO), Puerto Rico for nearly three years. I am an optical Aeronomer and used the AO's instrument facilities extensively. I found that AO is unique in many aspects. It is the largest single dish radar that can achieve several new targets till date. It is an incoherent scatter radar that can measure plasma parameters in the Earth's ionosphere. I have also worked in the lidar lab at AO which is capable of measuring Fe, Ca, Ca+, Na and K atoms in the upper atmosphere. AO also has airglow spectrometers and airglow imaging systems installed (owned by Boston University and Penn State University) that reveal upper atmospheric chemistry and dynamics. The newly commissioned ionospheric heater will open-up new era of upper atmospheric research at the observatory. AO is the only place in the planet which has both incoherent scatter radar and all these optical instruments (passive and active) for upper atmospheric research. It is such a wonderful working place which you probably will not find anywhere else.</p> <p>I believe that AO will continue its journey in the area of Aeronomy along with Radio Astronomy and Planetary Radar provided adequate funding is available.</p> <p>It is my sincere request to consider these factors for the preparation of the EIS for the Arecibo Observatory in addition to being a unique scientific facility.</p>	Against Closure	Website	6/22/2016	

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Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
174	Allison	Smith	Dept of Physics and Astronomy University of Georgia	<p>This is a response to the invitation for public comments on the environmental impact and future of the Arecibo Observatory. In particular, Arecibo Observatory has an extremely important impact on my career as a young scientist entering the radio astronomy field. As a graduate student I stayed on-site at the observatory for roughly 6 months while I acquired 200 hours of data for my dissertation. I received most of my training as a radio astronomer at this facility and have seen first hand the crucial role AO plays in the fields of radio astronomy, aeronomy, and planetary radar. As a student I benefitted immensely from my time there, and I implore the NSF to select Scenario 1, the No-Action Alternative for continued NSF investment for science-focused operations for reasons including but not limited to the following:</p> <ul style="list-style-type: none"> o The sensitivity of AO is like no other instrument. As a large single dish telescope, Arecibo is critical for experiments like my own in which we try to detect very weak signals related to magnetic fields in interstellar gas. o There have been 2 major upgrades to the telescope. Arecibo is a productive facility that is working very well and should require no major maintenance for years to come. o Arecibo has earned a Nobel Prize (Hulse and Taylor 1982) and remains in its prime as a scientific facility. It is still very useful not only for radio astronomy, but also for aeronomy and planetary radar. o The expertise of the AO scientific staff is invaluable to observers like myself. They are available for 24/7 support and have been extremely knowledgeable and helpful despite the fact that my project involves experimental work that has not been done before at Arecibo. Having observed at many other telescopes, it is my experience that the staff at Arecibo is unusually insightful and should be considered a valuable asset to the astronomical community. o As a multi-user facility, Arecibo attracts top scientists in the fields of radio astronomy, aeronomy, and planetary radar. This creates an on-site scientific community with a synergy that I have yet to experience elsewhere. During my stay I interacted with and received useful input from scientists of all of these backgrounds. I have been present for many aeronomy campaigns and planetary radar observations. This is experience I can gain at no other facility, and as a young radio astronomer I cannot think of a better place to cultivate my own scientific knowledge. <p>I conveyed above just a few reasons based on my personal experience to continue funding the observatory. The big picture, however, is that Arecibo is unique, powerful, and synergistic in its scientific capabilities. It has both produced groundbreaking science and can continue to do so for decades to come. Arecibo Observatory is inarguably a valuable scientific facility and a harbinger of scientific progress, the promotion of which is, after all, at the crux NSF's mission statement.</p>	Against Closure	Email	6/22/2016	AO_NSFletter.pdf
175	Alessandra	Springmann	Lunar & Planetary Laboratory Kuiper 322 sondy@lpl.arizona.edu (m) 415-509-4124 (o) 520-621-1485 http://www.lpl.arizona.edu/~sondy	<p>I worked at Arecibo Observatory as a data analyst and observing support from 2012-2014 in the planetary radar group. I had left a planetary science PhD program with a master's degree and was unsure of my next moves. Arecibo provided an incredible, unique opportunity to become a scientist, an independent researcher, and an advocate for the work the facility does. Nowhere else could I have been trained, trusted, and turned loose to run on my own a megawatt radar system to characterize potentially hazardous asteroids. I would not have been able to succeed in returning to a PhD program had I not had the opportunity to work at Arecibo. The name recognition of Arecibo has helped me immensely with networking, and the experience I gained at the observatory was second to none. The facility is inspiring and helps various groups succeed in many ways.</p> <p>The cultural value of Arecibo cannot be quantified: instantly recognizable from Goldeneye and Contact, Arecibo continues to inspire. I had dozens of friends agitate to visit me for a tour of the observatory. I gave a talk at Lucasfilm two weeks ago about Arecibo, and almost everyone raised their hand in the audience as having played Goldeneye on the Nintendo 64 while growing up. For many friends, reading Contact and seeing the movie inspired them to be scientists and to learn more about astronomy. No other observatory is as iconic, as instantly recognizable as Arecibo. A colleague even proposed to his future wife at the edge of the dish.</p> <p>The observatory itself has a low impact on Puerto Rico compared to surrounding communities. Trash is collected regularly. The observatory encourages recycling. A cafeteria on site means employees bring less food packaging. The well on site means water is neither trucked nor pumped on site.</p> <p>During hurricanes the observatory provides vital support for surrounding communities, as it has a generator and most importantly a reliable well. People from the neighboring areas rely on the observatory as a source of water and power during and after hurricanes, when road access to the rest of the island is restricted due to downed trees and power lines. The observatory is the safest place to remain during a hurricane on the island due to its access to resources.</p> <p>Almost every school child in Puerto Rico visits the observatory, which is the only science museum on the island that is already underserved and lacks many basic resources. Taking away the visitor center would entirely decrease access to science for students in Puerto Rico; taking away the observatory would substantially cripple the ability of the visitor center to provide effective scientific education and outreach.</p> <p>I commuted to the observatory at all hours for observations, and never found traffic from tourists to be an issue on the roads that lead to the observatory. The larger road issues were dogs, chickens, horses, potholes, and drivers who lived in the area.</p> <p>Finally, the observatory provides gainful employment for scores of Puerto Ricans. UMET, USRA, and SRI International provide benefits, training, and steady employment in an area with few job opportunities. USRA recently hired Edgard Rivera Valentin, an astronomer who was born in Arecibo. He has been invaluable with providing outreach to the island as to the research done at the observatory, and is active in mentoring numerous students on the island regarding science.</p>	Against Closure	Email	6/22/2016	

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176	Rhys	Taylor	Astronomical Institute of the Czech Academy of Sciences	<p>The Arecibo Observatory provides capabilities to US and international radio astronomy which are unmatched by any other facility. It continues to offer unique contributions to a highly diverse range of studies including galaxy evolution, pulsars, asteroids, and atmospheric physics. No other comparable facility exists or is planned, and without Arecibo several avenues with the potential for major scientific discoveries would be closed as well as losing decades of accumulated experience. Discoveries from Arecibo routinely generate spin-off projects involving new lines of theoretical inquiry, numerical simulations, and further observations, which directly and indirectly support the research activities of scientists around the world.</p> <p>In addition, the Observatory operates highly successful outreach and teaching programmes, using its iconic status and the expertise of its staff to inspire young scientists and inform the general public. The Angel Ramos visitor centre attracts tens of thousands of visitors per year, and undergraduate research programs have helped many Puerto Ricans to choose a career in science, advancing the local knowledge economy. Sustained investment to maintain and further develop the telescope and its instrumentation will ensure it continues to play a leading role in US and international science for the next decade and far beyond.</p> <p>I myself was a post-doc at Arecibo for two and half years. The data I collected there have been essential to my research (and for my institute and my international collaborators) ever since, and will likely to remain the core part of my career for many more years to come. Yet without Arecibo, vital follow-up work to understand the discoveries will be impossible.</p>	Against Closure	Website	6/22/2016	
177	Rhys	Taylor	Astronomical Institute of the Czech Academy of Sciences	<p>There should be a full consultation with the staff regarding how the Observatory is to be managed. Mothballing/closure such a unique facility make absolutely no sense. A greater amount of teaching/outreach might be a very good idea, but moving exclusively to teaching would be impossible - you cannot use a 305m telescope for teaching without also doing science. Allowing greater sources of non-NSF funding should be encouraged (and one should be wary of treating the three sensible options under consideration as being mutually exclusive). Most importantly of all, the Observatory needs to exist as its own legal entity so that it can seek out other funding sources without having to negotiate everything through the NSF. That is not to say the NSF should not have some role in Observatory - it should, and it should be proud of its asset - but the Observatory needs to be able to determine its own future. The best people to decide the future of Arecibo are the people who actually work there.</p>	Alternative Consideration	Website	6/22/2016	
178	Keeisi A. Caballero	Valdez	Arecibo Remote Command Center-Team Leader	<p>I am writing to comment on issues related to human and cultural environment. Any option that NSF pursues that is incompatible with continued science-focused operations at Arecibo will put in serious peril the ongoing science and engineering training of students from high school through postdocs.</p> <p>I am part of the Arecibo Remote Command Center (ARCC) based at the University of Texas Rio Grande Valley. This program is highly involved in observations with the Arecibo telescope. We are also a leading recruiting force for Hispanic students into the STEM fields. Our program has been so successful that it has been expanded to a number of other NANOGrav institutions. We involve a diverse group of high school and undergraduate students in Arecibo observations of pulsars and gravitational wave astronomy. Arecibo has played a particularly inspiring role in training our students to become a substantial group of observers for the Arecibo telescope. Students in the Rio Grande Valley area are filled with excitement and pride themselves in personally operating the telescope and using these experiences to recruit students. This group has propelled me to pursue a higher education in the STEM field. Using Arecibo through ARCC was the strongest influence in my life to obtain my B.S in Physics. I am thrilled to live in these exciting times where the existence of gravitational waves has finally been proven. Their discovery has opened a new "window" to observe the universe and Arecibo plays a staggering role in doing so. I strongly believe that through Arecibo's continued science-focused operations, hundreds of students will continue doing cutting edge research and hundreds more will receive the opportunity to work with the most sensitive radio telescope in the world.</p> <p>For me as a Hispanic student it has been a truly invaluable research and educational experience and I hope that with your help many other students can have such experience.</p>	Against Closure	Email	6/22/2016	Caballero_Keeisi.pdf

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179	Anthony P	van Eyken	Deputy Director, Center for Geospace Studies SRI International, Menlo Park CA 94025 650 859 2359	<p>The Arecibo management team, SRI International, USRA and UMET, envisions a bright, innovative, future for the Arecibo Observatory performing high-quality science investigations, supporting STEM education at all levels, playing a crucial role in tourism and the local economy, and supporting investigations for government and commercial clients.</p> <p>Within the present draft EIS Scope proposed by NSF, we support the preliminary alternative that includes NSF "collaboration with interested parties for continued science-focused operations". A plan to achieve this vision was outlined in the Arecibo management team's response to the NSF Dear Colleague Letter (DCL) requesting Concepts for Future Operation of the Arecibo Observatory.</p> <p>Fulfillment of any of the various possibilities within the second and third options of the draft EIS Scope may be dependent on extensive changes to the Observatory, its facilities, and usage as well as all such developments documented, or implied, in the responses to the DCL. Should this be the case, they would appear to fall within the scope of the necessary EIS but are not included explicitly, or even implicitly, in the presented draft EIS Scope.</p> <p>These changes include, but are not limited to: major technical upgrades/extensions to the main telescope and/or other Observatory instrumentation; major rebuilding and extension of site infrastructure; and major increases in the numbers of visitors and the facilities, roads, and other infrastructure to support them. The environmental impact of these possible changes on the site and surrounding area should be included in the EIS.</p> <p>In all cases, it is apparent that some existing government property, potentially including buildings and other infrastructure, will no longer be required. The environmental issues related to appropriate dispositions should therefore also be included for all cases considered in the draft EIS.</p>	Resource Considerations	Email	6/22/2016	
180	Anthony P	van Eyken		<p>The preliminary alternatives to be evaluated in the Arecibo-related EIS comprised the following:</p> <ul style="list-style-type: none"> • Continued NSF investment for science-focused operations (NoAction Alternative) • Collaboration with interested parties for continued science-focused operations • Collaboration with interested parties for transition to education-focused operations • Mothballing of facilities (suspension of operations in a manner such that operations could resume efficiently at some future date) • Deconstruction and site restoration <p>While the first, fourth, and fifth may be impractical, unaffordable, or both, the second and third do not appear to encompass all actually suggested alternatives, let alone all possible alternatives.</p> <p>Besides future scenarios principally constructed around science and future scenarios principally constructed around education, there are apparently viable scenarios principally constructed around tourism.</p> <p>Given the iconic and unique nature of the Observatory such scenarios cannot be dismissed. To be viable, they would need to generate considerable increases in the number of visits to the Observatory, may require substantial new infrastructure, including a variety of rides and other attractions, and would be expected to have quite dramatic effects on the environment, including substantial socio-economic impacts, both positive and negative.</p> <p>While in no way endorsing such a development, I believe that the EIS needs to be comprehensive and that it cannot ignore viable alternatives especially where such alternatives have actually been suggested and discussed at some length.</p> <p>Thank you for the opportunity to contribute to this endeavor; please note that this is a personal contribution and may not reflect the views or intentions of my employer or of any groups to which I am affiliated.</p>	Resource Considerations	Email	6/22/2016	

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181	Eskil	Varenius	PhD candidate, Onsala Space Observatory / Chalmers University of Technology, Sweden	<p>Below I attach a brief summary of the role Arecibo has played in the studies of compact radio sources in the galaxy Arp 220. This work is still ongoing, and we plan to submit a comprehensive study of all available data (including many datasets with Arecibo) in the near future. However, since there is not yet a reference to the current work, we have instead tried to summarise the contributions of Arecibo leading up to the current work. We hope it can be of use.</p> <p>Title: The crucial role of Arecibo for multi-frequency monitoring of Arp 220 Authors: E. Varenius, J. Conway, and collaborators Text: The merging galaxy Arp 220 is the host of extremely intense star formation. In the 1990s, observations using very long baseline interferometry at 18cm wavelength discovered dozens of compact (<3 milli-arcseconds) sources thought to be supernovae (Smith et al. 1998) and supernova remnants (Lonsdale et al. 2006). Parra et al. (2007) successfully used Arecibo, together with the Effelsberg and Westerbork telescopes in Europe, to find the first evidence of detection of the compact sources in Arp 220 at wavelengths shorter than 18cm. This opened up for detailed studies of source spectra, as well as monitoring at multiple frequencies. Subsequent high-sensitivity monitoring enabled measurement of source sizes and classification of individual sources based on phases of supernova evolution (Batejat et al. 2011). Since then, the VLBI monitoring of Arp 220 have continued to deliver intriguing results (e.g. Batejat et al. 2012) and we are soon to submit a comprehensive analysis of the all available data. Arecibo was, with its high sensitivity, crucial for the initial 6cm observations by Parra et al. 2007 upon which all later multi-frequency studies build. In this way, Arecibo has proven crucial for multi-frequency studies of Arp 220, which offers a unique opportunity to learn about the physics of star formation and galaxy evolution in extreme environments.</p> <p>References: Smith, H. E., Lonsdale, C. J., Lonsdale, C. J., & Diamond, P. J. 1998, ApJ, 493, L17 Lonsdale, C. J., Diamond, P. J., Thrall, H., Smith, H. E., & Lonsdale, C. J. 2006, ApJ, 647, 185 Parra, R., Conway, J. E., Diamond, P. J., et al. 2007, ApJ, 659, 314 Batejat, F., Conway, J. E., Hurlley, R., et al. 2011, ApJ, 740, 95 Batejat, F., Conway, J. E., Rushton, A., et al. 2012, A&A, 542, L24</p>	Against Closure	Email	6/22/2016	
182	Dr. Bill	Vartorella	Craig & Vartorella, Inc. P.O. Box 1376 Camden, SC 29021 USA Tel.: 803.432.4353 Twitter: @racingelectrics	<p>“Arecibo Observatory: Translating Ripples in Spacetime into the Fabric of a Networked Sustainable Future for an Iconic Radio Telescope” By William F. Vartorella, Ph.D., C.B.C., KJ4ORX, Camden, South Carolina</p> <p>Arecibo, in a very real sense, has spawned a science as revolutionary as Galileo’s first observations with a rudimentary telescope. True to its purpose, it has sensed “ripples in spacetime,” those mysterious, posited gravitational waves--the Holy Grail of Einstein’s followers--that Albert Einstein predicted a century ago in his theory of general relativity. Arecibo Observatory, like space itself, needs to be flexible. This isn’t about NSF’s investigation of the “environmental impacts of potential Arecibo futures.” To quote Galileo, “All truths are easy to understand once they are discovered; the point is to discover them.” While NSF’s universe is one of flattened budgets and “red-shifted” funding disappearing over some financial horizon, Arecibo’s real challenge is to develop a new disruptive paradigm that addresses what scholars call the “cost-curve” of telescopes. U.S. \$10 million—just less than NSF’s and NASA’s combined annual funding--is roughly the size and challenge of the Green Bank Radio Telescope’s annual budget in West Virginia, another iconic ‘scope seeking money and partners.</p> <p>Yet the NASA funding to Arecibo at U.S. \$3.7 million is part of the broader Earth defense of detecting potentially Earth-destroying asteroids and comets. Moreover, Arecibo’s extraordinary facilities spearhead upper atmospheric research and the space environment to help us understand Climate Change. Ignoring its search for distant galaxies, signs of extraterrestrial life, and exo-planets, Arecibo serves as a cosmic oasis for some 20,000 students who visit it annually in debt-strangled Puerto Rico. Its STEM-related programs are hyper-critical as Hispanic students are grossly underrepresented in the hard sciences. (See, for example, the Puerto Rico Space Grant Consortium.) The conundrum is that decommissioning Arecibo could cost some U.S. \$100 million—which is roughly a decade’s worth of current funding for telescope operations. U.S. \$100 million is an achievable fundraising target for an endowment, particularly if Arecibo severs all ties and becomes a free-standing global Nongovernmental Organization (NGO). An endowment of U.S. \$100 million would generate roughly U.S. \$5 million in investment “interest” in a year—half the current Arecibo budget--which could be used as a creative “match” to attract long-term donors, corporate “underwriters,” and green/science foundations worldwide.</p>	Against Closure	Email	6/22/2016	

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183	Dr. Bill	Vartorella	Craig & Vartorella, Inc. P.O. Box 1376 Camden, SC 29021 USA Tel.: 803.432.4353 Twitter: @racingelectrics	<p>Positioned with an aggressive grant-generating policy with an institutional overhead of 40% and U.S. \$12 million in grants (cf. Arecibo's current NSF/NASA support levels) would yield nearly U.S. \$5 million. In short, an endowment + grants' institutional overhead + asteroid and comet detection and Arecibo Observatory becomes self-sustaining. And, to take one example, the grants and "contract support" do not strictly have to focus on esoteric radio astronomy. As an emerging NGO, Arecibo could determine access, partners, and help set the agenda for broader global imperatives for radio telescopes. Let us not forget, radio telescopes worldwide are at risk—Green Bank, Very Long Baseline Array, Kitt Peak, Parkes Radio Telescope (Australia). The need here and what would potentially resonate with global donors is a "flagship initiative" in which Arecibo becomes the iconic face of radio astronomy, particularly in the "Global South."</p> <p>With more than 100 radio telescopes worldwide that are or have been used for radio astronomy, these single dishes and interferometric arrays are uniquely positioned for funding, particularly as the "developing South" agitates for greater support, access, and prominence in Big Science. "Access" is fundable. Unfortunately, Arecibo is "prioritized" below other observatories such as Atacama Large Millimeter/Submillimeter Array. This needs to change. Arecibo is on the National Register of Historic Places and has potential as an UNESCO World Heritage Site, particularly as its restrictions on AM, FM, and TV transmissions within the four-mile access perimeter have effectively prevented intrusive development and negative impact on the flora and fauna of the nearby forests. Arecibo, in a very real sense, is a Sentinel, a canary in the coalmine of cosmic research and a guardian of local biodiversity. This underscores the potential for grants and donors and STEM research (and students and economic impact of 100,000 tourists per year).</p> <p>NSF has listed five possible outcomes, ranging from continuing current operations to dismantling the telescope and returning the site to its natural state. What we advocate (and propose) here is a more creative approach-- a "thought experiment." We need to think through the consequences. NSF seems to take the position that this is Schrödinger's cat: that Arecibo is indeterminately alive or dead. Our thinking here is to quantify the event through live donors, what NSF has detailed as finding "partners." They are not Dark Matter. Examples abound in the visual universe. Some high-profile, historic venues such as the Lowell Observatory have taken dramatic steps to ensure scientific and public access to new instruments (see, the Discovery Channel Telescope--DCT—a U.S. \$53 million "fusion of research and outreach"). The Vatican's Advanced Technology Telescope (VATT) outside Tucson, Arizona has a strong "Friends" component (a model that should be followed by all existing scopes of varying form and function), which apparently is developing, to borrow the words of Don Keel (co-author of Funding Exploration) a cadre of donors with connectedness (involvement with the observatory), clout (access to philanthropic sources and/or corporate leadership + influence with sources to which s/he has access), and capacity (identified ability to give). While most observatories would salivate over the "windfall" of the Gordon and Betty Moore Foundation grant to California Institute of Technology and the University of California (Oakland) for U.S. \$7.5 million each over 15 months to complete the Thirty Meter Telescope, the grim reality is "Big Science" often requires a "Big Idea" with a "Big Supporter." Funding shortfalls aside, Paul Allen stepped up to create the Allen Telescope Array—a joint effort by the SETI Institute and the Radio Astronomy Laboratory at the University of California, Berkeley to construct a radio interferometer suitable for a multitude of observations, plus the search for "ET." Simply put, for public institutions, a "red shift" from "state-supported" (largely tax-based) model to "state-assisted," in which institutions, departments, and faculty compete for a diminishing number of Federal and largely-non-existent State dollars. What observatories such as Arecibo face is a combination of "donor fatigue," the lack of an urgent, compelling, interesting Case for Support capable of attracting New Economy money (entrepreneurial and risk-taking), and a systematic approach to competing for STEM grants (Science, Technology, Engineering,</p>	Alternative Consideration	Email	6/22/2016	

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				<p>With perhaps 50 defunct or nearly-so observatories dotting the landscape from the Midwestern cornfields to worldwide venues with exotic names such as Nizhny Novgorod (former Gorky) with its rusting relics of radio astronomy or Mohon del Trigo, Spain, whose facility was displaced by new observatories—radio and optical, it should come as little surprise that part of the expensive “red shift” in U.S. dollars have been replaced locally in the Far East, as the Asian Century ratchets into high gear. In Guizhou, China, FAST (Five Hundred Meter Aperture Spherical Telescope) is under construction with a projected completion date of late 2016. It is touted as the world’s largest and most sensitive radio telescope—an estimated three times more sensitive than the Arecibo Observatory. (Operate at 300 MHz to 5.1 GHz).</p> <p>Competition abounds. Yet, employing a decadal analysis, these corporate donors emerge for “Observatories, Planetariums, Physics, Astronomy”—Fireman’s Fund Insurance Co., Genentech, Inc., Norton Co., Sedgwick, James, Inc., Toshiba America Foundation, Phillips Petroleum Foundation, Allied Signal, ARCO Chemical, Barnes Aerospace, Beech Aerospace, Boeing, EG&G Aerospace, Grimes Aerospace Foundation, Kaman Aerospace Corp. Giving Program, Sundstrand Corp. Aerospace Foundation, and Toyota USA (also active in STEM), etc. Scientific organizations are also potential funding sources, especially as companies such as Air France, Nestle, Unilever, Union Bank of Switzerland, and a host of mineral extraction, pharmaceuticals, and shipping companies support some arcane and typically low-profile academic societies. The same is true on the “mentorship” front: BP America, Michelin No. America, Beretta Corp., CIBA-GEIGY Corp., Glaxo Wellcome Foundation—name changes are relatively common in this environment, but the point here is made. (An interesting study would be a 50-year retrospective exploring all the companies—such as Union Carbide—which, at one time or another—expressed interest in or actively supported radio astronomy in the U.S. or abroad. These all deserve “revisiting” with strong proposals matching their current—if any—interest either in radio astronomy or broader, community-based STEM support.)</p> <p>An excellent example of the counter-intuitive, highly-restrictive, but financially luscious “trustee discretionary grants” are those occasionally served up by the W.M. Keck Foundation, perhaps best known for its Special Project, the Keck Observatory, home to the twin 10-meter Keck telescopes near the summit of Mauna Kea, Hawaii. Other Special Projects—“exclusively initiated by the Board of Directors”—include the intriguing Institute for Space Studies — California Institute of Technology (www.kiss.caltech.edu). “The Institute combines the brainstorming of new ideas on space science and technology with follow-up research and development.” (For a broader discussion, also see www.wmkeck.org, which indicates scientific, engineering, and regional interests.)</p> <p>And, if the late Carl Sagan is to be believed, the definition of an “advanced civilization” is “one able to engage in long-distance radio communication using large radio telescopes.”</p> <p>NRAO has embraced “Google Sky” as part of its educational outreach; radio sky images would be a natural outgrowth as an overlay to that “one-pixel backyard” that many amateur radio enthusiasts take a decade or so to “map” via home-brew radio telescopes. Equally interesting are proclamations that next-gen large radio telescopes at frequencies below 100 (or so) MHz will exploit wide-band dipole-like antennas, each with a receiver instrument and linked via digital signal processing. “Galactic-noise-be-damned,” if proponents are to be believed, as noise can be mitigated, perhaps when such antennae are employed as compact array elements.</p> <p>Our recommendations, then, are these:</p> <ol style="list-style-type: none"> 1. Re-purpose Arecibo Observatory as a free-standing, global NGO, with “flagship” status for radio telescopes in the Global South. Make it the networked bridge to the cosmos. 2. Bring meaning, motive, and method to the “squiggly lines” of radio astronomy through an urgent, compelling, and interesting Case for Support that embraces disruptive technologies as the central clearinghouse and waystation for STEM, young scientists in developing settings, and next generation of earth-based radio astronomy observatories. 3. Embrace the Asian Century and the New Money donors worldwide who have a long-range vision for New Frontiers of Knowledge. Recognize that innovation often occurs at the interface of non-monetized ideas (but push for contracts and causes, regardless). 4. Create a two-tiered global Board, with the “wealthy, wise, workers” bringing cash and conviction to an expanded Scientific Advisory Board, who seek to know the unknowable. 5. Cultivate Foundations—STEM projects, perhaps tied to the International Space Station, space-based Earth Observation of the rainforests, student-based searches for Pulsars (cf. Green Bank), and innovative small RadioJOVE, etc. projects initiated by KP4AO A.R.C. 6. Develop budgets whose 40% Institutional Overhead will enable timely, sustainable upgrades to Arecibo Observatory and its (emerging) consorsial networked partners. 7. In the short term, move to decrease NSF’s financial burden (and NASA’s) to less than 50% of the total Budget, with an independent Five-Year Plan for aggressive science and a free-standing Endowment. An immediately-fundable baseline would include support for Hispanic Scientists/graduate students and STEM projects. <p>Galileo Galilei gets the last word: “In the future, there will be opened a gateway and a road to a large and excellent science into which minds more piercing than mine shall penetrate to recesses still deeper.”</p>				

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				<p>Selected References:</p> <p>Doty, Arch W7ACD. "Those Mysterious Signals: They may sound like noise to us, but to radio astronomers they are the desired signals." QST, October 2012, 37-39.</p> <p>Ekers, R.D. "The Future of Astronomy." Paper [73.01] delivered at AAS 199th meeting, Washington, DC, January 2002.</p> <p>Ferris, Timothy. Seeing in the Dark: How Backyard Stargazers Are Probing Deep Space and Guarding Earth from Interplanetary Peril. New York: Simon & Schuster, 2002.</p> <p>Hall, Jeffrey. "Director's Update," The Lowell Observer: The Quarterly Newsletter of Lowell Observatory, Issue 97, Spring 2013, 2.</p> <p>Matthews, Christine M. "The Arecibo Ionospheric Observatory." Congressional Research Service, February 23, 2012, [Summary], no page number.</p> <p>Munns, David P.D. A Single Sky: How an International Community Forged the Science of Radio Astronomy. Cambridge, MA: The MIT Press, 2013.</p> <p>"New Grants." The Chronicle of Philanthropy, April 11, 2013, 36.</p> <p>Sagan, Carl. The Cosmic Connection: An Extraterrestrial Perspective. Papermac, 1981.</p> <p>Vartorella, William F. and Keel, Donald S. Funding Exploration: the Challenge and Opportunity for Funding Science and Discovery in the 21st Century. Warren Center, PA: Marco Polo Monograph Series # 9, July, 2004.</p> <p>Vartorella, William F. "Exploiting the New Space Economy: Cryptocurrency, CubeSats, and Atypical Consortial Alliances in a Rural Broadband Setting." Delivered before the Northeastern Kentucky and the Broadband Economy Conference, Morehead State University, Morehead, Kentucky, 10 November 2014. Keynote Address.</p> <p>_____. "From the Earth to the Moon: 'Barbicane,' 'Nicholl,' and Jules Verne's Adversarial 'Model' for Venture Capital." Delivered before the 2014 Aerospace Industry Day, Morehead State University, Morehead, Kentucky, 29 April 2014.</p> <p>_____. "Beyond RadioOVE: a Case for a COSMIC Paradigm Shift to Embrace A Community-Based, All-Wavelength Funding Model that Showcases Small Instruments, Old Observatories, and Linked Research Agendas," pp. 6-1 to 6-17 in Proceedings of the 2013 SARA Conference held at National Radio Astronomy Observatory, Green Bank, West Virginia, July 14-17, 2013.</p> <p>_____. "Lost Horizon"—Manned Missions focused on Nanotechnologies, Astrobiology, Space Telescopes, and Advanced Materials will Re-define NASA and NewSpace." White Paper, The National Research Council Committee on Human Spaceflight, July, 2013.</p> <p>_____. "Venture in a Vacuum: NewSpace and the Plight of the 'Explorer-Investor." White Paper, AIAA Commercial Space Group, May, 2012.</p> <p>_____. "The New Space Race: The Quest for Venture Capital for Small Satellite Technologies." SatMagazine, Vol. 4, No. 12 (March, 2012), pp. 34-40.</p>				
184	Haley	Wahl		<p>I write to strongly urge that NSF choose alternative 1 of its "Notice of Intent to Prepare an EIS... ", namely "Continued NSF investment for science-focused operations (No-Action Alternative)." I do so in my role as an undergraduate researcher.</p> <p>Ever since I was a child, I have always had a strong interest in the sky. Stargazing has been a hobby ever since I was little and as I grew older, I developed a strong interest in astronomy. This interest led me to pursue formal astronomy research at the University of Vermont, where I began working with Dr. Joanna Rankin on pulsar research in the fall of my freshman year and have been for the past three years. During my first semester conducting research, I had the opportunity to travel to Arecibo for the first time for a NANOGrav conference. There I was able to meet many incredible scientists in the field who shared my passion for astronomy and while at the site of one of the most amazing instruments in the world. I was fortunate enough to return to Arecibo the following December and during that time, was able to do on-site observations from the control room, walk on the catwalk and under the dish, and really experience everything about the telescope. Since then, I have been able to do multiple remote observations with the telescope for a variety of different research projects.</p> <p>My experiences at Arecibo are ones that have greatly changed who I am as a person and have immensely shaped my future career path. Being at the observatory itself and being around people that share my passion has really made me realize that astronomy is the field that I want to go into. The NANOGrav conference I attended brought together scientists from all over the world who came together to use the instrument and attending the conference allowed me to do a great deal of networking and allowed me to meet people I could have possible collaborations with in the future and possibly work with in graduate school. Having the ability to travel to Arecibo, make both on-site and remote observations, and connect with others who use the instrument, so early in my astronomy career has opened countless doors in terms of my future in astronomy. I am currently working on multiple projects that require very precise pulsar observations and my work would not be possible without the amazing capabilities of Arecibo. The telescope itself and the science it conducts have inspired me to pursue radio astronomy as a career and the work I hope to do in graduate school and beyond would be greatly aided by the amazing capabilities of Arecibo.</p> <p>I am so thankful that Arecibo has allowed me to build the connections I have and to gain the experience I will need for my future in astronomy. It has been a crucial part of my undergraduate research career and hope that in the future other undergraduates will have the same opportunities that I have had and be as inspired by the telescope as I was the first time I laid eyes on the dish, a feeling of amazement and inspiration I continue to feel each time I use the telescope.</p>	Against Closure	Email	6/22/2016	

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185	Joel	Weisberg	Stark Professor of Physics and Astronomy and the Natural Sciences Carleton College Northfield, MN 55057 USA email: jweisber@carleton.edu phone: (507) 222-4367	<p>I write to strongly urge that NSF choose alternative 1 of its "Notice of Intent to Prepare an EIS . . .", namely "Continued NSF investment for science-focused operations (No-Action Alternative)."</p> <p>Impact of Arecibo Observatory on Research</p> <p>As a scientific user of Arecibo Observatory for over 44 years, I can attest to its historical and continuing importance for studies of general relativity, pulsars, and the interstellar medium. Its enormous collecting area (the largest in the world) has been and continues to be crucial in studies of faint objects such as pulsars. Most importantly, although the facility is over fifty years old, it has undergone two major upgrades, each of which created an essentially new, far more powerful telescope. Consequently it remains in the prime of its scientific life, still able to make important and useful scientific discoveries.</p> <p>While most radio astronomers now use multiple-dish interferometers for their observations, there remains an important need for large single dish telescopes such as Arecibo, for observations of objects too faint to be studied with interferometers. I will cite a prime example from my own research. For thirty-eight years, I have been involved in observations of the first binary pulsar, B1913+16, which earned its discoverers Joseph Taylor and Russell Hulse a Nobel Prize. It was too faint to be discovered by any other telescope in 1974. It is also so faint that essentially all useful observations of it have been done from Arecibo, despite the fact that it is a crucial object for the study of general relativity. For example, it was Arecibo observations of this object that first demonstrated the existence of gravitational waves, thus paving the way for this year's stunning LIGO detection of them. Even today, we continue to observe this object from Arecibo and to derive from these observations new, meaningful measurements of general relativistic phenomena. For example, our latest observations and analyses were just accepted by Astrophysical Journal (J.M. Weisberg and Y. Huang, "Relativistic Measurements from Timing the Binary Pulsar PSR B1913+16," Astrophysical Journal, in press). Furthermore, there is more to learn from this system in the future, and Arecibo will remain the only telescope able to adequately observe it for at least the next several years.</p> <p>I could cite several other examples of the role that Arecibo alone can play in my other research, and many others can and will do so. The telescope remains a unique, powerful, and flexible instrument for the 21st century.</p> <p>Impact of Arecibo Observatory on Education</p> <p>I have traveled regularly to Arecibo Observatory for over 44 years, often in the company of students. The observatory is a profoundly inspiring installation for its users, and especially for students. Many of my students have been powerfully motivated to pursue scientific careers by their visits to the observatory. I will cite a recent trip as an example. A colleague and I brought seven students from a variety of institutions to the observatory for a week of study and observations. The observatory staff presented tutorials on a wide variety of topics related to observatory research, while the two tour leaders taught the students how to carry out radioastronomical observations, which the students then did. Because of the unique hands-on nature of the observatory, we were able to take the students behind the scenes and show them the full nature of the data gathering process, from antenna through radio receivers and into digital data acquisition devices. They connected an oscilloscope to the telescope in order to view a pulsar pulsing on the screen in real time, saw the complexities of the observatory's atomic clock, and helped to gather data for a real pulsar experiment. There is simply no substitute for the direct experience of the workings of an observatory, and indeed one student participant noted that the week had changed his life.</p>	Against Closure	Email	6/22/2016	
186	Qihou (Herb)	Zhou	Professor & Chair Electrical & Computer Engineering Dept.; 260F Garland Hall; Miami University; Oxford, OH45056; Phone: 513-529-0743	<p>I am a professor at Miami University. I support unequivocally the first option "Continued NSF investment for science-focused operations (No-Action Alternative)" in the recent EIS regarding Arecibo. I would like to elaborate the value of Arecibo for atmospheric and ionospheric studies. Simply put, Arecibo is an irreplaceable national jewel. Any attempts to duplicate the capabilities for atmospheric/ionospheric studies alone will take hundreds of millions of dollars.</p> <p>I have been an active Arecibo user dating back over 30 years. I would like to testify that Arecibo is the only facility that can study the atmosphere continuously from the ground level to several thousand kilometers. This unmatched capability makes it a primary instrument in studying our spatial environment, including climate change. One indicator of climate change lies in the upper atmosphere temperature from 100 km to 600 km. As the surface temperature rises, the upper atmosphere cools. While ground temperature has significant local variations, the upper atmosphere temperature is more homogeneous. Clearly, the longer the data is available, the easier it is to discern any long-term trend. Continuous operation of Arecibo is important to understand climate change and our spatial environment.</p> <p>The unique capabilities afforded by the Arecibo incoherent scatter radar (ISR) in studying our atmosphere and ionosphere include:</p> <ul style="list-style-type: none"> - Arecibo ISR is the only instrument that can study consistently the ionospheric D-region from 60-90 km and the topside above 1000 km. - Arecibo ISR is the only instrument that can study day-time ionospheric plasma line consistently. - Arecibo ISR is the only instrument that can detect night-time plasma line. - Arecibo ISR is the only ground based instrument that can study the connections of inter-hemospheric photoelectrons. - Arecibo ISR, along with the on-site lidar and optical instruments, is the best place to study dynamic coupling from near ground level to 1000 km. - There is no dispute that Arecibo ISR is the most versatile ground-based instruments for ionospheric studies, ". . .". 	Against Closure	Email	6/22/2016	

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187	Qihou (Herb)	Zhou	Professor & Chair Electrical & Computer Engineering Dept.; 260F Garland Hall; Miami University; Oxford, OH45056; Phone: 513-529-0743	<p>I am a professor at Miami University. I support unequivocally the first option "Continued NSF investment for science-focused operations (No-Action Alternative)" in the recent EIS regarding Arecibo. Each year, Miami has about 20-25 undergraduate/graduate students visiting Arecibo or working with Arecibo data.</p> <p>The Arecibo Observatory inspires many undergraduates engaged in the STEM fields. Miami University has an annual faculty-led winter study-away workshop using the Arecibo facility. Students come to the observatory to take and analyze the data, and to experience the local culture. In 2015 and 2016 there were 14 and 19 students, respectively, participating in the Miami-Arecibo workshops. Additionally, there are another 5-8 Miami students working on capstone and research projects using the Arecibo data every year. I will continue to lead Miami in the Arecibo study-away workshops in the coming years.</p> <p>The following is an excerpt from the reflection essay of one Miami student participating in the Jan. 2016 workshop: "All in all the experience of visiting Arecibo Observatory was extremely humbling and awe inspiring. To think that in the 1960's that such an observatory could have been designed and built is truly amazing. What is even more exhilarating is to think of all the findings that originated from this observatory and how it's shaped the world as we see it today. Doing something as simple as walking around control room and seeing all the photos compiled from the radar of distant comets and asteroids was very surreal and inspiring. I am extremely thankful for the chance to visit such a facility and see this extreme engineering feat for both mechanical and electrical engineers alike. I hope to one day revisit the facility and to see what new mysteries of the universe that have been uncovered. Hopefully one day I'll play a small part in one of them myself."</p>	Against Closure	Email	6/22/2016	
188	Elizabeth A. K.	Adams		<p>This letter is in response to the Federal Register Notice of an EIS evaluating the potential environmental effects of proposed changes to operations at the Arecibo Observatory. I strongly request NSF to choose Alternative 1 of its "Notice of Intent to Prepare an EIS...", namely "Continued NSF investment for science-focused operations (No-Action Alternative)."</p> <p>I completed my PhD in 2014 with a dissertation based on data collected with Arecibo as part of the ALFALFA HI survey. Thanks to the Arecibo data, I undertook groundbreaking research identifying nearby low-mass galaxies that had been overlooked previously because most of their mass is in gas rather than stars. In addition, I was trained as a radio astronomer with Arecibo data, including many trips to Arecibo for observing experience and interaction with the support staff. I am currently a postdoctoral researcher and am applying the skills I learned from the use of Arecibo to other future radio surveys.</p> <p>In addition to my own education being strongly dependent on Arecibo, I had the opportunity during my PhD to mentor undergraduates and teach them radio astronomy through the Undergraduate ALFALFA Team (UAT). The UAT is a consortium of primarily undergraduate-only institutes (including Puerto Rican institutes) designed to involve undergraduate students in cutting edge scientific research. Through this program, undergraduate students are brought to Arecibo, trained to observe and participate in the data reduction and analysis of the ALFALFA survey. Importantly, the students are engaged in actual scientific research, gaining experience in how to formulate scientific questions and address them when the answers are not known. This critical aspect would be lost if Arecibo transitioned to an education-focused facility.</p> <p>Arecibo is also a landmark for the island of Puerto Rico. Over a hundred thousand people visit Arecibo every year, with almost a third of those visitors school children. A visit to Arecibo is inspiring - both for the impressiveness of human ingenuity and engineering in constructing it but also for the knowledge that the telescope is currently being used to increase our understanding of the Universe.</p> <p>In summary, I believe the continued scientific operation of Arecibo has a strong positive cultural and educational impact.</p>	Against Closure	Email	6/23/2016	

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189	Yolián	Amaro-Rivera		<p>I write to support NSF's alternative 1 of "Continued NSF investment for science-focused operations (No-Action Alternative)" for the Arecibo Observatory.</p> <p>The Arecibo Observatory has had some of the greatest impacts in my professional, academic, and personal life. Growing up in a rural area of Puerto Rico, the fact is there were no professionals in science or engineering to look up to. When I was about 7 years old, my parents took me to visit the Arecibo Observatory, and it was that same day that I decided I wanted to become an engineer. Later, when I was pursuing my undergraduate degree in Computer Engineering at the University of Puerto Rico at Mayagüez, I had the incredible opportunity to be part of the summer research program at the facility, and thus interact with well-known scientists and engineers. From this experience, I became interested in graduate school, and the skills and knowledge I obtained at Arecibo helped me get into my current graduate program.</p> <p>As a Puerto Rican in science and engineering, there are more positive contributions the Arecibo Observatory provides to the world than I could possibly list here. For example:</p> <ul style="list-style-type: none"> • It is an attractive well-known facility that many young students visit each year, which can impact the lives of these kids the way it did with me by exposing them to state-of-the-art work in the atmospheric sciences, astronomy, and engineering. • Each year, a group of undergraduate students have the opportunity to conduct research at AO, which allows them to obtain important skills that they can use in many different areas. • It represents one of the most attractive touristic locations in the island because of its history, size, interactive Visitor Center, and appearance in iconic movies. • It is the source of great discoveries, including the 1993 Nobel Prize obtained by Russell Hulse and Joseph Taylor for discovering a pulsar binary system. • It represents an opportunity for global collaboration between scientists and engineers. • It also gives the island international recognition, which attracts tourists and supports the island economy. <p>At a historic time when other foreign countries are doubling down on similar scientific institutions, keeping the Arecibo Observatory (which is on US soil) alive would be crucial if the United States of America intends to remain relevant at the cutting edge of science and innovation, both at national and international levels.</p> <p>The Arecibo Observatory continues to be one of the most important, powerful institutions to conduct research in atmospheric and space sciences. Many Puerto Ricans have been working at this facility for years, and losing their jobs during the economic crisis the island is currently facing would be devastating for many families. Teaching in my home island while conducting research at the Arecibo Observatory after finishing my PhD is my biggest goal and I am sure that many other Puerto Ricans have dreamed about working there someday.</p>	Against Closure	Email	6/23/2016	NSF_letter.doc
190	Jason W.	Barnes	Chair, Division for Planetary Sciences American Astronomical Society	<p>On behalf of the Division for Planetary Sciences (DPS) of the American Astronomical Society, I wanted to inform you of a relevant resolution that passed without any dissenting votes by the general membership at our annual meeting last fall in National Harbor, Maryland on 2015 November 11. The resolution reads: The Division for Planetary Sciences of the American Astronomical Society hereby recognizes the importance of the Arecibo Observatory and its planetary radar capability to our science and to planetary defense issues. We strongly encourage all of the concerned institutions to work together to resolve Arecibo's budgetary and other issues so that the Observatory can continue to be a scientifically productive facility for planetary science, radio astronomy, and atmospheric studies.</p> <p>Please let me know if you have any questions about the importance of Arecibo Observatory to the Planetary Science community, as I would be happy to help in any way that I can.</p>	Against Closure	Email	6/23/2016	Arecibo_NSF.pdf

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191	Dr. Lance A. M.	Benner	<p>Mail Stop 183-601 Jet Propulsion Laboratory California Institute of Technology Pasadena, CA 91109</p> <p>Phone: 818-354-7412 Email: lance.benner@jpl.nasa.gov Asteroid Radar Research Website: http://echo.jpl.nasa.gov/</p>	<p>This is a letter to express my strong support for continued operations of the Arecibo Observatory (the No-Action Alternative). As a scientific user of the Observatory since 1998, Arecibo has played a crucial role in my research on the physical properties of near-Earth and main-belt asteroids.</p> <p>Arecibo is the most sensitive planetary radar in the world by a factor of twenty relative to NASA's Goldstone Solar System Radar, the world's second most sensitive radar. Arecibo's range is double that of Goldstone, and despite its restricted pointing, significantly more asteroids are observable at Arecibo than at Goldstone. For example, in 2015 95 near-Earth asteroids were observed at Arecibo versus 39 at Goldstone. More generally, in a paper we recently submitted to the Astronomical Journal (S. P. Naidu, L. A. M. Benner, et al., in press), we found that Arecibo could, in principle, observe more than 250 near-Earth asteroids annually, so the observatory's radar capabilities are actually significantly underutilized.</p> <p>Two recent National Research Council reports have expressed strong support for continuing the planetary radar program at Arecibo: the 2010 "Defending Planet Earth" report led by Dr. Irwin Shapiro at the Harvard-Smithsonian Center for Astrophysics and the recent Planetary Science Decadal Survey.</p> <p>Tracking and characterizing near-Earth asteroids became part of United States National Space Policy in 2010 (https://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf), as formulated by the White House Office of Science and Technology Policy, and part of NASA's charter (https://www.nasa.gov/offices/ogc/about/space_act1.html), also updated in 2010. Thus, observations of near-Earth asteroids, with Arecibo as a key asset, is a national priority defined not only by multiple panels of planetary scientists with expertise in asteroids and comets but also by the White House.</p> <p>Scientific interest in near-Earth objects is increasing rapidly and the field is experiencing dramatic growth. This is attracting numerous undergraduate REU students and PhD students. In the last several years, observations at Arecibo have been utilized in Ph.D. theses by former and current students Michael Busch (Caltech), Shantanu Naidu (UCLA), Julia Fang (UCLA), Yu Takahashi (Univ. of Colorado), Anne Virkki (Univ. of Helsinki, Finland), Sean Marshall (Cornell), Agata Rozek (Univ. of Kent, UK), Adam Greenberg (UCLA), Jenna Crowell (Univ. of Central Florida), Tracy Becker (Univ. of Central Florida), and Alessandra Springmann (Univ. of Arizona).</p> <p>Arecibo has played a key role in support of numerous asteroid and comet robotic spacecraft missions by characterizing the properties of the targets and improving their orbits. Arecibo has made important contributions to the following missions: Dawn at Vesta and Ceres; NEAR-Shoemaker to asteroids Mathilde and Eros; EPOXI at Comet Hartley 2, where Arecibo played a crucial role with navigation of the spacecraft shortly before the flyby; JAXA's Hayabusa mission to asteroid Itokawa; the OSIRIS-REx mission to asteroid Bennu (scheduled for launch in September 2016); the proposed ESA/NASA Asteroid Impact Mission/Double Asteroid Redirect Test missions (AIM-DART), and NASA's proposed Asteroid Retrieval Mission (ARM). For the AIM-DART missions, currently in "Phase A" with both ESA and NASA and expected to enter "Phase B" later this year, Arecibo will play a vital role by observing the result of the impact between the spacecraft and the asteroid in October 2022. Diameters of near-Earth asteroids observed by Arecibo are also helping calibrate results from NASA's Wide-field Infrared Observer (WISE) mission. Those, in turn, form the foundation of our knowledge for the size-frequency distribution of the near-Earth population.</p> <p>Recently, the exciting discovery of fast radio bursts and gravitational waves have opened up new fields where Arecibo's unparalleled sensitivity could make major contributions. Rather than contemplating closure of the facility, the real discussion we should be having is how to augment its capabilities to exploit these important scientific discoveries.</p> <p>Due to its iconic status and the major discoveries that have occurred there, tens of thousands of Puerto Rican students visit the observatory annually. The Observatory is also a major tourist attraction and provides arguably the most effective venue for scientific outreach in the Caribbean. The observatory has provided some of the best scientific and engineering jobs to Puerto Ricans for decades and is a major employer locally, which is particularly important given the current economic crisis on the island.</p> <p>Arecibo is also an outreach engine for astronomy public outreach. Press releases describing new radar images of near-Earth asteroids at Arecibo are viewed by millions of people and appear widely on major online news websites.</p>	Against Closure	Email	6/23/2016	

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Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
192	Dr. Lance A. M.	Benner	<p>Mail Stop 183-601 Jet Propulsion Laboratory California Institute of Technology Pasadena, CA 91109</p> <p>Phone: 818-354-7412 Email: lance.benner@jpl.nasa.gov Asteroid Radar Research Website: http://echo.jpl.nasa.gov/</p>	<p>In addition to its significance as an astronomical observatory, Arecibo Observatory is home to the US federally-endangered Puerto Rican broad-winged hawk, which occurs only on Puerto Rico. This species has been documented at the Observatory for many years by knowledgeable observers using the "eBird" online database of world-wide bird observations (for example, see http://ebird.org/ebird/hotspot/L682836?yr=all&m=&rank=mrec&sortBy=spp and links therein). An additional 12 endemic bird species found only on Puerto Rico breed regularly at the Observatory, and a thirteenth, the Puerto Rican Parrot, which is among the most endangered birds in the world, has been released nearby at Rio Abajo State Forest as part of a breeding program. The contiguous tract of relatively undisturbed forest between Rio Abajo and the Observatory are key elements in recovery efforts for that species.</p> <p>In summary, I urge strong support for continued operations at Arecibo Observatory. Its closure would be incredibly short-sighted given its substantial scientific potential for future discoveries. Due to its unique capabilities, the Arecibo Observatory is a globally-significant facility and the whole world will lose if it closes.</p>	Resource Considerations	Email	6/23/2016	
193	Donald B.	Campbell	<p>Professor of Astronomy Space Science Bldg. Cornell University Ithaca, NY USA 14853</p> <p>Tel: 607 255 9580 e-mail: campbell@astro.cornell.edu</p>	<p>The Arecibo telescope is still by far the largest single dish radio telescope in the world and its collecting area combined with high quality instrumentation is a resource that should not be abandoned. As Arecibo's history has made clear, big telescopes do make big discoveries. The Chinese FAST telescope may eventually have about 1.6 times the sensitivity of Arecibo but the difference is small and not a reason to deprive US scientists of access to a telescope with Arecibo capabilities.</p> <p>Four areas of astronomical research for which Arecibo plays a critical role are:</p> <p>Gravitational waves: It is widely accepted that precision timing of selected pulsars has the potential to detect gravitational waves in a different frequency regime than the one that LIGO is sensitive to. The Division of Physics (with a contribution from Astronomy) has provided extensive funding for the North American Nano-Hertz Gravitational Wave Observatory for this purpose. Given its sensitivity, Arecibo plays a critical role in this endeavor in both finding new millisecond pulsars that can be accurately timed and in the precision measurement of pulsar arrival times. Even if Arecibo's entire budget from AST were just to support the pulsar search and timing effort it would be well worth it given the possibility of such a giant payoff. Fast radio bursts: A recently published paper (Spitler et al, Nature, 531, 202-205, March 2016) makes clear Arecibo's unique capability to study the enigmatic Fast Radio Bursts. Cosmology: Arecibo's sensitivity and relatively small beam area also makes it the only U.S. instrument capable of determining the volume density of small gas bearing haloes in the local universe by sampling a sufficiently large area of the sky. Solving the problem of the ubiquity of these haloes has strong implications for the currently preferred cosmological model. Near-Earth asteroids: Radar studies of near-Earth asteroids provide critical astrometric and characterization information about these scientifically interesting and potentially hazardous objects. While NASA is providing ~\$3.9M per year to support this program at Arecibo its continuation is very dependent on the overall health of the telescope and the observatory. Education: Arecibo is one of the very few large radio telescopes that still allow "hands on" observing, often remotely but also sitting in the telescope's control room. This makes it a tremendous learning environment for students, graduate and undergraduate. A number of graduate students working with me have spent time at Arecibo. Hundreds of undergraduates have participated in the NSF supported ALFALFA Undergraduate Program either visiting Arecibo or using it remotely. A large number of students have used Arecibo remotely through the Arecibo Remote Control Centers (ARCCs) at U. of Texas at Brownsville, U. of Wisconsin at Milwaukee and at Franklin&Marshall College. All of these promote STEM at, primarily, undergraduate universities. Hundreds have gone through Arecibo's REU program many of who went on to graduate studies in astronomy. Finally, there are the ~100,000 visitors per year, primarily from Puerto Rico including many thousands of school children, who gain some appreciation of scientific research through the visit.</p> <p>The Gregorian upgrade to the Arecibo telescope completed in 1997 was, perhaps, the most radical modification of the large telescope that has ever been done. It resulted in a very modern telescope with tremendously enhanced capabilities. The installation of the 7-beam ALFA system, the only multi-pixel cm wavelength system on a US telescope, in 2004 further increased these capabilities.</p> <p>The NSF needs to find a means by which Arecibo can continue as a critically needed telescope for the nation's astronomers and as an outstanding educational resource.</p>	Against Closure	Email	6/23/2016	NSF Arecibo EIS letter June 23 2016.pdf

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Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
194	Al	Clayton		<p>First allow me to say "kudos" for allowing public input into these decisions. I am not a professional scientist by any means, but have an extensive science background. I am also a former student of Dr. Kerr's, from his final days at Boston University.</p> <p>That being said, I think the public would best be served if Arecibo could endeavor to relate its science directly to the average American. Science has a very bad reputation among the ignorant in this country; they just can't understand it or the need for it; or they are all so close minded. (& when I point to things they use everyday like GPS I am scoffed at)</p> <p>I think you need to educate the average American (most likely at a 5th grade level) and inspire the children. My kids are 6 & 4 and love the sky, space, planets, stars, moon, and ask questions. I'm afraid most parents don't have the right answers.</p> <p>People need to understand why the science you are doing is important and what it means to their daily lives. This is no easy task. Americans are irrationally skeptical of science, look how many people believe Creationism should be taught with evolution! I think it's necessary to connect with the general public and relate to them what your science is doing for them.</p>	Against Closure	Email	6/23/2016	
195	James	Cordes	George Feldstein Professor of Astronomy Cornell University Cornell	<p>I am an astrophysicist who has used the Arecibo Observatory for more than 40 years, first as a graduate student, then as a post doc, and for the last 36 years, as a professor at Cornell. As a professor I have trained over 20 PhD students who have used Arecibo as part of their dissertation research, including two students who have finished in the last year. Cornell has had a Research Experience for Undergraduates program since 1989 and I have typically had two students per summer work on Arecibo-related research. The common thread to my research that also is highly attractive to students is discovery science at radio wavelengths. As the world's largest reflector, Arecibo plays center stage in these activities.</p> <p>I am involved in two large collaborations that make heavy use of Arecibo: the Pulsar ALFA (PALFA) Consortium and NANOGrav, the North American Nanohertz GravitationalWave Observatory. Letters from these consortia are being sent separately so my only comment here is to emphasize that Arecibo has a primary role in the activities of these groups. NANOGrav in particular relies on regular timing of pulsars as part of its effort to detect gravitational waves. Arecibo (along with the Green Bank Telescope) are the best radio telescopes in the world for use in GW detection using pulsars. Of great importance is the stability of Arecibo's performance in achieving high timing precision (since the signal we are looking for is very weak). Also key is access to the telescope because we need highcadence observations (monthly in some cases, weekly in others). It is doubtful that adequate time will be available on the FAST telescope being built by China for these kinds of observations. The PALFA Consortium does an ongoing survey for pulsars with the goals of finding neutron stars in binary systems with other neutron stars (and potentially a black hole); also finding new members of the special class of pulsars (those rotating with millisecond periods) that are needed to further NANOGrav's mission'; and also finding 'transient' signals. We have been successful in all of these categories.</p> <p>Most notable is our discovery of a fast radio burst that comes from outside our galaxy but is otherwise an enigma; we do not know what produces it. More such bursts need to be discovered and PALFA has improved its algorithms for finding such bursts in the data taken. More recently, we found by monitoring the same sky position of the original burst that it was emitting repeated bursts. This was a landmark discovery and has gotten great notice from around the world after its publication in Nature magazine.</p> <p>Very recently (2016 February), a group of us led by Professor Brian Jeffs at Brigham Young University submitted a proposal to NSF Astronomy's Midscale Innovation Program (MSIP) to build a new phased-array feed (ALPACA) for Arecibo that would dramatically enhance our efforts to find more pulsars and fast radio bursts. Phased array feeds for radio astronomy are at the technology forefront so they are of interest solely from a technical point of view but the driver is Arecibo science. The review panel ranked our proposal very highly and it is poised for funding after going through a very competitive review. The program officer has informed us that the project is fundable and that funds are being held in reserve. Evidently the reviewers saw significant merit in the science enabled by the combination of the phased-array feed with Arecibo's collecting area. However, funding is on hold until the outcome of the process of Proposed Changes to Arecibo Observatory Operations is resolved. This example makes clear what the situation is: Arecibo is highly important for high-visibility science that is of great interest to the broader astrophysics community and also to the public. Fast radio bursts have gotten much attention in the public press. I have given interviews to the (on line) Wall Street Journal, NPR, and Sky and Telescope and my colleagues have done similar interviews across the U.S., Canada, and Europe. New technology (ALPACA) was recognized in a peer review process to provide important scientific capabilities. All it needs is a telescope to go on! So please make the choice of Continued NSF investment for science-focused operations. Or stated more strongly, there should not only be continued investment in operations, but enhanced investment in new technology and in students who will use the largest telescope in the world available to U.S. scientists for making landmark discoveries.</p>	Against Closure	Email	6/23/2016	Arecibo_JMC2016.pdf

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Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
196	James	Cordes	George Feldstein Professor of Astronomy Cornell University	<p>Response to the Notice of Intent, Proposed Changes to Arecibo Observatory Operations From the Pulsar Arecibo L-band Feed Array (PALFA) Survey Consortium This letter is in response to the Federal Register Notice of an EIS evaluating potential environmental effects of proposed changes to operations at Arecibo Observatory. It is written on behalf of the PALFA Consortium, a group of scientists concentrated in North America but including worldwide participation who are focused on key science being done with the Arecibo Observatory. Members of the Consortium are based in the U.S., Canada, Germany, the Netherlands, South Africa, and the United Kingdom.</p> <p>We strongly urge the evaluation to focus on the first option under consideration, Continued NSF investment for science-focused operations.</p> <p>The PALFA Consortium has directly involved many undergraduate, graduate students, and postdoctoral researchers who have taken part in the project and have used data from the Arecibo Observatory for a wide range of scientific applications. However, Arecibo's impact extends much further: the data we obtain at Arecibo are used in the Einstein@Home project, a citizen science program that enables volunteers to participate in the discovery of new astronomical objects (neutron stars/pulsars with data from PALFA and gravitational waves from the LIGO project). There are currently 44,000 active users of Einstein@Home and there have been a total of 850,000 participants from 221 countries. Volunteers have discovered 25 new pulsars in PALFA data.</p> <p>Neutron stars discovered by the PALFA search program serve as astrophysical laboratories for fundamental physics, and have been used to probe the nature of gravity as well as the strong force. Some of the pulsars we have discovered are ultra-accurate clocks. Their precise ticks enable the NANOGrav collaboration to use them as elements of a Galactic-scale detector of long-period gravitational waves. That gravitational wave band is completely different from, and thus complements, the band sampled by the LIGO project, which has recently made spectacular discoveries of merging black holes. Fast radio bursts (FRBs) are enigmatic isolated radio pulses that appear to be coming from beyond our Galaxy, hinting at prodigious energies underlying their production. The peer reviewed literature has dozens of conflicting proposals for their origin, including active stars, neutron stars, hypernovae, merging black holes, and cosmic strings. Arecibo is playing a key role in the mystery, with our recent discovery of the first repeating FRB source. Collaborative joint follow-up observations of this source have involved (in order of wavelength) Fermi, Chandra, Swift, XMM-Newton, Gemini, Keck, the Very Large Array, the Green Bank telescope, Effelsberg, GMRT, LOFAR, and LWA, reflecting the wide breadth of interest in the astronomical community. These and other results are topics of wide interest to communities that extend well beyond the astronomers who make direct use of Arecibo. The Arecibo telescope has been at the cutting edge of radio astronomy for over 50 years and its capabilities continue to increase. As the largest aperture on the planet, it provides unique capabilities that are exploited by deploying more powerful digital processors, better astroinformatics, and management of big data sets. The complexity and challenge of handling our data sets has been and continues to be a perfect opportunity for students to learn about big-data methods and to develop new algorithms that enable new discoveries.</p> <p>Arecibo is a key, unique resource for the worldwide science community. What cannot be understated is that it is the underpinning of collaborations of U.S. scientists with foreign colleagues. Without Arecibo, we not only lose the technical capabilities of the instrument, but we lose a basis for our international collaborations.</p> <p>We also urge continuation of Arecibo's science-focused operations because the Observatory is of great importance to Puerto Rico. Not only does the Observatory provide jobs to the local community, but it brings great prestige to the entire island, which is important for attracting Puerto Rican students into STEM fields. The Visitor Center at the Observatory has been enormously successful in exposing students on the island (as well as the broader public) to the highly attractive science areas that astronomy delivers. However, the attractiveness of the Visitor Center is due in large part to its connection to a vibrant, active observatory that delivers brand new, real science results at the cutting edge of research. It would be much less effective as a stand-alone educational facility without that connection. However, creative approaches that better meld research and education activities at the site with the Puerto Rican community should be pursued.</p> <p>Finally, we note that the Chinese FAST telescope, which is slated to have its "first light" later this year, is an Arecibo-like telescope with larger collecting area. In principle, its technical capabilities may surpass some of those of Arecibo. However, as with all new telescopes, commissioning and ramp up to full capabilities takes years. Moreover, it will not allow high-frequency observations that extend up to Arecibo's 10 GHz limit owing to the precision of FAST's primary surface. Such frequencies are becoming more important for precision pulsar timing that underlies NANOGrav's gravitational wave program. In addition, FAST will not have the radar capability that Arecibo provides for the incredibly important role in tracking near-Earth objects that can potentially impact the Earth with great consequence.</p> <p>For human resource development, there is no guarantee that adequate telescope time on FAST will be available for NANOGrav's program, which requires regular and frequent observations of a large number of pulsars. Indeed, there is no guarantee that U.S. scientists will have the same access to FAST as do our European and Australian colleagues (and competitors). Multiple, large radio telescopes are in fact needed to fulfill the requirements of cutting-edge science, just as there is scientific need for the largest optical telescopes, three of which are now about to be constructed. Reiterating, we strongly urge the evaluation to focus on the first option under consideration, Continued NSF investment for science-focused operations.</p>	Against Closure	Email	6/23/2016	Arecibo_PALFA2016.pdf

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Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
197	Lucy	Crespo	Chief Executive Officer Puerto Rico Science, Technology & Research Trust	<p>My name is Lucy Crespo, Chief Operating Officer (CEO) of the Puerto Rico Science Technology and Research Trust ("the Trust"). Thank you very much for the opportunity to present our publics comments as inputs to the Environmental Impact Statement (EIS) of the Arecibo Observatory.</p> <p>The Puerto Rico Science Technology and Research Trust is a private non---profit organization created by law in 2004 to encourage and promote innovation, transfer and commercialization of technology and to foster the creation of jobs in the technology sector. We are also responsible for Puerto Rico's public policy for science, technology, research and development.</p> <p>Our mission is to invest, facilitate and build capacity to continually advance Puerto Rico's economy and its citizens' well---being through innovation---driven enterprises, science and technology and its industrial base.. Our vision is that by 2022, Puerto Rico is a globally recognized innovation hub that develops, attracts, and retains scientists, technology entrepreneurs, and enterprises to unlock world---class creativity and competitiveness.</p> <p>During the last two years the Trust has implemented several key initiatives to accelerate Puerto Rico's transformation into knowledge economic that includes:</p> <ul style="list-style-type: none"> • Established the first local Research Grants Program to empower scientists and researchers to take Puerto Rico's knowledge economy to a higher level of excellence. The initiatives seek to impact researchers in the academia, non--- profit research organizations and at the private sector. The first cohort of grantees from 2015, include various projects in aerospace technology. of these projects belongs to the Puerto Rico Photonics Institute and its director, Dr. Jonathan Friedman from "Universidad Metropolitana" currently a partnering institution of the Arecibo Observatory. • The Center for Tropical Biodiversity and Bio---prospecting, which will enable a number of efforts aimed at advancing the exploration of tropical biodiversity, the development of searchable collections of biological specimens from tropical environments, the conservation of biodiversity resources and the commercialization of biodiversity---derived products. • The Puerto Rico Consortium for Clinical Investigation (PRCCI), a not---for---profit cooperative of top academic and private research sites. PRCCI enhance clinical research quality and speed by driving performance and efficiencies across our sites, leveraging strategic partnerships, and establishing world--- class capabilities. • Parallel18, an economic development initiative sponsored by the Trust, the Puerto Rico Economic Development and Commerce Department (DDEC), and the Puerto Rico Industrial Development Company (PRIDCO) aim to attract and create high impact start---ups that can scale from Puerto Rico to global markets including Mainland US, Latin America, and Europe leveraging Puerto Rico's location, bicultural and bilingual culture, lifestyle and competitive tax incentives. <ul style="list-style-type: none"> • Established the Puerto Rico Technology Transfer Office that offers services to public and privates universities in Puerto Rico to enable commercialization of Intellectual Capital. • For more than 50 years, the Arecibo Observatory has been the Puerto Rico's most recognized scientific and technological facility. As the largest radio/radar telescope in the world, it used in three major areas of research: radio astronomy, atmospheric science, and radar astronomy. Many scientific discoveries have been made in the Observatory, leading to more than 500 publications in peer---review scientific journals that include the most prestigious such as Nature and Science journals, and specialized publications such as the Astrophysical Journal and others in related disciplines. The number of citations of such important work is close to 20,000. The discoveries and knowledge originated from the Observatory have been recognized with many awards, including a Nobel Prize in Physics in 1993. The Observatory continues its valuable scientific contributions as it is evidenced in the consistency and the number of publications and other work, which is similar to previous years. • One of the most critical roles of the Arecibo Observatory is to be a source of inspiration for the minds of our young Puerto Rican students in areas of science, technology, engineering, mathematics and physics. The Arecibo Observatory is one of the few places in Puerto Rico that provide the opportunity of understanding and appreciating scientific work. As a major resource for scientific outreach thousands of students every year experienced science, technology, engineering, mathematics, and physics thru their visit, orientations, and tours to the Observatory facilities. The new science and visitor centre recently remodelled with the support of the Angel Ramos Foundation is providing a unique interactive and operating scientific experience for all the visitors. Close to 90,000 visitors, including 30,000 students, come to the observatory, each year. The observatory has served as a training ground for both scientists and engineers from universities within Puerto Rico. • The Observatory played also a critical role in Puerto Rico's economy. The observatory employs about 100 people, including scientists, engineers, and technicians as well as maintenance, grounds, and housekeeping staff. The Arecibo Observatory is a center of international scientific collaboration, and as such brings every year scientists and researchers around the world that directly and indirectly contributes to the Puerto Rico's economy. It is well know how the great economies of the world are empowered by their investments in basic and applied scientific research, the one that generates, knowledge and the economic activity. • Another economic area that is impacted by the Arecibo Observatory is the tourism sector. As a globally recognized scientific facility and a place registered in the American National Register of Historic Places since 2008, thousands of tourists visit and enjoy the Observatory every year. Another positive economic impact is in Puerto Rico's film and television industry given that the Observation had appeared in several productions. 	Against Closure	Email	6/23/2016	Arecibo Observatory- PRSTRT.pdf

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198	Lucy	Crespo	Chief Executive Officer Puerto Rico Science, Technology & Research Trust	<p>• We invite NSF to Continued its investment for science---focused operations and if possible expand the commercialization and educational components. The Trust in particular will be interested in collaborating with scientists and engineers to provide support and collaborations thru our initiatives. Also we will be interested in facilitating the commercialization of technologies developed at the observatory with companies located at Puerto Rico and in particular technologies that can be commercialize thru startups.</p> <p>Please, don't hesitate to contact the Trust in regard of this important local and global issue for the advancement of science.</p>	Alternative Consideration	Email	6/23/2016	Arecibo Observatory-PRSTRT.pdf
199	Rafael Cortes	Dapena	President of Fundación Ángel Ramos	<p>A "Notice of Intent to Prepare an Environmental Impact Statement and Initiate Section 106 Consultation for Proposed Changes to Arecibo Observatory Operations, Arecibo, Puerto Rico and Notice of Public Scoping Meetings and Comment Period" (the "Notice ") was published by the National Science Foundation (NSF) on May 23, 2016. Pursuant to the Notice the NSF has requested public comments from stakeholders and other parties that may be affected by any future decision regarding operations of the Arecibo Observatory (the "Observatory" or the "Facilities "). Specifically, the NSF is asking for comments as to the following five possible courses of action with respect to the Facilities and its operation:</p> <ol style="list-style-type: none"> 1. Continued NSF investment for science-focused operations (No-Action Alternative) 2. Collaboration with interested parties for continued science focused operations 3. Collaboration with interested parties for transition to education-focused operation 4. Mothballing the facilities (suspension of operations in a manner such that operations could resume efficiently at some future date) 5. Deconstruction and site restoration <p>Fundación Ángel Ramos Inc., a Puerto Rico private foundation, (the "Angel Ramos Foundation" or the "Foundation ") takes this opportunity to present its views as to the future of the Observatory , its importance to Puerto Rico, especially in education and tourism , and our commitment to, and interests in, the Observatory.</p> <p>For reasons hereinafter indicated we strongly believe that mothballing or deconstruction and site restoration (alternatives 4 and 5 cited above) would:</p> <ol style="list-style-type: none"> a. Result in the closing of the newly renovated Fundación Angel Ramos Science and Visitor Center b. Constitute an important setback to the efforts being carried by many public and private institutions towards improving education on the Island, especially in the important fields of science and mathematics. c. Result in a serious blow to tourism on the Island d. Have severe adverse effects, direct and indirect, real and psychological, on the people of Puerto Rico and its economy. Furthermore, the Angel Ramos Foundation cannot think of a worse time for the Federal Government to take either of the two courses of action mentioned above. We are extremely concerned about the consequences that will result from any of these alternatives and sincerely hope that they are promptly disregarded. Puerto Rico greatly needs the support of the Federal Government to successfully overcome the social and economic crisis it is living through. <p>President Obama has repeatedly indicated the commitment of the Federal Government to helping Puerto Rico during this time of need. In his weekly address to the nation on June 11 he stated that "Puerto Ricans are American citizens, just like the folks in Maine, Oklahoma, or New Mexico [. . .] Today the island continues to face a crippling economic crisis [. . .] We do not turn our backs on our fellow Americans [. . .] We come together when it is hard". Therefore, the Angel Ramos Foundation hopes the Federal Government supports the Island in this particular juncture.</p> <p>As to the other options, and as hereinafter explained, we believe that the best alternative is for NSF to continue funding the operations of the Observatory, and together with other stakeholders (including the Angel Ramos Foundation), aggressively explore alternatives to diversify funding for the existing operations and/or to bring additional research related activities to the Facilities.</p>	Against Closure	Email, Letter	6/23/2016	Elizabeth Pentecost 6-21-2016.pdf (converted to *.doc)

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				<p>The Foundation</p> <p>The Angel Ramos Foundation was founded in 1958 by the late Angel Ramos, owner and president of El Mundo Media Conglomerate. The Foundation's mission is to improve the quality of life in Puerto Rico. From its inception as a grant-making foundation, it has benefited a large number of worthy projects in the fields of art and culture, education, and human services. The Foundation is the largest philanthropic institution in Puerto Rico and has contributed approximately \$100 million to hundreds of charitable causes across the island. To many residents the Angel Ramos Foundation is the leading institution in the philanthropic sector.</p> <p>Supporting the Observatory has been one of our flagship projects, and it reflects our commitment to improving education in Puerto Rico, especially in science and mathematics. We firmly believe the Observatory is a very valuable educational asset for Puerto Rico and an important contributor to its economy.</p> <p>The Angel Ramos Foundation: A consistent donor with a significant linkage to the Observatory</p> <p>Here is where the Foundation's and the Observatory's work intersect: on their mission. The Foundation's mission is to improve the quality of life in Puerto Rico, on the other hand, the Observatory's mission as a renowned research facility has been performing cutting-edge research and acting as an academic facilitator for astronomical, atmospheric and geospace science careers. Therefore, the Foundations' philanthropic focus on education (which we all know is key to the future of Puerto Rico) dovetails seamlessly with the Observatory's scientific and academic goals.</p> <p>For over 25 years the Angel Ramos Foundation has been a firm ally and consistent donor of the Observatory. The Foundation's investment began in 1989 when it awarded \$25,000 towards the design of the Angel Ramos Foundation Visitor Center (the "Angel Ramos Visitor Center" or the "Visitor Center"). In 1991 the Foundation donated \$650,000 for the actual construction of the Center. In 1995 \$75,000 was donated for construction improvements. In 1997 an additional \$10,000 was granted to finalize the construction. On March 1, 1997 the Angel Ramos Foundation Visitor Center opened its doors to the public.</p> <p>Between 1997 and 2009 the Foundation donated \$690,000 for diverse projects to improve the Visitor Center's offering. Some of the projects include the financing of the production of a film about the Arecibo Observatory (for the Visitor Center's Auditorium); a donation to build for the Learning Center (audio/visual resources for special groups, scientific workshops, and other student-oriented programs); a grant for exterior exhibit programs (the 'Paseo Educativo') including a series of exhibits - such as a scale model of the solar system, a solar clock, and a graphic panel describing our geology among others; and finally, for 6 years the Foundation sponsored a series of summer workshops for 250 distinguished science teachers throughout the Island.</p> <p>In 2011 there was a change of administration in the Observatory from Cornell University to that of a consortium made up of the SRI International, the Universidad Metropolitana (UMET), and the Universities Space Research Association (USRA). Between 2011 and 2015 the Foundation donated \$900,000 to substantially renovate the Angel Ramos Visitor Center. The name of the center was changed to the "Angel Ramos Science and Visitor Center" in order to underline its focus in science education.</p> <p>At present the Foundation's total investment in the Arecibo Observatory is \$2.35 million.</p> <p>The inauguration of the renovated Visitor Center</p> <p>The newly renovated Angel Ramos Foundation Science and Visitor Center re-opened on May 10th 2016. In demonstration of commitment and solidarity, the launch was attended by the head partners of the Arecibo Observatory: National Science Foundation, SRI International, Universities Space Research Association, and Universidad Metropolitana of the Ana G. Mendez University System, as well as local government officials and members of the "Puerto Rico Chancellors and Stakeholders Committee".</p> <p>It is also important to note that on the same day, the Foundation also held the Tina Hills Award ceremony at the "new" Visitor Center. The Award recognizes the trajectory, quality of program and services and the outstanding contribution of a nonprofit organization in improving the quality of life in Puerto Rico. The winner of the 2016 Award was The Sociedad de Educación y Rehabilitación (SER) de Puerto Rico, an organization devoted to provide services to children and adults with physical and/or developmental disabilities. The ceremony was attended by more than 150 leaders representing the top nonprofit institutions in the island. For all of those present the Observatory represented a source of pride and a hope in our future in the field of science. The activity was widely covered by the media in Puerto Rico.</p> <p>The Angel Ramos Foundation Science and Visitor Center: Education and tourism</p>				

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				<p>The Visitor Center is an educational facility that receives 30,000 student visits every year, and a tourism destination that attracts 100,000 visitors a year. The Center is an important attraction which channels tourism to a part of the island with very limited economic activity.</p> <p>The Visitor Center offers guests permanent and temporary exhibits, workshops, and interactive experiences in order to keep the public's interest in the Observatory's scientific investigations. Also there are academic courses and curriculums in the works. But engagement with the public does not end there. For example, events such as the Digital Planet Fair, "Inflandia," and Puerto Rico STEM's UP have brought over 50,000 participants to the Observatory.</p> <p>The Center has established a regular program for school visits and offers daily group talks as well as educational workshops and learning activities, like Nano Days, Yuri's Day, "Noches de Observación" (Nights at the Observatory), Solar Observations, and videoconferences with renowned NASA and University professors.</p> <p>The Visitor Center also designed a program for the hearing impaired, as well as working to help people with other disabilities. There is currently an interpreter available for the hearing impaired.</p> <p>Scientists from the Observatory participate in "Education Public Outreach" to bring to life the research they are conducting. Workshops focused on science, technology, engineering and mathematics ("STEM") for teachers as well as students are given regularly. Early exposure to school-to-work programs are promoted through Academic Guidelines, giving schools guidance on how to provide university students with a taste of what the working environment will feel like. The discoveries made at the Arecibo Observatory help explain the history of the universe, the history of our solar system, the spatial geography of Earth's ionosphere, and tell the story of how life began. There are no bigger "Big Picture" questions than these. They form the basis of our search for who we are and where we came from.</p> <p>In essence, the Observatory is a living, breathing network that ties science to the general public in an engaging and exciting manner. Its potential as inspiration and jumping-off point for young people just beginning to think about their future in science is incalculable.</p> <p>Scientific achievements and the public</p> <p>It is important to mention that the scientific achievements of the Observatory are well known by the scientific community. However, the general public has little or no knowledge of the Observatory's accomplishments or its importance.</p> <p>The Visitor Center has been an effective mean of communicating to the general public, and to the visitors in particular, of the many important astronomical, atmospheric and planetary science discoveries that have taken place at the Observatory, such as:</p> <ul style="list-style-type: none"> • Pulsars: the first binary pulsar was discovered using the radiotelescope at Arecibo Observatory. The discovery rewarded a Nobel Prize in Physics. • Planets: established the rotating rate and the molten core of the planet Mercury; discovered ice in craters at Mercury's north and south poles; discovered the first planets outside the solar system; made the first radar ranging of an Earth-crossing asteroid; created the first radar maps of Venus; found hydrocarbon lakes on Saturn's moon Titan among others. • Asteroids : developed images and videos of binary asteroids, revealed the exotic physical and dynamic properties of asteroids; generated incredibly detailed images of asteroids; discovered the first triple asteroid system among near-earth asteroids; established that the previously discovered asteroid 2000 DP 107 was in fact a binary system; • Galaxies: established the presence of a 'starburst ' galaxy 250 million light years away, showing how pre-biotic molecules, the primary ingredients of life, may have arisen, and how widespread they are in the cosmos ; published the largest single-source collection of galaxy rotation velocity data with galaxy intrinsic luminosity data, including photometric and spectroscopic data, used to accurately map distances to galaxies; discovered the 'megamaser' emission in the starburst galaxy Arp 220; created the first detailed maps of the distribution of galaxies in 3D. 				

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				<p>Indeed, it is an immense source of pride for Puerto Rico and for the Angel Ramos Foundation to be part and support the Arecibo Observatory and it is our hope that the Visitor Center will continue to disseminate information to a broader audience about the important scientific contribution produced at the largest radio/radar telescope in the world.</p> <p>The Foundation hopes the positive relationship it has had with the Observatory for almost three decades will continue to grow and serve the scientists, the students, Puerto Ricans, and the Observatory's stakeholders, as well as serve the broader interests of science, education and development around the world. We must work together to save what has been such a productive relationship.</p> <p>NSF's other alternatives and the best option</p> <p>As previously stated, the position of the Angel Ramos Foundation is that the Observatory should not be mothballed or subject to deconstruction. The damage to Puerto Rico, and to those of us who are living through the current social and economic crisis, would be enormous. We believe that the Observatory continues to be a valuable asset to its stakeholders. The Foundation cannot emphasize enough the importance of the Visitor Center as a tool to improve education, promote tourism, disseminate scientific information, and contribute to the island's economic development.</p> <p>The other three alternatives mentioned in the Notice are:</p> <ol style="list-style-type: none"> 1. Collaboration with interested parties for transition to education-focused operation 2. Continued NSF investment for science-focused operations 3. Collaboration with interested parties for continued science-focused operations <p>Regarding the first alternative, since the 1960's the Observatory has been focused on astronomy and scientific research. In reality it is a "single purpose entity." To transition away from science into academia, or to focus solely on education, would change its character and the very reason for its existence. An education component without the research component will constitute a passive mothballing. Should this become the selected option, the basic concept of the Angel Ramos Visitor Center would be substantially altered and practically nullified. Our efforts in education and science would face a big setback.</p> <p>We believe that the best option for all parties concerned is a combination of the following two options: Continued NSF investment for science- focused operations with an aggressive plan to eventually enter into collaboration with interested parties for continued science- focused operations.</p> <p>We fully understand the budget restraints on the NSF. However, a plan could be developed to add interested parties and income streams to the Facilities in order to reduce NSF funding. The Angel Ramos Foundation is willing to contribute -- in collaboration with UMET-- in finding new partners and identifying potential sponsors.</p> <p>Conclusion The Angel Ramos Foundation has been a consistent and committed stakeholder in the Arecibo Observatory since the late 80's and today we would like to reinforce that commitment. We are dedicated to the Observatory and what it represents to Puerto Rico, its people and its stakeholders. The Foundation is also committed to continue supporting the public outreach component and promoting educational activities focused on STEM for teachers, students, and the general public because believes in the importance of this extraordinary and unique facility.</p> <p>In this particular juncture, the Foundation will do our part in reaching a solution that is best for all parties involved. We ask the NSF to continue funding the scientific research conducted at the Arecibo Observatory and at the same time, together with other stakeholders, search for ways to diversify the funding of the operations.</p>				
200	Rafael Cortes	Dapena	President of Fundación Ángel Ramos	<p>As to the other options, and as hereinafter explained, we believe that the best alternative is for NSF to continue funding the operations of the Observatory, and together with other stakeholders (including the Angel Ramos Foundation), aggressively explore alternatives to diversify funding for the existing operations and/or to bring additional research related activities to the Facilities. We fully understand the budget restraints on the NSF. However, a plan could be developed to add interested parties and income streams to the Facilities in order to reduce NSF funding. The Angel Ramos Foundation is willing to contribute -- in collaboration with UMET-- in finding new partners and identifying potential sponsors.</p>	Alternative Consideration	Email, Letter	6/23/2016	Elizabeth Pentecost 6-21-2016.pdf (converted to *.doc)

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201	Megan E.	DeCesar	Postdoctoral Research Associate University of Wisconsin-Milwaukee, Physics Department Center for Gravitation, Cosmology, and Astrophysics (P) 414.229.6360 (E) decesar@uwm.edu http://www.cgca.uwm.edu/decesar	<p>I am writing in response to the invitation for comments on environmental impacts of Arecibo Observatory (AO). My response is focused on the human and cultural impacts of losing this observatory, both for scientists and for the general public. I strongly encourage the NSF to choose option #1 of its "Notice of Intent to Prepare an EIS...", namely "Continued NSF investment for science-focused operations (No-Action Alternative)."</p> <p>1. Arecibo Observatory's positive impact on global citizenship I am a postdoctoral researcher in astrophysics. I study pulsars and gravitational waves, in large part because of how influential AO has been in both my personal and professional life. As a young girl, I was fascinated by astronomy, and from the time I learned about AO, I dreamed of visiting the observatory and using the telescope. As an undergraduate, I was fortunate to be a summer student at AO through the Research Experience for Undergraduates (REU) program and to learn how to observe pulsars and other astronomical phenomena with this incredible instrument.</p> <p>Even more important than the way AO expanded my horizons scientifically is that my world view was also greatly expanded, through interactions with the other students and especially with the locals. Every year, there would be at least two Puerto Rican students in the REU program, and all the visiting students and I became close friends with the Puerto Rican students who studied there that summer. Additionally, all the people who kept the observatory running, as well as most of the operators and some of the astronomers, were native Puerto Ricans. Through speaking, working, living, and traveling with these individuals, I became proficient in Spanish, I explored much of the island, and I came to love the people and culture in this place that is very different from the US. I grew up in a conservative, rural town in Pennsylvania, where Puerto Ricans and other non-white groups are viewed as second-class citizens at best; this was my first real and extended exposure to a group of people who are significantly different, both in appearance and culture, than my mostly white, middle-class, educated-but-sheltered family and friends. Coming back to the States, I had a new perspective to share with the people around me, and to this day I use examples from my summer in Puerto Rico to encourage tolerance and acceptance of other cultures when discussing these issues with others.</p> <p>Thus, living in Arecibo gave me the opportunity to feel and think as not only a US citizen but as more of a global citizen as well. Although I am sharing my personal experience, I want to stress that I am only one of the many students, scientists, and other visitors who have spent time at AO—people from many different countries have had this opportunity to become more globalized and understanding of other cultures through visits to the observatory and region around it, especially during extended visits that are common in scientific research.</p> <p>2. The impact of Arecibo Observatory on equity for STEM students and researchers I am a woman in a field that is still male-dominated, and in which inequity for underrepresented groups is usually subtle but still prevalent. In college and graduate school, I experienced some gender-related setbacks, in particular from significant sexual harassment as a graduate student. I also have friends who have experienced inappropriate behavior and discrimination due to their ethnicity or gender identity. Therefore, I understand the importance of addressing these issues head-on, through raising awareness and implementing anti-harassment and discrimination policies (not only for gender, but for all forms of discrimination).</p> <p>The North American Nanohertz Observatory for Gravitational Waves (NANOGrav) and the International Pulsar Timing Array (IPTA), two collaborations that use AO extensively in their ongoing efforts to detect gravitational waves from black holes, have both adopted anti-harassment and discrimination policies. For at least the last two years, these groups have held pro-diversity/anti-harassment training sessions during their collaboration meetings (NANOGrav does this three times per year, and the IPTA once per year). These policies and sessions have opened the door for many of us to speak more openly about our experiences and to engage in conversations with people who were previously unaware of the problem, and have led to near-elimination of inappropriate behavior within NANOGrav (I am less involved in the IPTA and therefore do not know how effective this has been). If the members of these collaborations saw AO as a more secure resource, they would have more time to focus on diversity and anti-harassment, and I think that they would actually use that time because it is an issue that everyone is now taking very seriously.</p>	Against Closure	Email	6/23/2016	AreciboObservatory_EIS_MeganDeCesar.pdf

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				<p>Additionally, the deputy director of AO, Dr. Joan Schmelz, is very involved in raising awareness about this issue and also in giving a voice to people who have been sexually harassed. She writes blog posts on the topic, invites people to write their own posts (anonymously or not), and speaks with harassment victims in confidence. I can personally attest that her work helps harassment victims become more empowered. NANOGrav and the IPTA are also connected with the Arecibo Remote Command Center (ARCC) and the Pulsar Search Collaboratory (PSC). ARCC, which originated at the University of Texas-Brownsville (now Rio Grande Valley) and has expanded to a dozen or so other institutions, is a group of undergraduate students who run AO observations of pulsars and search for pulsars in the data. The PSC, which began in West Virginia but has spread to several states, is a group of high school students who search for pulsars and in the process learn about astronomy and what it is like to be a scientist. Both groups have had a significant impact on the students, many of whom go on to study physics in college. ARCC is especially increasing the number of Hispanic students in STEM fields, while the PSC boasts large increases in the number of young women in STEM. Finally, for me personally, the impact that AO had on me contributed to my remaining in the field of pulsar astronomy, despite considering leaving during the difficult times that I referenced above. I know what incredible science can be done with this instrument, and that helps me to rise above personal troubles and continue working toward my goals. I think this is really important, because if I stay in the field then I will have opportunities to inspire more girls to enter STEM fields in the future.</p> <p>3. Impact on education and employment in Puerto Rico In Puerto Rico, AO is of very considerable economic value and could be made even more so. Its staff salaries are highly important in the Arecibo Town region. Its educated staff has significantly contributed to building up current and future generations of educated people in the area, and the tens of thousands of tourist visitors are also important to the overall island economy. Withdrawal of support now would compound what is already a difficult situation for Puerto Rico and its citizenry—in the current Puerto Rican economy, quality jobs are almost impossible to find.</p> <p>AO is a very important part of STEM education on the island: thousands of school children visit the facility to learn about the scientific and engineering accomplishments made there and become inspired about their own futures. The primary and secondary contributions to STEM Hispanic STEM professionals are still vastly underrepresented: in spite of being 20% of the college-age population, only 5-9% of physical sciences, mathematics, and engineering degrees (https://www.aps.org/programs/education/statistics/hispanicmajors.cfm) are awarded to Hispanic college graduates. The AO ducational programs get children interested, and the student research programs (summer and Saturday) have a huge impact in recruiting and retaining talented Latino/as into the STEM workforce. Approximately 20,000 K-12 students travel to the Arecibo Observatory Visitor Center each year, most of which come from low-income families. The Visitor Center resembles a miniature air and space museum and is inspiring to say the least. Students need such exposure so that they see what higher education brings and how it offers a path to an exciting and productive career. Also Arecibo upgrades the teaching capabilities of high school teachers through STEM learning and conducts a Saturday School Space Academy for local high school students, essentially providing advanced placement-level education for these students. This is a cultural as well as socioeconomic impact that extends way beyond the island itself.o other observatory worldwide does more to advance the socioeconomic development of the underprivileged. The educational problem that will arise from the proposed AO changes will be much deeper than even the unemployment disaster of laying off more than one hundred local Puerto Rican residents who work at the Observatory, and the proposed changes to AO will be highly detrimental to the education of underprivileged children in Puerto Rico.</p> <p>4. Human pride in human endeavors, and pride for the people of Puerto Rico As a national facility located in the US territory of Puerto Rico, the observatory is a major cultural resource on the island. The facility attracts large numbers of tourists, both from the island and from the rest of the world, forming part of Puerto Rican cultural identity and a strong point of pride.</p> <p>Puerto Ricans have a lot to be proud of—as anyone who goes to the AO visitor center will learn, AO has been used for many important discoveries in many different subfields of astronomy and ionospheric science. Its unique radar capability has been used to map the Moon, Mercury, Venus, and asteroids. In pulsar astronomy, it was used to discover the first millisecond-spin-period pulsar in 1982, and the first extrasolar planets (which were orbiting a pulsar) in 1990. The discovery of the Hulse-Taylor pulsar-neutron star binary system was made at AO in 1974; this pulsar system was used to show that gravitational waves must exist, earning its discoverers the 1993 Nobel Prize. The forthcoming discovery of gravitational waves from supermassive black holes—the black holes in the centers of galaxies, which are millions to billions of times more massive than those discovered by LIGO and which will give us more information about gravity, black holes, galaxy evolution, and cosmology—will be made possible by the ongoing pulsar observing programs at AO. That discovery will be a major source of pride for the people of Puerto Rico, not to mention for the rest of the US! (As an example, I cite the recent gravitational wave discovery by LIGO. Many US citizens were very excited and proud to be part of the country that made the discovery. In Milwaukee, where I work, the ~250-300 people at our outreach events following LIGO’s announcement were thrilled to learn that Milwaukee scientists played a major role in that discovery.)</p> <p>Additionally, the construction and functionality of AO demonstrate the incredible ingenuity of human scientists and engineers. The appearance and sheer size of the telescope are breathtaking; it is both an engineering feat and a work of art. The Arecibo Observatory is a reminder of the great things humans can accomplish, and its use as a site for research and education continues to bring people from different backgrounds together to work toward their common goals.</p>				

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				<p>1. Arecibo Observatory's positive impact on global citizenship I am a postdoctoral researcher in astrophysics. I study pulsars and gravitational waves, in large part because of how influential AO has been in both my personal and professional life. As a young girl, I was fascinated by astronomy, and from the time I learned about AO, I dreamed of visiting the observatory and using the telescope. As an undergraduate, I was fortunate to be a summer student at AO through the Research Experience for Undergraduates (REU) program and to learn how to observe pulsars and other astronomical phenomena with this incredible instrument.</p> <p>Even more important than the way AO expanded my horizons scientifically is that my world view was also greatly expanded, through interactions with the other students and especially with the locals. Every year, there would be at least two Puerto Rican students in the REU program, and all the visiting students and I became close friends with the Puerto Rican students who studied there that summer. Additionally, all the people who kept the observatory running, as well as most of the operators and some of the astronomers, were native Puerto Ricans. Through speaking, working, living, and traveling with these individuals, I became proficient in Spanish, I explored much of the island, and I came to love the people and culture in this place that is very different from the US. I grew up in a conservative, rural town in Pennsylvania, where Puerto Ricans and other non-white groups are viewed as second-class citizens at best; this was my first real and extended exposure to a group of people who are significantly different, both in appearance and culture, than my mostly white, middle-class, educated-but-sheltered family and friends. Coming back to the States, I had a new perspective to share with the people around me, and to this day I use examples from my summer in Puerto Rico to encourage tolerance and acceptance of other cultures when discussing these issues with others.</p> <p>Thus, living in Arecibo gave me the opportunity to feel and think as not only a US citizen but as more of a global citizen as well. Although I am sharing my personal experience, I want to stress that I am only one of the many students, scientists, and other visitors who have spent time at AO—people from many different countries have had this opportunity to become more globalized and understanding of other cultures through visits to the observatory and region around it, especially during extended visits that are common in scientific research.</p>				
202	Dr. Timothy	Dolch	<p>Assistant Professor of Physics Dept. of Physics, Hillsdale College 33 E. College St. Hillsdale, MI 49242 Email: tdolch@hillsdale.edu Phone: (517) 607-2449</p>	<p>In this letter, I write with significant concern about some of the proposals for the future of Arecibo Observatory (ARECIBO) outlined in the National Science Foundation's "Notice of Intent To Prepare an Environmental Impact Statement" released on 23-May 2016.</p> <p>As a first-year faculty member at Hillsdale College, a small liberal arts institution in rural Michigan, I've spent significant time and energy with a team of five undergraduate researchers. These bright, young men and women have learned to remotely operate the William E. Gordon telescope at ARECIBO, making a fantastic contribution to our gravitational wave (GW) science collaboration, the North American Nanohertz Observatory for Gravitational Waves (NANOGrav). Hillsdale students were the first undergraduate observers in our nation to obtain regular timing data for NANOGrav, which is a long-term dataset that will result in the detection of long-period GWs. Their contribution has not gone unnoticed in the field, resulting in their co-authorship on NANOGrav publications. In addition to these five students, many other interested young people, both undergraduates and high school students, have come by to watch a live Arecibo observation.</p> <p>In the wake of the LIGO Collaboration's announcement of the first direct GW detection, my students were thrilled to be part of the GW field. They are not unaware of some of the current proposals being put forward for the facility's future. Mothballing, deconstruction, or otherwise ramping down ARECIBO's science-focused operations is perplexing to them, coming at the very moment when the GW sky has opened up. Unfortunately, all I can currently say is that I am as perplexed as they are.</p> <p>The result of these research experiences has been the formation of concrete plans for my students' future STEM careers. Some of them are in the process of applying to graduate school in physics; others want to incorporate their experiences into future teaching careers. Hillsdale College is amongst the lowest-tuition top tier liberal arts schools in the country. As a result, not a few students with whom I have interacted come from disadvantaged socioeconomic backgrounds. The experience of using a world-class radio telescope, as part of GW science, the most groundbreaking subfield of astrophysics, is simply irreplaceable.</p> <p>The irreplaceability of Arecibo is even more apparent at Hillsdale College than at the other liberal arts colleges associated with NANOGrav. Our institution does not receive federal funding, and providing research experiences through individual AST grants is simply not an option. NANOGrav also observes with the Green Bank Telescope, but the GW detection effort requires both telescopes (http://arxiv.org/abs/1210.5998) and experience has shown that Arecibo is significantly more compatible with student observers, given its less complex scheduling algorithm, and its long history of student involvement through the various ARCC (Arecibo Remote Command Center) institutions, a list which now includes Hillsdale College. While our institution is a unique case with regard to federal grants, we are a living highlight of the fact that Arecibo's benefits are society-wide, and not limited to those immediately awarded funding for research.</p>	Against Closure	Email	6/23/2016	dolch_aerecibo.pdf

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				<p>Large radio telescopes are being built in other parts of the world – namely, the FAST telescope in China and the Square Kilometer Array (SKA) in South Africa. It has been at times pointed out that these telescopes could continue the GW detection effort. However, US involvement and access to data is not a given. Additionally, FAST is still years away from regular operation, and in the case of the SKA, the telescope's construction has become less certain due to austerity measures in Germany, one of its principal consortium members. Clearly, the socioeconomic benefits within the US have no parallel at these future telescopes, even if the uncertainties about these facilities were resolved. If anything, the case of FAST demonstrates a desire for nationalistic competition, sparked by the success of Arecibo. While speaking of society-wide benefits, it also must be said that Arecibo's role in detecting potentially hazardous asteroids is unparalleled. The consequences of a major impact on humanity and on the environment are well-known, and only the Arecibo Planetary Radar system possesses the radio transmitting capability to obtain crucial data on potential objects. The FAST telescope possesses no transmitting capability whatsoever.</p> <p>To summarize, the socioeconomic impact on society through student involvement with, and inspiration from, the Arecibo Observatory should not be underestimated. This is especially the case when, through the efforts of NANOGrav, Arecibo has become a gravitational wave detector at the fraction of the cost of LIGO. Nationwide, it should not be forgotten that many students touched by Arecibo are from disadvantaged backgrounds or groups, and frequently from Puerto Rico itself. While other large radio telescopes are indeed being built around the world, it is very unlikely that students at many smaller US institutions like mine would have any chance of involvement, nor that Arecibo's asteroid-detecting capability could be matched. While the option of transitioning Arecibo to an education-focused role is admirable, the reality is that serious STEM education is only possible if students are truly involved in cutting-edge research such as pulsar discoveries and gravitational wave detection. The only feasible option is the No-Action Alternative.</p>				
203	Casey	Dreier	Director of Space Policy The Planetary Society	<p>The Planetary Society, which represents over 52,000 members worldwide, wishes to express our strong support for the National Astronomy and Ionosphere Center (NAIC) at Arecibo and urges the National Science Foundation (NSF) to continue to fund the operation of this important and unique scientific capability.</p> <p>Our organization is actively involved in near-Earth object detection and defense, and we have funded projects to help characterize the orbits of newly found asteroids as well as early technology studies for deflection techniques. Arecibo's radar allows for the characterization of near-Earth asteroids and is a critical capability to maintain. Closing down Arecibo is not in the nation's interest, and its unique capabilities are crucial to providing insight into the low probability, high impact event of an asteroid collision.</p> <p>We believe that the small operating cost of Arecibo must be maintained within the NSF, particularly considering the cost to re-create Arecibo's capabilities at a later date. We know that there is a large community of scientists expressing support for Arecibo's continued operations as well as representatives at NASA, who have signaled their intention to continue using Arecibo's capabilities for the foreseeable future.</p> <p>For over 50 years, the Arecibo Observatory has provided the world with a uniquely sensitive instrument for listening to the cosmos, as well as a uniquely powerful radar to directly interrogate it. While it was forged during the Cold War, Arecibo represents how our worst instincts can be channeled to create something truly beneficial by advancing humanity's frontiers of knowledge.</p> <p>We urge the NSF to continue Arecibo's operations, and to preserve this unique asset of scientific exploration and near-Earth object characterization.</p>	Against Closure	Email	6/23/2016	

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204	Dr. Robert	Ferdman	Research Associate Department of Physics McGill University 3600 rue University Montréal, QC Canada H3A 2T8 http://www.physics.mcgill.ca/~rferdman	<p>This letter is a comment in response to the Federal Register Notice of an EIS evaluating potential environmental effects of proposed changes to operations at Arecibo Observatory.</p> <p>The future of the Arecibo Telescope is particularly crucial to the astrophysics research community. As a radio astronomer, it is a facility that has been, and continues to be, unparalleled in providing the highest quality data for high-impact scientific studies that a great many of my colleagues and I regularly perform. This includes probing fundamental physics such as testing the limits of Einstein's theory of general relativity—for which Arecibo data has led to a Nobel Prize—and excitingly, performing gravitational-wave astrophysics in regimes that are not possible with other current and proposed gravitational-wave observatories, such as LIGO/VIRGO and eLISA. Arecibo truly provides a unique window to the Universe, and this is possible due to its place as the world's largest and most sensitive radio telescope. It will continue to be a vital instrument that will complement future telescope arrays such as the Extended Very Large Array, which probes very different astrophysical scales, and the Square Kilometer Array, which will certainly be a higher sensitivity instrument, but cannot access large portions of the sky that are visible to Arecibo.</p> <p>My experience with the Arecibo Telescope has provided me with the skills and training to continue to perform high-profile science. As a doctoral student, for example, I was heavily and centrally involved in developing backend instrumentation for the Arecibo Telescope that helped to greatly improve the capabilities and quality of the data it collected. Since then, I have utilized the Arecibo Telescope for several exciting endeavors, which include projects that continue to constraining the predictions of gravitational theory, and aim to understand the astrophysics that govern the evolution of stars and stellar systems. I am also a longstanding member of high-profile collaborations that depend on the high sensitivity of the Arecibo Telescope. These include the North American Nanohertz Observatory for Gravitational Waves (NANOGrav), a highly regarded collaboration that currently holds a prestigious National Science Foundation Physics Frontier Center Grant, and the Pulsar-Arecibo L-band Feed Array (PALFA) survey, which has now discovered nearly 200 radio pulsars in and around the Galactic plane, allowing my colleagues and I to probe fundamental physics and astrophysics with extremely high precision. These projects and their undeniable merits are discussed in greater detail in separate letters submitted by the NANOGrav and PALFA collaborations.</p> <p>I am particularly enthusiastic about the future possibilities that Arecibo will allow me. Specifically, I am commencing a faculty position this fall at the University of East Anglia (UEA) in the United Kingdom. I look forward to training many talented students in observing with, and analyzing data from, the Arecibo telescope. This will be done in part through the Arecibo Remote Command Center (ARCC), a network of institutions that provide undergraduate students with the opportunity to work with the world's largest telescope, and gain valuable analysis, leadership, and communication skills in the process. At UEA, we would become the first European outpost of the ARCC network, reflecting the global scale of Arecibo's impact on observational astronomy.</p> <p>It is my aim to continue to have the privilege of using this truly unique observatory as a central part of my research and educational goals. I therefore conclude this letter by stating emphatically that I am in strong favor of continued NSF investment of the Arecibo Telescope for science-focused operations.</p> <p>Thank you for your consideration, and please do not hesitate to contact me if there is any further information I can provide.</p>	Against Closure	Email	6/23/2016	Arecibo_Letter.pdf

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205	Paulo C. C.	Freire	Max-Planck-Institut für Radioastronomie Auf dem Hügel 69, D-53121 Bonn, Germany Phone: (+49) 228 525 - 496 ; Fax: (+49) 228 525 - 229	<p>I am writing to urge NSF to choose alternative 1 of its "Notice of Intent to Prepare an EIS . . .", namely "Continued NSF investment for science-focused operations (No-Action Alternative)." The reasons are manifold, I will list them now:</p> <p>The Arecibo Telescope is a completely new instrument. Not only that, but we have barely scratched the surface in regards to what we can do and find with this new instrument.</p> <p>I will attempt to present this point graphically. In 2013, we found one new millisecond pulsar, PSR J2234+0611, in the Arecibo 327 MHz drift-scan survey. In recent observations with the Arecibo L-wide, it appears like this: The signal-to-noise ratio (S/N) of this observation is 650, in an integration time of for Radio Astronomy It is incredible to think that previous surveys had not found this pulsar.</p> <p>With the new instruments at Arecibo, we are truly looking at the sky anew, and finding many new pulsars that, given Arecibo's new instrumentation and radically improved sensitivity, appear to be incredibly bright - but could not even be detected by previous generations of instruments. So, it is a completely new instrument looking at a completely new, unexplored sky.</p> <p>This brings me to my second point. Arecibo is 5 times more sensitive than the next radio telescope in the world. Similar improvements in sensitivity have been made for other telescopes. However, the fact remains that the GBT has a gain of 2.0 K/Jy, Arecibo has a gain of 10 K/Jy. And, as you can see in the picture above, it shows. This unique sensitivity is crucial for many areas of research. I will go into some that are related directly to my own area of research.</p> <p>The mystery of fast radio bursts One of the great mysteries in astrophysics at the moment is the nature and origin of fast radio bursts (FRBs). If it were not for the unequalled sensitivity of Arecibo, we would not have learned that they are repeating sources (see Spitler et al. 2016, Nature, 531, 202). This enormously constrains the range of possibilities for these objects.</p> <p>New tests of general relativity As is well known, Arecibo was the telescope that led to the discovery of the first binary pulsar, PSR B1913+16. Arecibo timing of this pulsar resulted in the first detection of gravitational waves, decades before LIGO. This resulted in the Nobel Prize in physics for Russell Hulse and Joe Taylor in 1993. Continued Arecibo timing of this system continues producing cutting-edge results.</p> <p>In 2012, me and my collaborators published an Arecibo experiment that probes, more deeply than ever, the nature of gravitational radiation - to an extent that LIGO will never be able to do. The experiment concluded that, to a very tight limit, gravitational radiation is purely quadrupolar, as predicted by Einstein's general relativity (see Freire et al. 2012, MNRAS, 423, 3328). These for Radio Astronomy measurements also introduced the tightest constraints on the best studied classes of alternative theories of gravity, all of which predict emission of other types of gravitational waves that we don't observe.</p> <p>The Arecibo PALFA survey has recently discovered a new double neutron star system (PSR J1913+1102) with a strong mass asymmetry and tight orbital period that will likely allow an order of magnitude improvement on this test of the fundamental nature of gravitational radiation. However, to do that experiment, we will need at least a decade of timing. Arecibo is the instrument to do this - this pulsar is too faint to be timed properly with any other instrument. An even better (but non-radiative) test of the best studied alternative theories of gravity is the pulsar in the triple system, PSR J0337+1715 (see Ransom et al. 2014). The unique sensitivity of Arecibo applied to this system represents an improvement of six orders of magnitude in the test of the Strong Equivalence Principle, compared to previous tests like Lunar Laser Ranging. This experiment is our best hope of detecting gravitational effects beyond general relativity. Arecibo is fundamental for achieving this.</p>	Against Closure	Email	6/23/2016	Freire_EIS_input.pdf

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				<p>Direct gravitational wave detection The sensitivity of Arecibo implies that it will very likely be the first telescope to achieve a direct detection of the very low-frequency gravitational waves produced by supermassive black hole binaries, the goal of NANOGrav. The reason is that such a detection will require the precise timing of many faint millisecond pulsars, like the object shown above (PSR J2234+0611).</p> <p>Measurement of neutron star masses Given its high sensitivity, Arecibo has allowed the measurement of many neutron star masses (about half of those known). The most massive NS currently known, PSR J0348+0432, was extensively studied with Arecibo (see Antoniadis et al. 2013, Science, 340, 448). This result is of fundamental importance to the study of super-dense matter and nuclear physics; it has a large number of astrophysical implications, as attested by the 723 citations in the 3 years since it was published.</p> <p>The sensitivity of Arecibo is now allowing the measurement of many more neutron star masses - we are working on 25 of them. To finish these measurements, we need Arecibo to stay open. For a recent example of these, for Radio Astronomy see the first double neutron star with a strong mass asymmetry - discovered and timed with Arecibo (Martinez et al. 2016, ApJ, 812, 143). I could go on very long with the scientific motivation. Please do not hesitate to contact me for a discussion on these topics.</p> <p>Non-scientific aspects I worked at the Arecibo telescope for 8 years, between 2001 and 2009. I can say, from first hand observation, that the staff at Arecibo has world class expertise, is extremely professional and dedicated to their facility. Arecibo is located in an island, Puerto Rico, where such inspirational examples of technical competence and world-class scientific achievement are rare.</p> <p>Arecibo inspires students into the study of science and mathematics; through the REU program is has allowed many under-graduate students - from the US, from many other countries, but particularly from Puerto Rico - to start productive scientific careers.</p> <p>From all of this, I have no doubts that any option other than continued NSF investment for science-focused operations would not only be a scientific tragedy, but it would also be a disaster for the future of Puerto Rico.</p>				

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206	Ricardo J. Rodriguez	Garcia	MIT Class of 2019 Department of Aeronautics and Astronautics	<p>As requested by the NSF, the purpose of this message is to comment on the socioeconomic and cultural influence of the Arecibo Observatory in order to aid in the preparation of an Environmental Impact Statement (EIS).</p> <p>Through the combined efforts of the Angel Ramos Foundation Science and Visitor Center and the Arecibo Observatory Space Academy (AOSA), the Arecibo Observatory has enabled careers in the STEM fields in an island with a lack of educational resources. It does so by challenging students to carry out the scientific method with rigor in a field of their choosing and by having professionals guide their research. The final result is not advanced expertise, but the ability to observe a system and understand it by asking simpler questions: a type of common sense for science.</p> <p>Learning by asking contrasts highly with my high school learning experience. Though the school's professors and administrators may have the best interest of the students in mind, it is too easy to memorize simple procedures and facts right before a test, score good grades, and feel accomplished. Of course, science is not merely about knowing the equations that govern our world, but also about how to derive them and how they work together, because, in research, the only use of knowledge is expanding it. As such, thinking about learning from distinct perspectives is not a skill taught by the school systems, and requires extracurricular opportunities such as a science club or research to grasp. AOSA is one of these opportunities.</p> <p>I attended AOSA for two years when I was in high school. My peers there traveled every Saturday from as close as Arecibo to as far as Fajardo. Since the island lacks public transportation in rural areas, students relied on their family members for travel back and forth. Every week, we discussed a different set of deliverables and facts about life in space. Sometimes we designed a space settlement for the NASA Ames Space Settlement Contest and at other times we worked on our research projects, but we always interfaced with our peers and helped each other complete their research when possible. Meeting students with a similar interests in STEM fields was an invaluable source of determination and connected future professionals that may work together in the future. To this day, I collaborate with some of my AOSA peers to organize and carry out the student program of the International Space Development Conference (ISDC) of the National Space Society (NSS).</p> <p>The Arecibo Observatory itself has been an integral part of the process. First, the variety of professional backgrounds within the observatory's scientific community allowed us to explore different fields, which ultimately led me to pursue aerospace engineering in college. Second, there was natural potential for biology research in the flora under the dish, an opportunity that many of the students used. Third, being near such a massive system as the radio receiver and the dish almost forced us to learn how it all works together, which was knowledge that the engineering team appreciated.</p> <p>As a result of these factors, all AOSA alumni have gone on to join either college or the military, and most are completing technical degrees in STEM. With Puerto Rico's crumbling economy, these alumni are the island's hope for the future.</p> <p>For now, that is all. I hope this information is useful in writing the EIS.</p>	Against Closure	Email	6/23/2016	
207	Steven	Gibson	Western Kentucky University Bowling Green, KY	<p>I am writing in response to the Federal Register Notice of an EIS evaluating potential environmental effects of proposed changes to operations at Arecibo Observatory (AO) in Puerto Rico. I strongly urge that NSF choose Alternative 1 of its "Notice of Intent to Prepare an EIS...", namely "Continued NSF investment for science-focused operations (No-Action Alternative)."</p> <p>As a science educator, I can testify to the power of AO to inform and inspire students in STEM education. Arecibo Observatory is a magnet for school children from all over the island of Puerto Rico and beyond, with tens of thousands of K-12 students passing through the AO Visitor Center every year, a great many from economically disadvantaged backgrounds.</p> <p>I've also made heavy use of AO-related materials in my own teaching at Western Kentucky University, building considerable interest among WKU students to pursue careers in scientific and technical fields, including radio astronomy. Two of my students have been fortunate enough to take part in the NSF-REU summer internship program at AO, where they gained invaluable hands-on research experience while also learning about Puerto Rico's rich cultural and environmental heritage.</p> <p>As a scientific visitor and past AO employee, I have myself witnessed the positive role that AO plays on the island, where it is all at once an educational institution, a research powerhouse, a cultural touchstone, and a point of great pride for Puertorriqueños amidst the challenges that they face every day -- even more now with the recent financial crisis. As a major employer in the region, AO provides a stable economic anchor through its 100+ paid staff, the services it hires, and the ripple effects of this activity that spread throughout the local economy. In addition, AO is a top tourist draw for visitors coming to Puerto Rico, regularly ranking favorably among other major attractions including Old San Juan, the El Yunque rain forest, Taino Indian ruins, and bioluminescent bays like La Parguera. These unique assets combine synergistically, so AO directly impacts the likelihood of visitors coming to the island to boost the economy and learn about local history and ecology.</p> <p>As a scientific researcher, I have made considerable use of AO observations in my own work over many years, including current work to discover and understand how cold gas clouds assemble in interstellar space prior to the formation of new stars, and how magnetic fields influence this hitherto elusive process. This research would not be possible without AO's unique sensitivity, leveraged by the tremendous collaborative efforts of some of the brightest scientists and engineers in the field, whose ongoing dedication to AO testifies to its premiere role as a cutting-edge science facility.</p> <p>For these reasons and many more, I hope the NSF will continue to support AO in its current operational mode, or even to increase its support to a level more sustainable for AO's long-term health.</p>	Against Closure	Email	6/23/2016	

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208	Leonid	Gurvits		<p>The RadioAstron International Science Council (RISC), currently in its annual session in Moscow, Russia, expresses its deep concern about the future of the most sensitive currently operational radio telescope on Earth, the W. E. Gordon Arecibo Radio Telescope.</p> <p>The immense capability of this unique facility in advancing fundamental knowledge and science applications are outstanding and are not matched by any other radio science facility.</p> <p>The Arecibo Telescope plays an irreplaceable role as the most sensitive component of the International Space Very Long Baseline Interferometer, RadioAstron, involving Russia, the United States, Australia, China, Japan, India, as well as numerous countries in Europe.</p> <p>We strongly support the continued global open access to the Arecibo Radio Telescope for radio astronomy research.</p> <p>Members of RISC: Philip Edwards, Australia (co-chair) Yuri Kovalev, Russia (co-chair) Willem Baan, The Netherlands Norbert Bartel, Canada Leonid Gurvits, The Netherlands Carl Gwinn, USA David Jauncey, Australia Bhal Chandra Joshi, India Nikolai Kardashev, Russia Kenneth Kellermann, USA Andrei Lobanov, Germany Leonid Matveenko, Russia Ilya Pashchenko, Russia Victor Stepanyants, Russia Mikhail Popov, Russia</p>	Against Closure	Email	6/23/2016	
209	Gregory	Hallenbeck	Union College	<p>I am writing in response to the notice of an EIS evaluating potential environmental effects of proposed changes to operations at the Arecibo Observatory (AO). I strongly recommend that the NSF choose alternative 1, namely "Continued NSF investment for sciencefocused operations (NoAction Alternative)." I am writing both in my role as a science educator at Union College and user of Arecibo.</p> <p>Over the past two years as a faculty member, I've brought four of my own undergraduate students to Arecibo to learn about the telescope and perform hands on observation. Before that, while a graduate student, I participated in organizing the Undergraduate ALFALFA Team (UAT) workshop, which brought dozens of undergraduate students each year, from across the mainland United States and Puerto Rico, to Arecibo. There, students have been taken on tours of the telescope and platform, heard lectures on radio astronomy, performed observation as members of major surveys, and interacted with the telescope staff. The experience for them is informative and transformative in a way that working with the small radio telescope at Union could never be. I have frequently heard students say that, as a result of attending the workshop and working at the observatory, that they have gained confidence in their ability to become successful professional astronomers. Of course, this impact is not limited to astronomy: constructing, maintaining, and operating the observatory are major accomplishments of mechanical, electrical, and computer engineering which have been appreciated by students from those fields.</p> <p>Finally, it is impossible to speak of the impact of the Observatory without discussing the people of Puerto Rico directly. The Visitors' Center at Arecibo receives thousands of schoolaged children and young adults each year from across the island and beyond. Every time I have visited the Observatory, the Visitors' Center has been packed throughout its operating hours. Whenever I tell anyone visiting that I am a professional astronomer, I receive many questions and stories of how the Observatory has inspired them (either from that visit, or in one case, a visit which happened forty years earlier!). The excitement is palpable. There is simply nowhere else offering a comparable experience, and definitely nothing within the reach of children from lowincome families on the island.</p>	Against Closure	Email	6/23/2016	AOEnvironmental impact-Ghallenbeck.pdf

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210	Ast. Prof. Marijke	Haverkorn	Member of the Young Academy of the Dutch Royal Academy of Science and Arts IMAPP, Dept of Astrophysics Radboud University Nijmegen the Netherlands +31 (0)24 365 2809	<p>I am writing in response to the Federal Register Notice of an Environmental Impact Statement (EIS) evaluating environmental impacts of the Arecibo Observatory.</p> <p>Arecibo Observatory is a unique facility. Apart from producing cutting-edge science results it has a crucial impact on its surroundings and is an icon for the island of Puerto Rico and the United States in general.</p> <p>Arecibo plays an important role for education in Science, Technology, Engineering and Mathematics (STEM). The dish, the observatory and the visitors center have a great attraction for young people who contemplate going into STEM. The observatory holds activities like the weekend schools and summer schools that grow and nurture that interest among children and students. Arecibo's location at Puerto Rico is especially important, since the STEM field has a severe underrepresentation of Hispanic students and scientists. Arecibo is a significant part of efforts to lessen that underrepresentation. The observatory is training the next generation of scientists, consultants and leaders.</p> <p>I strongly prefer EIS Action #1 "Continued NSF Investment for science-focused operations", and I kindly request that you consider these arguments in the EIS.</p>	Against Closure	Email	6/23/2016	
211	Dr. Ellen	Howell	and Michael Nolan, University of Arizona Tucson, AZ 85721	<p>Near-Earth asteroids (NEAs) represent a wealth of scientific information for understanding the origin of the Earth, the connection to meteorites, as well as accurately assessing the impact hazard to the Earth. Radar is the only groundbased observing technique capable of spatially resolving near-Earth asteroids at a fraction of the cost of spacecraft missions. To date, over 300 asteroids have been detected using the Arecibo planetary radar system, one of only two planetary radar facilities in the world, and more than 20 times more sensitive than the other one, Goldstone Solar System Radar in CA. The sizes and shapes of NEAs resulting from analysis of radar images has led to a number of fundamental breakthroughs in our understanding of the formation and evolution of small solar system bodies: formation of binary systems, Yarkovsky and YORP (non-gravitational radiation effects on small bodies), high porosity of NEA rubble-pile structures, and more.</p> <p>The Arecibo planetary radar facility is crucial in determining the orbital parameters for near-Earth asteroids, and can prevent objects from being lost, and extend the time frame for which impact predictions can be made with certainty. This capability is not available at any other telescope either existing or planned (i.e. FAST, SKA, LSST). The loss, if support for Arecibo were to be withdrawn or significantly reduced, would be catastrophic. Although current NASA support is sufficient for the fraction of the telescope time and effort needed to continue at or near current levels, the overall operation of the facility must also be maintained. Current levels of NSF support through both astronomy and aeronomy divisions are barely adequate to maintain the facility operation.</p> <p>Our ongoing efforts to understand the detailed thermophysical characteristics of near-Earth asteroid depend critically on continued operation of the Arecibo planetary radar, and thus the facility itself. We use detailed shape models together with thermal emission measurements to understand the thermal properties and internal structure of near-Earth asteroids. We have found a wide variety of behaviors of objects having different sizes, rotation rates, compositions and surface properties. Without radar shape models, this work could not continue. Radar imaging is essentially a fly-by mission of an asteroid at a fraction of the cost for tens of objects per year. Closing or reducing the effectiveness of such a resource would be extremely short-sighted, and a poor choice for economizing on an irreplaceable and precious scientific facility.</p>	Against Closure	Email	6/23/2016	Arecibocase.nsf2016.doc
212	Mary	Ide		<p>With a lifelong interest in historic preservation, I was surprised to learn that the National Science Foundation is considering dismantling or crippling one of our most notable and historically significant scientific instruments, the Arecibo Observatory in Puerto Rico. I understand that it is on the National Register of Historic Places, not only because of the significant scientific developments there – one of which led to a Nobel Prize – but also because of the engineering feat that it represents. No one who has visited the telescope could imagine tearing it down, any more than we would tear down Mount Vernon. Moreover, the Observatory has ongoing value and can be used, whereas Mount Vernon is purely a museum.</p> <p>While we hope our country is known for many kinds of accomplishments, our contribution to the scientific world, and astronomy in particular, is an important part of our national heritage. The Arecibo Observatory gives a glimpse of an era when anything could be built that could be dreamed – and foretells a future where the US can continue to make real contributions to science around the world.</p>	Against Closure	Email	6/23/2016	
213	Henrick-Mario	Ierkic	Prof. ECE - UPRM	<p>This letter is in response to the Federal Register Notice of an EIS evaluating potential environmental effects of proposed changes to operations at Arecibo Observatory (AO).</p> <p>I am a professor at the Electrical and Computer Engineering Department of the University of Puerto Rico Mayaguez.</p> <p>Arecibo helps my academic duties in three areas : teaching, research and service.</p> <p>My preference is for Action #1 : Continued NSF investment for science-focused operations (No- Action Alternative).</p>	Against Closure	Email	6/23/2016	

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214	Eric	Korpela	Berkeley	<p>This letter is in response to the Federal Register Notice of an EIS evaluating potential environmental effects of proposed changes to operations at Arecibo Observatory. I feel strongly that the NSF should choose continued NSF investment for science-focused operations (the no-action alternative).</p> <p>Arecibo's cultural impact is as large as the Arecibo dish itself. As the source of data for the SETI@home project, the worlds largest volunteer computing project, Arecibo has been part of the both the formal and informal science education of millions of Americans and millions of other people worldwide. SETI@home and Arecibo have been incorporated into the primary and secondary education in many school districts. Arecibo continues to inspire the scientific pursuits of children and adults every day. These pursuits would be diminished by its absence.</p> <p>The social and economic impact of Arecibo on the local and Puerto Rican economy should also not be understated. At a time of financial crisis in Puerto Rico, continued support of Arecibo can be a stabilizing influence.</p>	Against Closure	Email	6/23/2016	
215	Joseph	Kwasizur	Indiana University	<p>I am writing in response to the notice of intent to produce an Environmental Impact Statement regarding the future of the Arecibo Observatory. As an undergraduate student at Lafayette College, I undertook research using the Arecibo Observatory for studies of pulsar astrophysics as part of a summer research internship and a senior thesis. During my research, I visited and made observations with the telescope. Through this project I learned skills in computer coding and algorithm development, in addition to gaining knowledge of pulsar astrophysics itself. This experience was a significant part of my development as a researcher, and an important step leading to my present position as a graduate student in physics.</p> <p>I hope that Arecibo can remain in operation with a science-focused research program, and that it can continue to provide valuable experiences for future students.</p>	Against Closure	Email	6/23/2016	
216	Luke	Leisman	PhD Candidate Department of Astronomy Cornell University	<p>I am writing to urge the NSF to continue full scientific funding for the Arecibo Observatory.</p> <p>I should acknowledge that as a graduate student in astronomy and a regular user of Arecibo, I have a vested interest in the future of the observatory; the science I do depends on its unique capabilities. Other telescopes simply aren't sensitive enough to efficiently search for the faint emission from from the nearly dark galaxies I study, searching for clues to how galaxies form.</p> <p>However, I understand that the NSF is in a difficult position. Important scientific telescopes like Arecibo are expensive to operate, and new exciting telescopes like ALMA demand substantial funding, requiring some form of operations cuts elsewhere. While I strongly feel that Arecibo's budget is justified given the cutting edge science I, and others, do with Arecibo each day, I recognize that Arecibo is just one of many national telescope that does unique science, just one tool in a suite of tools we use to better understand the universe.</p> <p>Yet, Arecibo stands out in my mind less for its substantial scientific usefulness, and more because of the way that it contributes to the inspiration and education of students nationwide. As a graduate student I have the opportunity to work with a team of astronomers from institutions across the country, from Chicago State University to the University of Puerto Rico. We involve undergraduate students from these institutions in our observations, both on site and remotely. More than any other teaching I do, working directly with this leading facility inspires and engages students. Some of it may be that, larger than three football fields from end to end, Arecibo is the most impressive of many telescopes I've used or visited. But more than that, unlike most observatories where students cannot contribute to the data taking process, student thrive on the direct engagement with new discoveries as they happen at Arecibo.</p> <p>On a more personal note, Arecibo has also been an important part of my education as a budding scientist. From conversations with observatory staff, to all night observing runs in the control room, the fascinating science we do with this unique and powerful instrument have shaped my view of what is possible in astronomy.</p> <p>So I will conclude by emphasizing that by investing in science at Arecibo, the NSF is investing in the careers of young scientists, many, like the students at UPR, who would not otherwise have exposure to real, cutting edge science. I am thankful for the inspirational role this telescope has played in my career, and hope it will continue to inspire students of astronomy for years to come.</p>	Against Closure	Email	6/23/2016	
217	Sergio A. Colón	López		<p>El radiotelescopio de Arecibo, no solo ha sido una atracción turística sino también una fuente de inspiración para estudiantes que estudian las ciencias. Sería una pérdida inmensa el dejar de apoyar a esta maravilla de la ingeniería que tantos descubrimientos ha hecho para la astronomía. Yo como arecibeño me siento orgulloso de que este radiotelescopio esté en mi pueblo. Por eso, como me identifico con el mencionado radiotelescopio le pido a la NSF que nos siga dando todo su apoyo.</p>	Against Closure	Email	6/23/2016	

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218	Jean-Luc	Margot	Professor and Chair Dept. of Earth, Planetary, and Space Sciences University of California, Los Angeles 595 Charles Young Drive East Los Angeles, CA 90095 (310) 206 8345 http://mel.epps.ucla.edu/jlm	<p>I am writing to submit comments about the NSF's preparation of an Environmental Impact Statement related to the Arecibo Observatory. Losing the Arecibo Observatory would result in incalculable losses, affecting both the scientific and broader impacts missions of the NSF.</p> <p>I attended the town hall meetings and understand that the curvature in the AST Division budget is flatter than that of the Universe. Nevertheless, I urge you to consider the fact that Arecibo, unlike most telescopes supported by the NSF, is a unique facility. There is no other telescope on the planet, for instance, that enables a direct, dynamical measurement of the oblateness of the sun by tracking the orbits of near-Earth asteroids. Goldstone, the only other planetary radar facility in the world, does not approach Arecibo in terms of sensitivity (factor of 20), accessibility (both in terms of telescope time and observer affiliation), or broader impacts (both in terms of student training and public outreach).</p> <p>This Spring, a class of 14 UCLA undergraduate and graduate students in astrophysics, engineering, and computer science were inspired and engaged by the data that they collected at the Arecibo Observatory. They wrote computer programs to analyze the data, producing an impressive data processing pipeline as a team in a short 10-week period. There is no doubt that Arecibo's flexibility in enabling these observations accounted in large part for the students' motivation and success. These students will now bring their signal processing and software development skills to the workplace. After taking the course, one of the graduate students in electrical engineering declared an interest in developing astronomical instrumentation. An anonymous student evaluation read "I loooooove how we actually had telescope time, that definitely made the course so much more meaningful!"</p> <p>As I write this letter, UCLA graduate student Adam Greenberg is using Arecibo for his PhD research. Previous users of Arecibo in my group include graduate students Shantanu Naidu (PhD 2015, now Postdoc at JPL), Julia Fang (PhD 2013, now Staff Scientist at MIT Lincoln Laboratory), Carolyn Nugent (PhD 2013, now Staff Scientist at IPAC), Patrick Taylor (PhD 2009, now Staff Scientist at Arecibo Observatory), as well as a dozen undergraduate students. There is little doubt that my postdoctoral position at the Arecibo Observatory was the decisive turning point in my career in research and teaching. It is at Arecibo that I had an opportunity to design and build instrumentation that improved the science return of the planetary radar. This instrumentation was later cloned and deployed at Goldstone and Green Bank. It produced the overwhelming majority of asteroid radar images obtained since 2000. It is also at Arecibo that I was noticed by a senior Caltech astronomer who encouraged me to apply for a prize fellowship at Caltech. If it had not been for Arecibo, I might have gone into industry or business.</p> <p>Finally, I urge you to consider the symbolic value of your actions. Arecibo is the largest telescope on Earth. It is a monument to mankind's curiosity. Imagine what you will signal to generations of students by nurturing this unique facility, or by dismantling it.</p>	Against Closure	Email	6/23/2016	nsf2016dps.pdf
219	Sean	Marshall	PhD candidate Department of Astronomy Cornell University	<p>I am writing to urge the NSF to choose alternative 1 of its "Notice of Intent To Prepare an Environmental Impact Statement" for Arecibo Observatory: "Continued NSF investment for science-focused operations (No-Action Alternative)".</p> <p>As a graduate student who focuses on the analysis of radar observations of near-Earth asteroids, I am relying heavily on data from Arecibo. I am hoping to build a career on studies of asteroids. Observations from Arecibo will yield scientific breakthroughs for many years to come.</p> <p>Arecibo Observatory is a unique facility, and its enormous collecting area gives it unparalleled sensitivity. While many radio astronomers use multiple-dish interferometers in order to achieve better angular resolution, arrays like ALMA have a total collecting area that is an order of magnitude less than that of Arecibo. If Arecibo is closed, astronomers will lose the world's most sensitive radio telescope, a facility which has been critical for studies of near-Earth objects.</p> <p>Radar observations from Arecibo are a critical component of efforts to monitor potentially hazardous asteroids and comets. Without Arecibo, our capabilities to assess future impact hazards would be greatly diminished. Without radar observations, predictions of asteroids' future trajectories are less accurate, and many asteroids would have been lost if they had not been observed from Arecibo.</p> <p>Recognizing Arecibo's importance, the members of the Division for Planetary Sciences of the American Astronomical Society passed a resolution at the annual meeting last November encouraging all concerned institutions to work together to keep Arecibo open so that it can continue to be a scientifically productive facility.</p> <p>For asteroid radar observations, there is no other current or planned facility that is nearly as sensitive as Arecibo Observatory. The only other active facility, the Goldstone Solar System Radar in California, is much smaller and thus much less sensitive than Arecibo. Furthermore, Goldstone spends most of its time communicating with spacecraft, so if Arecibo were closed, Goldstone would not be able to replace it.</p> <p>The Five hundred meter Aperture Spherical Telescope (FAST), currently under construction in China, will not be able to mount a radar transmitter on its platform. And even if FAST had the capability to do asteroid radar observations, it would be extremely short-sighted for the NSF to abandon American leadership on a topic which is of great interest to the public. I implore the NSF to maintain the funding necessary to keep Arecibo Observatory operating.</p>	Against Closure	Email	6/23/2016	

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220	Dr. Michael C	Nolan	Senior Research Scientist Lunar and Planetary Laboratory, University of Arizona Tucson, AZ 85721 USA +1 520 626 1978	<p>The Arecibo Observatory is the premier scientific facility in Puerto Rico, and as such attracts numerous minority and underprivileged students to its STEM education programs, such as the Arecibo Observatory Space Academy. There, these students learn they can be scientist and engineers by interaction with the scientific and technical staff of the Observatory. Any option except scientific operation would eliminate these programs, which depend vitally on the scientific mission of the observatory. A purely educational facility that did not maintain the telescope scientifically operational would have little appeal: A crumbling edifice does not inspire future leaders.</p> <p>In addition, the Observatory hosts numerous external instruments, such as seismometers from the Puerto Rico Seismic Network, level benchmarks from the National Geodetic Survey, and GPS receivers to study the local tectonics. All of these rely on the scientific infrastructure of the Observatory.</p> <p>In summary, any mode of operation that does not preserve the scientific mission of the Arecibo Observatory will be an enormous loss to Puerto Rico and to the local communities.</p>	Against Closure	Email	6/23/2016	
221	Kyra Zola	Norsigian		<p>I visited the Arecibo Observatory only once, when I was ten years old, but it made a lasting impact on me. Even as a child, I could glimpse the value and importance of its contributions not just to science but to the education of both school children and tourists. As an experienced educator now, I can attest to the crucial importance of children being exposed at an early age to scientific instruments and experiences which will inspire them to consider science or engineering as a career, or simply to appreciate and marvel at the universe we live in. Losing the cultural and educational resource that the Observatory represents would be a sad loss for tens of thousands of Puerto Rican school children. There is a commitment to ensure that each child in the school system there will visit the Observatory at some point, which also instills pride in having this instrument which is important worldwide located in Puerto Rico, and staffed by many professional Puerto Ricans. I hope you will not consider any options other than continuing the future of this great instrument.</p>	Against Closure	Email	6/23/2016	
222	Tim	Olszanski		<p>I am writing in response to the invitation for public comments on environmental impacts of the Arecibo Observatory. I write to strongly urge that NSF choose alternative 1 of its "Notice of Intent to Prepare an EIS . . .", namely "Continued NSF investment for science-focused operations (No-Action Alternative)."</p> <p>Ever since I was young, I was fascinated by the night sky, and this eventually inspired me to pursue a career in physics. I never truly had the chance when I was working on my Bachelor's degree at New Mexico Tech to truly experience my passion. It only has been just recently possible now that I am working towards a M.S in physics at University of Vermont. I currently am involved in the study of Pulsars, which Arecibo Observatory plays a major scientific role in observing. Though Pulsars were discovered in the 1960's, many things about them remain unknown and mysterious. Pulsars are important because they provide us a look at extreme phenomena that cannot be recreated in a lab. By studying them, we can apply this knowledge of how these phenomena behave to modern day applications. Arecibo also plays a major part in the detection of gravitational waves using Pulsars and is one of the only Planetary physics observatories. If Arecibo were to be defunded, even partly, astronomical science would be put back years. Indeed, the users of Arecibo would be forced to use other instruments. Though there are some exceptional proposals submitted to observatories, most tend to be of an equal quality. Without Arecibo, observers would be forced to use other instruments with already competitive standards, which will overall reduce the amount of meaningful scientific observations conducted. Graduate students who in general have less experience with research and writing proposals, will be put even at more of a disadvantage with obtaining observation time for their research. This could potentially lead to less graduate students pursuing observational astrophysics because of the time they have to wait to simply obtain their data.</p> <p>That is not the only concern to worry about if Arecibo were to be defunded. Arecibo has played a historic role in helping us understand our universe, and the Puerto Rican people consider it a source of cultural pride. In fact, numerous children, including minorities and poor, of Puerto Rico visit Arecibo. A fair portion choose to go to college and some chose the STEM field. If Arecibo were to be mothballed, a major representation of both the NSF and science itself to minorities and those of poor backgrounds (in Latin America) would be lost. I again strongly urge the NSF to continue funding Arecibo, and allowing future generations to continue using this phenomenal instrument.</p>	Against Closure	Email	6/23/2016	

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223	Joanna	Rankin	<p>Arecibo Science Advocacy Partnership Board Members Frank Djuth Geospace Res. Timothy Hankins NM Tech Carl Heiles UC Berkeley Amy Lovell Agnes Scott John Mathews Penn State Dipanjan Mitra Univ. Vermont David Nice Lafayette College Joshua Peek Space Telescope Science Institute Joanna Rankin Univ. Vermont Scott Ransom NRAO Julio Urbina Penn State Joel Weisberg, Carleton College Daniel Werthimer UC Berkeley Qihou Zhou Miami University</p>	<p>We are writing as the Board of the Arecibo Science Advocacy Partnership (ASAP, http://www.areciboscience.org), an organization of 150 scientist-users of Arecibo, representing its three major disciplines and including many of the most prominent and distinguished scientists using the Observatory and its science.</p> <p>Any discussion of changing the current operation of the world's largest and most sensitive radio telescope, the Arecibo Observatory, must first consider the positive impacts of this culturally significant resource on the human environment, as well as the negative impacts of its decommissioning. Why is Arecibo culturally significant?</p> <p>1. It has been crucial to past contributions to scientific discovery in its three major disciplines of atmospheric studies, radar and radio astronomy, including Nobel Prizewinning research, such as the Hulse-Taylor discovery of the Binary Pulsar. It is a unique resource in understanding aspects of the Earth's environment. In addition, the Arecibo Observatory is an important part of the human and cultural environment of Puerto Rico. Any examination of the environmental repercussions of mothballing or decommissioning the Arecibo Observatory that does not consider these impacts would be insufficient. More details can be found in ASAP's response to NSF's "Dear Colleague" letter, http://www.areciboscience.org/ASAP_DCL_Reply_Post.pdf.</p> <p>2. The Observatory is listed on the National Register of Historic Places of the United States Department of Interior's National Park Service because it qualifies under multiple criteria: ☐☐The Observatory has a nationwide significance under Criterion A because of its contributions to the sciences of atmospheric studies and the development of radar and radio astronomy in the United States. ☐☐It is also eligible under Criterion C because it represents a significant work of mechanical and electrical engineering. ☐☐The Observatory's scientific achievements attest to its exceptional importance, thus it qualifies under Criterion G: "The contribution of the Arecibo Radio Telescope to the human knowledge of space is, literally, beyond this world." "The Arecibo Radio Telescope has become a popular icon." For the full description of why the Observatory qualifies for the National Register, see https://www.nps.gov/nr/2008nrlist.htm. Under 54 U.S.C. § 306108 of the National Historic Preservation Act, the effects of any undertaking on the Arecibo Observatory site must be considered and require their own process</p> <p>3. The Observatory is an engineering marvel, cited jointly by the Institute of Electrical and Electronic Engineers (IEEE) and the American Society of Mechanical Engineers (ASME). It has also been designated an IEEE Milestone in Electrical Engineering (http://ieeemilestones.ethw.org) and an ASME Landmark in Mechanical Engineering (https://www.asme.org/about-asme/engineering-history/landmarks). This is the only such designation in Puerto Rico and one of only a few joint designations nationwide. (http://ethw.org/Milestones:NAIC/Arecibo_Radiotelescope,_1963).</p>	Against Closure	Email	6/23/2016	EIS_Board_Letter_V3.0.pdf
				<p>4. The Observatory is a longstanding and vital contributor to the culture of Puerto Rico. Every Puerto Rican knows of it and hears of it often on local media. Many of their educators participate in its teacher-training programs and then take the Observatory back to their classrooms, as well as bringing students directly to the Observatory. It is closely associated with Puerto Rican conceptions of science, excellence and accomplishment. In short, the Observatory is a major symbol of Puerto Rican pride. There is no comparable facility of international prominence in the Caribbean basin. Its fame literally puts Puerto Rico on the map and this in turn continues to provide significant cultural benefits. It attracts tourists who form a different impression of the island and its culture because it hosts and nurtures a world-class scientific institution.</p> <p>5. A large proportion of all Puerto Rican school children visit the Observatory at some point. They are exposed to the excitement of scientific and engineering research and careers, showing them direct role models of other Hispanic people who are succeeding. Some participate in the Observatory's Saturday Academies and go on to win science fairs and university scholarships. The Arecibo area in Puerto Rico is an island center of excellence for such accomplishment in science.</p> <p>6. The Observatory is a significant employer in a part of the island where there is little well paid, much less professional, work. The quarter-million residents of the City of Arecibo have a 12.8% unemployment rate. Most of the Observatory's Puerto Rican employees have worked at the facility for decades, weathering administration changes and many other storms. They have supported their local economies, and sent their children to school and, in many cases, to college, which would have been an unattainable goal without steadily and decently paid Observatory employment. This changes the culture of what students believe is possible and what they try to attain, and provides role models which are crucial to their development.</p> <p>7. Intertwined with these cultural factors, the Observatory also attracts significant revenue to the area through tourist visits and supports the local economy through its purchasing locally and in San Juan. As eco-tourism emerges as an ever more important factor, visiting Arecibo and the nearby caverns provides an appealing alternative to far more damaging tourist options. Eco-tourism is expected to increase on the island and elsewhere. If the Observatory drops off the list of recommended visiting sites, many tourists will choose more environmentally damaging alternatives.</p>				

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				<p>All our remarks above are in the context of strongly urging that NSF choose "Continued NSF investment for science-focused operations (No-Action Alternative)" as cited in its "Notice of Intent to Prepare an EIS." ASAP replied earlier this year to the AST's "Dear Colleague Letter." Some of the cultural, educational and scientific accomplishments and resources of the Observatory which we reviewed are relevant here, since science is a part of the human environment and culture. We, the Arecibo Science Advocacy Partnership (ASAP), replied earlier this year to the AST's "Dear Colleague Letter" outlining in detail our recommendations for the NSF's implementation of this alternative #1 (and reviewing some of the cultural, educational and scientific accomplishments and resources of the Observatory). Highlights include ---</p> <p>☐☐Arecibo Observatory is the most sensitive radio telescope, planetary radar and incoherent scatter radar (ISR) on the planet.</p> <p>☐☐AO serves a highly international scientific community and is recognized worldwide as an iconic scientific facility and human achievement.</p> <p>☐☐One of the Observatory's principal strengths is its ability to adapt quickly to new science and techniques, a capability rapidly being lost on other more complex and/or array instruments configured towards certain fixed science goals.</p> <p>☐☐AO is uniquely powerful for planetary and Near-Earth-Asteroid (NEA) radar. AO and the GBT could, as in the past, be paired for unique new observations particularly of Near-Earth Asteroids (NEAs).</p> <p>☐☐AO's great sensitivity is required for gravitational wave detection and study. Single dishes provide important advantages over arrays for certain types of astronomy. For example, AO pulsar timing activities cannot be superseded by the Very Large Array (VLA). The capabilities of AO and the Green Bank Telescope (GBT) are highly complementary—and the loss of either one would cripple leading areas of US astronomical research.</p> <p>☐☐The most sensitive ISR (Incoherent Scatter Radar) in the world combined with metals lidar, other optical instruments, and the VHF radar make AO the premiere facility for studying the role of meteoroid flux metals in the upper atmosphere and ionosphere. The full document is at http://www.arenboscience.org/ASAP_DCL_Reply_Post.pdf. This document represents only a first pass at potential impacts of the options NSF is considering.</p> <p>We trust that as the process proceeds, these will be amplified so that the conclusion is clear: we have a culturally unique treasure whose value is recognized by scientists, engineers, tourists and schoolchildren. We trust that the NSF will follow suit.</p>				
224	Joanna	Rankin	<p>Arecibo Science Advocacy Partnership Board Members Frank Djuth Geospace Res. Timothy Hankins NM Tech Carl Heiles UC Berkeley Amy Lovell Agnes Scott John Mathews Penn State Dipanjan Mitra Univ. Vermont David Nice Lafayette College Joshua Peek Space Telescope Science Institute Joanna Rankin Univ. Vermont Scott Ransom NRAO Julio Urbina Penn State Joel Weisberg, Carleton College Daniel Werthimer UC Berkeley Qihou Zhou Miami University</p>	<p>In summary, an environmental impact analysis would be insufficient without conducting a full examination of these economic, cultural, and related impacts. These overall impacts are so interrelated that they probably entail "cumulative" or "indirect" effects [e.g., U.S. Code 40 C.F.R. 1508.8 (b)]. The interrelated economic impacts of all options considered by NSF with regard to the future of Arecibo need to be addressed in the Environmental Impact Statement. If the NSF were to diminish the scientific mission of the Observatory, it would sacrifice the underlying fundamental reason for the Observatory's existence: to explore and further understand human beings in relation to our environment, or, in NEPA language, the human environment. Nothing is more fundamental than that. To operate the Observatory only as an educational institution would keep the facility alive, but would remove the research function from which it's educational facility derives. The Observatory's three research areas are highly interdependent, and its role as an educational institution depends on the scientific and engineering activities of them all. The alternative of mothballing the Observatory would affect the human environment in countless ways. It would turn a source of pride into a source of shame. It would turn out on the street Puerto Rican people who have given decades of their lives to an institution that has contributed importantly to humankind everywhere. Once those people are gone — at every level from its highly skilled and dedicated platform staff to its trained technical staff — they cannot be replaced without a commitment to years of training, and the rents in the social fabric of their communities caused by their being terminated would last longer than the Observatory itself. The deterioration of the physical plant of the Observatory in a tropical salt-air climate can only be imagined by those who have experienced what it can do to a painted metal structure. During its mothballing, it would have to be guarded so as not to be a local hazard, and if ultimately the physical structures were disassembled, the lack of maintenance would make the process more costly and hazardous with much more devastating environmental impacts (including the landfill impacts). Because climate change is expected to make hurricanes more frequent, the mothballed instrument would become more vulnerable to natural destructions that would in turn create uncontrolled environmental disasters. Because most school children in Puerto Rico visit the Observatory at some point, the new generations who will not have that opportunity would learn the opposite of the lesson we have been trying to instill for decades, that science and engineering careers are open to Hispanics and other "minorities," and that people have rewarding and remunerative lives as a result of their education and training. This would be a blow not only in Puerto Rico, but in our country as a whole. We all lose when we instill despair rather than hope in the rising generation. These potential circumstances need to be studied and assessed in the EIS. What would the environmental impact be if NSF decided on the most draconian option of destroying the Observatory?—that is, attempting to return the property to its original natural state. Such destruction would result in compromised habitat for plants and animals which still have not been fully catalogued. Both the process of destruction and its result would compromise the water quality of the Tanama River which runs under the dish and its tributaries—and consequently the plants and animals which depend on it. It is hard to imagine that it is even possible to decommission the Observatory, dismantle its structures and buildings and return the site to its original condition at any cost. The amount of landfill material that would be generated is almost unthinkable, and it would consist primarily of materials which are slow to deteriorate and have some amount of toxicity. The Observatory was constructed at a time when Puerto Rico's environmental regulations were hardly existent, and now they are reasonably strict as the recent triangle painting exercises have clearly demonstrated. Who knows what materials will be found if the NSF makes this wrong choice? Restoring the natural environment would be impossible without an accurate catalogue of the existing plants and animals, which are almost surely fewer in species and number than they were before the Observatory was built.</p>	Resource Considerations	Email	6/23/2016	EIS_Board_Letter_V3.0.pdf

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				<p>There are currently 145 species in Puerto Rico on the Endangered Species list. It would be astonishing if none of these is present at the Observatory, and this would need to be verified by the appropriate experts. Historic evidence from other similar environments would need to be brought in. Even in the presence of that data and a contemporary inventory — assuming that no endangered species were found — a huge amount of clean soil and numerous, costly native plants and animals would be required to return the valley floor to its original condition. Where would that soil be excavated, and at what cost to that location? How and where would the plants and animals be bred, and at what cost? Restoring the valley profile would cause huge damage to existing vegetation, so the contractors would be starting from scratch — and doing so on top of a vulnerable river and sinkhole of unknown character.</p> <p>Restoring the drainage system alone would be a nightmare. Even apart from all of these issues, the process of destruction and its result would compromise the water quality of both the Tanama River which runs under the dish and the Arecibo River into which it drains—and consequently the plants and animals which depend on these essential waterways. In addition, decommissioning activities may require temporary road building and additional impactation of the soil due to the use of heavy machinery. All of these negative repercussions on the natural environmental of the Observatory site need to be examined. If NSF chooses any option but continuation, all the impacts discussed above would disproportionately affect a “minority” population—that is, the 99% of Puerto Ricans who are Hispanic. As E.O. 12898 concerning environmental justice specifies, Federal agencies are ordered to avoid disproportionate impacts on minority populations. The same stricture applies to low-income populations. The median income in Puerto Rico is \$19,429, compared to \$51,371 in the US at large. These issues need to be addressed in the assessment of the impacts on the human and socio-economic environment</p>				
225	Joanna M.	Rankin	Professor of Physics and Astronomy	<p>I write in response to the Federal Register Notice of an EIS evaluating potential environmental effects of proposed changes to operations at Arecibo Observatory (AO). Arecibo Observatory is a unique institution nationally and internationally culturally, educationally, scientifically and also economically in Puerto Rico. Arecibo’s attributes have been cultivated over many years, are interconnected and mutually supportive, and can not readily be separated. The Observatory’s contributions in all four areas continue to be very strong, and they could multiply in future with a more appropriate level of support. The scientific contributions from AO have been outstanding, and its scientific future remains very bright indeed. The Observatory’s cultural contributions to Puerto Rico and the world are beyond reckoning. Here are a few examples:</p> <ul style="list-style-type: none"> ☑ In my experience, Arecibo is the most exciting observatory for students on the planet. Students sometimes describe their experience at AO as “life changing” and this can be traced in the lives of students who visit for scientific work. ☑ Arecibo is a work of art and is often apprehended in this manner by visitors. It is understood as a supremely elegant mechanical and electronic monument to the in service to the human imagination. ☑ The Observatory is iconic nationally and internationally. Its very existence has raised consciousness about science, to say nothing of its several prominent movie roles! ☑ AO is almost certainly the single best known and influential scientific institution in the Spanish speaking US and Caribbean basin. Puertoricans are very very proud of their “El Radar” and its presence has entered the culture and consciousness in a very deep and positive manner. ☑ In Puerto Rico, the Observatory is of very considerable economic value and could be much more so. Its staff salaries are highly important in the Arecibo Town region. Its educated staff has significantly contributed to building up a further generation or two of educated people in the area, and the tens of thousands of tourist visitors are also important to the overall island economy. Withdrawal of support now would compound what is already a difficult situation for Puerto Rico and its citizenry. ☑ Educationally, the Observatory is of key importances at every level: For the island high school students who visit AO in conjunction with their science classes. The Arecibo Institute students who go on to excel in STEM disciplines. Training programs for teachers in PR and elsewhere in Latin America. Graduate students in science and engineering both from PR and the mainland. Postdocs. As a facility for visits by US colleague students to do research with their mentors. <p>A primary environmental principle is to use well and not waste—in this case waste its scientific, educational, economic and cultural value. AO has enormously greater value than the cost of its support. It is unique in the world in all three of its science areas. AO is hardly 20 years old since its Gregorian renovation, still very much in its prime years. It could multiply, 2-3 times, more important and productive with adequate, rather than starvation, support. Replacing AO would take years and many times the cost of dismantling it. All such facilities/institutions have finite lifetimes, but crippling the Observatory before it has become outdated or malfunctioning would indeed be an environmental crime.</p>	Against Closure	Email	6/23/2016	EIS_Arecibo_June2016_JMR.pdf

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226	Alessandro	Ridolfi	Ph.D. candidate at Max-Planck-Institut für Radioastronomie Auf dem Hügel 69 D-53121 Bonn, Germany	<p>This letter is in response to the Federal Register Notice "Proposed Changes to Arecibo Observatory Operations", evaluating potential environmental effects of proposed changes to operations at Arecibo Observatory.</p> <p>I am writing to strongly urge the National Science Foundation to choose the first option under consideration, namely "Continued NSF investment for science-focused operations". Since its construction in 1963, the Arecibo radio telescope has proved to be an outstanding research facility, always capable of world-class scientific breakthroughs. Its huge collecting area is clearly the main, but not the only, reason of its success. Over the decades, the observatory was able to greatly improve itself, with new instrumentation and computing power. This has allowed the Arecibo science to be always at the top of astronomical research. As a pulsar astronomer and science enthusiast, I am very keen to remind you of the discovery of the very first pulsar in a binary system, made at Arecibo by R. A. Hulse and H. J. Taylor in 1974. The object found showed strong relativistic effects and opened up unprecedented possibilities for the study of gravitation. Such a discovery was worth the Nobel Prize for the two astronomers. This was just one the first of the amazing findings that Arecibo can boast. To take a much more recent example, I would like to highlight the detection of the first repeating Fast Radio Burst, recently published in Nature (Spitler et al. 2016).</p> <p>As a Ph.D. candidate at the Max-Planck-Institut für Radioastronomie in Bonn, Germany, I would hereby like to call attention to how much the Arecibo Observatory is crucial not only for my personal research, but also for a huge community of young students and researchers from all over the world. The project that I am currently carrying out for my Doctoral studies finds its own foundations in the aforementioned work of Hulse and Taylor. The focus of my work is indeed to study a particular effect predicted by Einstein's General Relativity in the binary pulsar PSR B2127+11C (see, e.g. Jacoby et al. 2006, Kirsten et al. 2014). This pulsar resembles for many aspects the system that Hulse and Taylor found and, as the latter, it is a unique object for studying gravitation. According to Einstein's equations, the spin of the pulsar couples to the orbital motion of the binary; this effect, called "Geodetic Precession", causes the direction of the pulsar radiation beam to vary over time, consequently changing the amount and the characteristics of the pulsar signal that we can collect on Earth. Such a modification in the signal allows us to test whether the changes are indeed occurring in the way that Einstein's General Relativity predicts. However, despite being a fantastic natural laboratory, PSR B2127+11C is a very weak source that, because of the very same effect that we want to study, it is getting fainter and fainter very quickly. The Arecibo radio telescope is currently the only instrument available to study this source with the necessary sensitivity and we have now been using it for more than two years to monitor the changes in the pulsar (Arecibo Project P2910). However, over the next 5-10 years, PSR B2127+11C is expected to become so weak that it will be impossible to observe it. It is thus of utmost importance to have Arecibo available to be able to continue our monitoring campaign.</p> <p>In the above paragraph I described just one, and very personal, example of how the Arecibo telescope is still, after more than 50 years, an indispensable tool for leading-edge fundamental physics experiments and top-class science. Many other scientists (see, e.g. http://areciboscience.org/WhoAreWe.html) share the same opinion and are continuously demonstrating the immense capabilities of Arecibo with great scientific achievements.</p> <p>Therefore, I strongly encourage the NSF to continue to support Arecibo as a worldleading astronomical facility by choosing the first option, namely "Continued NSF investment for science-focused operations".</p>	Against Closure	Email	6/23/2016	Ridolfi_Letter_in_response_to_Proposed_Changes_to_Arecibo_Observatory_Operations.pdf
227	Xiomara	Rivera		I sing for arecibo observatory.	Against Closure	Email	6/23/2016	
228	Alberto	Sensana	(Chair) and the IPTA Steering Committee	<p>We are writing this email in support of the Arecibo Observatory on behalf of the International Pulsar Timing Array collaboration (IPTA).</p> <p>The IPTA comprises more than one hundred scientists in ten countries (and counting) who are using radio telescopes around the world for their science. The primary goal is the detection of low-frequency gravitational waves that are distinct from those discovered recently by the LIGO project. The IPTA's primary sources are supermassive binary black holes in merging galaxies and hence the IPTA is instrumental to our understanding of supermassive black hole assembly and astrophysics, galaxy evolution and cosmology. The detection of low-frequency gravitational waves is a critical step towards the goal of a complete characterization of the gravitational wave universe.</p> <p>The entire worldwide collaboration benefits from the data obtained with the Arecibo Observatory by scientists within NANOGrav, the North American component of the IPTA. The Arecibo data are pooled with data from other telescopes, including the Green Bank Telescope in West Virginia, and multiple telescopes in Europe and Australia. Soon, we expect to be joined by scientists in South Africa and China.</p> <p>Arecibo is an important linchpin in the collective effort because it provides the highest precision data due to its large aperture. In addition, instrumental effects are well understood given the many decades of experience we have with using it. Loss of Arecibo would have a severe detrimental impact on the scientific collaborations between scientists working within the IPTA, which have developed over many years. In recent years those collaborations have grown because new instrumentation developed for Arecibo and the other telescopes in the context of the IPTA are now placing us at the doorstep of detection of long-wavelength gravitational waves. These will be as distinct from those detected by LIGO as X-rays are distinct from radio waves, and hence this effort must be continued.</p> <p>We strongly urge the National Science Foundation to continue operation of the Arecibo Observatory to ensure the success of this large international effort.</p>	Against Closure	Email	6/23/2016	

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229	Xavier	Siemens	<p>Chair, NANOGrav Director, NANOGrav Physics Frontiers Center Associate Professor Center for Gravitation, Cosmology, and Astrophysics Department of Physics University of Wisconsin-Milwaukee Milwaukee, WI 53201 (414) 229-6439 (Office) (414) 793-5047 (Cell) (414) 229-5589 (FAX) E-mail: siemens@gravity.phys.uwm.edu http://www.lsc-group.phys.uwm.edu/~siemens</p>	<p>The Arecibo Observatory is a Key Instrument for Gravitational-wave Astronomy Introduction We are the North American Nanohertz Observatory for Gravitational waves (NANOGrav), a collaboration that involves over 100 students and scientists from 15 institutions in the US and Canada. The US portion of NANOGrav is largely funded by the National Science Foundation's NANOGrav Physics Frontiers Center.</p> <p>Using the Arecibo Observatory and the Green Bank Telescope, our collaboration is doing gravitational wave astronomy: we are leading the search for low-frequency gravitational waves produced by the mergers of supermassive black holes at the centers of galaxies.</p> <p>These low-frequency gravitational waves have periods 11 orders of magnitude longer than those discovered by LIGO and announced earlier this year. By regularly monitoring millisecond pulsars with our telescopes, we are building an observatory, much like LIGO, that will open a window onto a completely new part of the gravitational wave spectrum.</p> <p>We are now at a time when we have reached unprecedented sensitivities and are exploring astrophysically relevant parts of galaxy evolution parameter space. A detection could therefore happen soon.</p> <p>The Importance of Arecibo</p> <p>Arecibo is the most sensitive radio telescope in the world and will continue to be for several more years. Lack of access to this instrument will delay the first detection of gravitational waves in the regime accessible to pulsar timing, and significantly hamper efforts to maximize astrophysical studies using these waves once they are detected.</p> <p>Given the unprecedented sensitivity of NANOGrav, and LIGO's recent gravitational wave discovery-----which was appropriately announced with much fanfare by both LIGO and NSF, and has already received several major scientific prizes-----we were surprised to learn about NSF's decision to consider the shutdown of Arecibo, thus triggering the need to develop a scoping notice for an Environmental Impact Statement. The scientific context of prior reviews of Arecibo in 2006 (Senior Review) and 2012 (Portfolio Review) has changed profoundly, so that their conclusions about the scientific merits of this facility need to be re-examined.</p> <p>Human and Cultural Importance</p> <p>We are writing to comment on issues related to human and cultural environment. Any option that NSF pursues that is incompatible with continued science---focused operations at Arecibo will put in serious peril 1) the ongoing science and engineering training of students from high school through postdocs, discussed further below, 2) the research and careers of our more than one hundred students and scientists in NANOGrav, 3) US leadership in low-frequency gravitational wave astronomy and high precision pulsar science, and 4) a new scientific discovery as profound as the one announced by LIGO earlier this year.</p> <p>Over the past decade NANOGrav has involved a diverse group of hundreds of US high school and undergraduate students in Arecibo observations of pulsars and gravitational wave astronomy. Arecibo has played a particularly inspiring role in training our Hispanic students who, through the Arecibo Remote Command Center based at the University of Texas Rio Grande Valley and expanded to a number of other NANOGrav institutions, form a substantial part of our group of observers. Arecibo is a source of cultural pride for our Hispanic students (as well as the people of Puerto Rico). The excitement of our students in personally operating Arecibo has propelled many of them into careers in physics, astronomy, engineering, and other STEM fields. Indeed, the career---defining moment for many of the senior researchers and faculty in NANOGrav was using Arecibo as a student. With Arecibo's continued science---focused operations, over the coming years hundreds more students will continue doing cutting edge research by operating the most sensitive radio telescope in the world in our search for gravitational waves, a truly valuable research and educational experience for them.</p> <p>We emphasize that, scientifically, the Arecibo Observatory is not the same telescope it was when it was first constructed, or even a few years ago. It is a far superior instrument. The modern telescope structure, including the Gregorian dome, was inaugurated twenty years ago, but instrumentation capable of using the full instantaneous telescope band has been available for less than five years. Additionally, upcoming wideband and multibeam systems promise to greatly increase the sensitivity of the telescope in the next few years.</p> <p>We recognize that other telescopes, particularly the FAST telescope now under construction in China or the proposed SKA phase 2 telescope in southern Africa, could eventually be suitable replacements for Arecibo for our gravitational wave science program (though not for the educational mission described above). However, their suitability for our program ultimately depends on the instrumentation and observing programs implemented at those facilities. Even more importantly, we will not know for several years the true sensitivity of upcoming telescopes or the ability of scientists from the United States to access these international facilities, which are not expected to operate under "open skies" policies. Given the timescales for building and commissioning these new instruments, as well as our need for overlapping observations to link existing data sets to data collected with the new instruments, it is critical that Arecibo continue to operate in the coming years. Arecibo's status among US and world radio facilities should be re-evaluated when the new facilities are in full operation and when it is understood whether U.S. scientists and their international collaborators have access to them.</p>	Against Closure	Email	6/23/2016	NANOGravNSFNOI Response.pdf

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
				<p>If you have any questions or would like to reply to our letter please contact the NANOGrav Management Team (nano--mt@nanograv.org).</p> <p>Signed by 123 NANOGrav students and scientists:</p> <p>Zaven Arzoumanian, USRA, NASA Goddard Space Flight Center Paul Baker, West Virginia University Robert Bavisotto, University of Wisconsin---Milwaukee Adam Brazier, Cornell University Paul Brook, University of Oxford Sarah Burke---Spolaor, National Radio Astronomy Observatory Keesii Caballero, University of Texas---Rio Grande Valley Richard Camuccio, Franklin and Marshall College Fernando Cardoso, West Virginia University Rachel Chamberain, Franklin and Marshall College Sydney Chamberlin, Penn State University Shamibrata Chatterjee, Cornell University Brian Christy, Notre Dame of Maryland University John Combs, Franklin and Marshall College James Cordes, Cornell University Neil Cornish, Montana State University Marcus Covington, Franklin and Marshall College Froney Crawford, Franklin and Marshall College Steve Croft, University of California, Berkeley Thankful Cromartie, University of Virginia Kathryn Crowter, University of British Columbia Megan DeCesar, University of Wisconsin---Milwaukee Paul Demorest, National Radio Astronomy Observatory Julia Deneva, Naval Research Laboratory Timothy Dolch, Hillsdale College Eric Edwards, University of Wisconsin---Milwaukee Justin Ellis, Jet Propulsion Laboratory, California Institute of Technology Rob Ferdman, McGill University Elizabeth Ferrara, University of Maryland William Fiore, University of Wisconsin---Milwaukee Emmanuel Fonseca, University of British Columbia Ellen Friesen, Hillsdale College Nate Garver---Daniels, West Virginia University Pete Gentile, West Virginia University Simon Gilbert, Oberlin College Daniel Halmrast, Hillsdale College</p> <p>Steven Hawkins, University of Wisconsin---Milwaukee Sarah Henderson, Lafayette College Eliu Huerta, West Virginia University Thomas Hull, Cornell University Ben Izmirlil, Oberlin College Fredrick Jenet, University of Texas---Rio Grande Valley Cody Jessup, Hillsdale College Lou Jing, University of Texas---Rio Grande Valley Glenn Jones, Columbia University Megan Jones, West Virginia University David Kaplan, University of Wisconsin---Milwaukee Victoria Kaspi, McGill University Filip Keri, Franklin and Marshall College Tonia Klein, University of Wisconsin---Milwaukee Zachary Komassa, University of Wisconsin---Milwaukee Michael Koop, Penn State University Stasia Kuske, Franklin and Marshall College Joseph Kutil, Hillsdale College Michael Lam, Cornell University Joseph Lazio, Jet Propulsion Laboratory, California Institute of Technology Han Le, Franklin and Marshall College Kat Lefebvre, Franklin and Marshall College Lina Levin, University of Manchester Tyson Littenberg, University of Alabama Andrea Lommen, Franklin and Marshall College Duncan Lorimer, West Virginia University Hao Lu, Lafayette College Jintao Luo, National Radio Astronomy Observatory Ryan Lynch, National Radio Astronomy Observatory Dustin Madison, National Radio Astronomy Observatory Walid Majid, Jet Propulsion Laboratory, California Institute of Technology Kaleb Maraccini, University of Wisconsin---Milwaukee Allison Matthews, University of Virginia Margaret Mattson, West Virginia University Maura McLaughlin, West Virginia University Sean McWilliams, West Virginia University Chiara Mingarelli, Jet Propulsion Laboratory, California Institute of Technology Dan Mix, Franklin and Marshall College Chifu Moua, University of Wisconsin---Milwaukee Rusty Mundorf, University of Wisconsin---Milwaukee Ryan Nesselrodt, Franklin and Marshall College Sophia Newton, Franklin and Marshall College Cherry Ng, University of British Columbia Benjamin Nguyen, Franklin and Marshall College David Nice, Lafayette College Stella Ocker, Oberlin College</p>				

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Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
				<p>Jeff Ouellette, Cornell University Nipuni Palliyaguru, Texas Tech University Tim Pennucci, Columbia University Indira Rahman, Franklin and Marshall College Joshua Ramette, Hillsdale College Joanna Rankin, University of Vermont Scott Ransom, National Radio Astronomy Observatory Paul Ray, Naval Research Laboratory Douglas Reigel, Cornell University Nora Rice, Oberlin College Miguel Rodriguez, University of Texas---Rio Grande Valley Joseph Romano, University of Texas---Rio Grande Valley Caitlin Rose, Franklin and Marshall College Laura Sampson, Northwestern University Andrew Seymour, NAIC Arecibo Observatory Brent Shapiro---Albert, West Virginia University Joey Shapiro Key, University of Texas---Rio Grande Valley Xavier Siemens, University of Wisconsin---Milwaukee Joe Simon, University of Wisconsin---Milwaukee Renee Spiewak, University of Wisconsin---Milwaukee Ingrid Stairs, University of British Columbia Daniel Stinebring, Oberlin College Kevin Stovall, University of New Mexico Joseph Swiggum, University of Wisconsin---Milwaukee Stephen Taylor, Jet Propulsion Laboratory, California Institute of Technology Matthew Tibbetts, Franklin and Marshall College Lam Tran, Franklin and Marshall College Michael Tripepi, Hillsdale College Jacob Turner, Oberlin College Rachel Umberger, Franklin and Marshall College Michele Vallisneri, Jet Propulsion Laboratory, California Institute of Technology Rutger van Haasteren, Jet Propulsion Laboratory, California Institute of Technology Sarah Vigeland, University of Wisconsin---Milwaukee Yan Wang, Huazhong University of Science and Technology Ryan Wilber, University of Wisconsin---Milwaukee Kathryn Williamson, West Virginia University Emily Wilson, Franklin and Marshall College Caitlin Witt, Cornell University Alex Wolszczan, Penn State University Enia Xhakaj, Lafayette College WeiWei Zhu, Max Planck Institute for Radio Astronomy</p>				
230	Thomas	Sorenson	sorenson gunsmithing services	This facility is important for research of our universe and for SETI. To close this facility would severely hamper ongoing research of our universe and the search for extraterrestrial life. I urge you reconsider and keep this facility open for the new generations of astronomers.	Against Closure	Website	6/23/2016	

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Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
231	Ingrid	Stairs	Professor, THE UNIVERSITY OF BRITISH COLUMBIA Department of Physics and Astronomy 6224 Agricultural Road Vancouver, BC Canada V6T 1Z1 Tel: (604) 822-3853 Fax: (604) 822-5324	<p>The Arecibo Observatory has been a vital instrument in my research program since my very first and extremely memorable trip as a beginning graduate student in 1993. For my Ph.D. degree, I had what is rapidly becoming a rare opportunity in astronomy: the chance to assemble an observing instrument, write data acquisition and reduction software for it, install it at the telescope in late 1997 at the end of the Gregorian-dome upgrade, and acquire data with it. That instrument, the Princeton "Mark IV" pulsar observing machine, was one of the instruments used by several of us for years in monitoring the fastest-spinning millisecond pulsars, a project that in 2007 extended its scope and collaboration to become the North American Nanohertz Observatory for Gravitational Waves (NANOGrav). This collaboration is on the road to making a direct detection of gravitational waves passing near the Earth; the loss of Arecibo would delay the time of detection and late reduce our ability to carry out astrophysical studies of the waves.</p> <p>I have led or been involved with numerous other radio pulsar projects at Arecibo throughout my career, including the large-scale PALFA survey of the Galactic Plane for pulsars and Fast Radio Bursts, a project to find pulsars in the globular clusters visible to Arecibo, and long-term monitoring of relativistic binary pulsars which test Einstein's theory of General Relativity (GR). I helped build the "Arecibo Signal Processor" (ASP) pulsar instrument, successor to Mark IV and precursor to the current "Puerto Rico Ultimate Pulsar Processing Instruemnt" (PUPPI) machine. ASP in particular afforded me the opportunity to train my own graduate student on the commissioning and detailed understanding of an observing instrument. I have seen similar benefits in the PALFA collaboration, with students learning to understand the details of instrument operation and telescope beam shapes in order to correctly interpret their data. I have so far mentored 10 trainees ranging from undergraduates to postdoctoral fellows on the use of Arecibo data and hope to be able to continue doing this for years to come.</p> <p>Losing Arecibo would have a tremendous negative impact on my research program, on my collaborations with US-based scientists, on the training of US, Canadian and international students, and on significant and highly successful public outreach programs such as the Angel Ramos Visitor Center and the Einstein@Home "citizen science" pulsar search program. Arecibo results only receive widespread press coverage. Examples that I have been involved with include the first quantitative, model-independent measuremnt of the GR-predicted "wobble" of the pulsar's spin in a double-neutron-star system, a qualitative measurement of the same effect in another relativistic system (this garnered considerable media attention in 2015, including an interview I did for CBCRadio's Quirks and Quarks science show), the discovery of a repeating Fast Radio Burst, and the discovery of unexpected and therefore extraordinarily interesting pulsars in the PALFA survey, such as an eccentric millisecond pulsar binary that required development of new evolutionary scenarios. None of these results would have been possible without Arecibo.</p> <p>Arecibo's scientific and cultural reach is worldwide, providing everything from training opportunities and a sense of local pride and accomplishment in Puerto Rico to invaluable research infrastructure for the world radio astronomy community. With its unique sensitivity and infrastructure, Arecibo is poised to make fundamental astrophysical contributions for years to come.</p> <p>In summary, I advocate strongly for the first option under consideration: Continued NSF investment for science-focused operations.</p> <p>A recent Arecibo-based paper likely not listed in any letters from my collaborations: We used Arecibo data to derive precision measurements of 5 relativistic corrections to a basic elliptical Keplerian orbit for a double-neutron-star system. These parameters provide multiple self-consistency verifications of the predictions of General Relativity (GR) and also allow us to make a precise measurement of the distance to the pulsar. We also confirmed our earlier measurement of the precession "wobble" of the pulsar's spin axis; again it is consistent with GR. This paper has garnered 20 citations in just two years.</p> <p>Fonseca, Emmanuel, Stairs, Ingrid H. and Thorsett, Stephen E., "A Comprehensive Study of Relativistic Gravity Using PSR B1534+12," Astrophysical Journal 787, article 82 (2014).</p> <p>We present updated analyses of pulse profiles and their arrival times from PSR B1534+12, a 37.9 ms radio pulsar in orbit with another neutron star. A high-precision timing model is derived from 22 yr of timing data and accounts for all astrophysical processes that systematically affect pulse arrival times. Five "post-Keplerian" parameters are measured that represent relativistic corrections to the standard Keplerian quantities of the pulsar's binary orbit. These relativistic parameters are then used to test general relativity by comparing the measurements with their predicted values. We conclude that relativity theory is confirmed to within 0.17% of its predictions. Furthermore, we derive the following astrophysical results from our timing analysis: a distance of $d_{GR} = 1.051 \pm 0.005$ kpc to the pulsar-binary system, by relating the "excess" orbital decay to Galactic parameters; evidence for pulse "jitter" in PSR B1534+12 due to short-term magnetospheric activity; and evolution in pulsedispersion properties. As a secondary study, we also present several analyses on pulse-structure evolution and its connection to relativistic precession of the pulsar's spin axis. The precession-rate measurement yields a value of $\Omega_1 \text{ spin} = 0.59 \pm 0.12$ yr⁻¹ (68% confidence) that is consistent with expectations and represents an additional test of relativistic gravity.</p>	Against Closure	Email	6/23/2016	Arecibo_EIS_Stairs.pdf

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Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
232	Daniel R.	Stinebring	Federighi Professor of Natural Science Oberlin College Oberlin, OH 44074	<p>I write to strongly urge that the NSF choose alternative 1 of its "Notice of Intent to Prepare an EIS . . .", namely "Continued NSF investment for science-focused operations (No-Action Alternative)."</p> <p>I have been using the Arecibo Observatory since 1976 and have made an observing trip to it in almost all of the years since then. During the period 1985-90 when I was an Assistant Professor at Princeton University I took many graduate students (~ 10 to the Observatory) as well as a few undergraduates. Since 1990 I have been a professor at Oberlin College in Ohio. During that time I have taken about 30 Oberlin undergraduates to the Observatory and worked with about 45 other students on Arecibo data, much of which we obtained through remote observing that they participated in. (Please see the list appended at the end for more details.)</p> <p>I am a member of the NANOGrav collaboration that is on track to detect long-wavelength gravitational waves in the next five years if our access to our two detectors – the Arecibo Observatory and the Green Bank Telescope – is not impaired. In fact, we hope that in the aftermath of the stupendous LIGO announcements of gravitational wave detection in the high- frequency GW regime our effort to open another gravitational wave window will be supported fully by the NSF, including crucial support for the Arecibo Observatory.</p> <p>My research into turbulence and structure in the interstellar medium, as probed by pulsar signals, has been supported by the NSF since 1993. More than 70 Oberlin College undergraduates have worked with me on that research, and most of them have gone on to careers in science or related fields. Small- group, high-quality science is a key component in our national science effort, and Arecibo excels in that area as well as in larger-scale efforts. The Arecibo Observatory is an extraordinary research instrument and a training ground for the next generation of astronomers. It certainly has been for me and for my students.</p> <p>The Arecibo Observatory is at the peak of its scientific productivity and remains a leading instrument of discovery in astronomy. In the more than 40 years that I have been using it, the telescope has never been more capable, reliable, and better instrumented than it is today. Much of this capability is due to a far-sighted NSF initiative in the 1990's that completely upgraded Arecibo's capabilities. Since the telescope is approximately 5 - 8 times more sensitive than any other telescope on Earth over much of its broad frequency range, there are crucial projects that can be done nowhere else. These include fundamental tests of General Relativity, ultra-deep searches for neutral hydrogen gas between galaxies, and the discovery of pulsars that are undetectable elsewhere. Arecibo is also a crucial element in the international effort to detect gravitational waves by monitoring a bank of pulsar clocks distributed around the sky.</p> <p>Arecibo is a world-class instrument that is a beacon of excellence in U.S. science. The unique capabilities of Arecibo could not be duplicated for an amount approaching half a billion dollars. By comparison, the annual NSF support of about \$5M/year buys an enormous capability that garners national and international respect for U.S. science.</p> <p>There are many other compelling reasons for choosing Option #1: Continued NSF investment for science-focused operations (No-Action Alternative): the extraordinary impact that the Observatory has on minority serving education and outreach in Puerto Rico being one of the most salient. However, to these other reasons, I would add these two:</p> <p>* NANOGrav is on track to detect long-wavelength gravitational waves from pulsars in the next five years using Arecibo and the Green Bank Telescope. This will be a transformative achievement in gravitational wave astronomy, and the NSF will be able to take great pride in having robustly supported that science.</p> <p>* The Arecibo Observatory is a hands-on telescope with unique and extraordinary capabilities. It has been a training ground for numerous generations of US radio astronomers who have gone on to accomplish world-class science based on its unique capabilities. The research training – and the resulting exceptional science – that has resulted from NSF support of the instrument is a national resource that should not be downscaled at this propitious moment. My more than 25 years of research with Oberlin College undergraduates depends crucially on continued access to this national resource.</p>	Against Closure	Email	6/23/2016	Arecibo support letter - EIS - v2.pdf

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Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments																																																																																																																																							
				<p>Best regards,</p> <p>Daniel R. Stinebring</p> <p>Federighi Professor of Natural Science Department of Physics and Astronomy Oberlin College Oberlin, Ohio 44074</p> <p>Appendix: I am attaching a list of the students who have worked with me on Arecibo data since my arrival at Oberlin College in 1990. The students marked with a + have spent time at the Observatory, and those marked with an * have observed remotely with the telescope.</p> <p>OC grad year</p> <table border="0"> <tr><td>1</td><td>James Chapman</td><td>1993</td></tr> <tr><td>2</td><td>Eric Freeman</td><td>1993</td></tr> <tr><td>3 +</td><td>Michael Faison</td><td>1994</td></tr> <tr><td>4 +</td><td>Laura Francavilla</td><td>1995</td></tr> <tr><td>5 +</td><td>Jennifer Hovis</td><td>1995</td></tr> <tr><td>6</td><td>Eric Miller</td><td>1996</td></tr> <tr><td>7</td><td>Edward Myers</td><td>1996</td></tr> <tr><td>8 +</td><td>Bryce Denney</td><td>1997</td></tr> <tr><td>9 +</td><td>Joshua Kempner</td><td>1997</td></tr> <tr><td>10 +</td><td>Naomi McClure-Griffiths</td><td>1997</td></tr> <tr><td>11</td><td>Ross Patty</td><td>1997</td></tr> <tr><td>12</td><td>Karen Hole</td><td>1998</td></tr> <tr><td>13</td><td>Matthew Schick</td><td>1999</td></tr> <tr><td>14 +</td><td>Jim Sheckard</td><td>2000</td></tr> <tr><td>15</td><td>Miranda Balkin</td><td>2001</td></tr> <tr><td>16 +</td><td>Kate Becker</td><td>2001</td></tr> <tr><td>17 +</td><td>Joaquin Espinoza Goodman</td><td>2001</td></tr> <tr><td>18 +</td><td>Mark Kramer</td><td>2001</td></tr> <tr><td>19 +</td><td>Clait Smith</td><td>200</td></tr> <tr><td colspan="3"> </td></tr> <tr><td>20 *</td><td>Henry Barnor</td><td>2003</td></tr> <tr><td>21</td><td>Collin Powell</td><td>2003</td></tr> <tr><td>22</td><td>Aaron Webber</td><td>2003</td></tr> <tr><td>23 +</td><td>Alex Hill</td><td>2004</td></tr> <tr><td>24 *</td><td>Ilana Percher</td><td>2004</td></tr> <tr><td>25 *</td><td>Daniel Berwick</td><td>2005</td></tr> <tr><td>26 +</td><td>Natalie Hinkel</td><td>2005</td></tr> <tr><td>27</td><td>Tyler Solomon</td><td>2005</td></tr> <tr><td>28 +</td><td>Wendeline Everett</td><td>2007</td></tr> <tr><td>29 +</td><td>Curtis Asplund</td><td>2005</td></tr> <tr><td>30</td><td>Benjamin Sulman</td><td>2006</td></tr> <tr><td>31</td><td>Jon Myers</td><td>2006</td></tr> <tr><td>32 *</td><td>Margaret Putney</td><td>2006</td></tr> <tr><td>33 +</td><td>Maxwell Rudolph</td><td>2006</td></tr> <tr><td>34 +</td><td>Robert Yatteau</td><td>2006</td></tr> <tr><td>35</td><td>Daniel Hemberger</td><td>2007</td></tr> <tr><td>36</td><td>John Matters</td><td>2007</td></tr> <tr><td>37</td><td>Kelty Allen</td><td>2007</td></tr> <tr><td>38</td><td>Kerry Neal</td><td>2007</td></tr> <tr><td>39</td><td>Brandon McClintock</td><td>2007</td></tr> <tr><td>40</td><td>Courtney Epstein</td><td>2008</td></tr> <tr><td>41 +</td><td>Everett Schlawin</td><td>2009</td></tr> <tr><td>42</td><td>Ben Breslauer</td><td>2009</td></tr> <tr><td>43 +</td><td>Keith Spencer</td><td>2009</td></tr> <tr><td>44 +</td><td>Sydney Harris</td><td>2010</td></tr> </table>	1	James Chapman	1993	2	Eric Freeman	1993	3 +	Michael Faison	1994	4 +	Laura Francavilla	1995	5 +	Jennifer Hovis	1995	6	Eric Miller	1996	7	Edward Myers	1996	8 +	Bryce Denney	1997	9 +	Joshua Kempner	1997	10 +	Naomi McClure-Griffiths	1997	11	Ross Patty	1997	12	Karen Hole	1998	13	Matthew Schick	1999	14 +	Jim Sheckard	2000	15	Miranda Balkin	2001	16 +	Kate Becker	2001	17 +	Joaquin Espinoza Goodman	2001	18 +	Mark Kramer	2001	19 +	Clait Smith	200				20 *	Henry Barnor	2003	21	Collin Powell	2003	22	Aaron Webber	2003	23 +	Alex Hill	2004	24 *	Ilana Percher	2004	25 *	Daniel Berwick	2005	26 +	Natalie Hinkel	2005	27	Tyler Solomon	2005	28 +	Wendeline Everett	2007	29 +	Curtis Asplund	2005	30	Benjamin Sulman	2006	31	Jon Myers	2006	32 *	Margaret Putney	2006	33 +	Maxwell Rudolph	2006	34 +	Robert Yatteau	2006	35	Daniel Hemberger	2007	36	John Matters	2007	37	Kelty Allen	2007	38	Kerry Neal	2007	39	Brandon McClintock	2007	40	Courtney Epstein	2008	41 +	Everett Schlawin	2009	42	Ben Breslauer	2009	43 +	Keith Spencer	2009	44 +	Sydney Harris	2010				
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233	Kevin	Stovall	Postdoctoral Researcher University of New Mexico	<p>Observatory has operated as the most sensitive radio telescope in the world for the entirety of its scientific existence and remains such to this day. There is no currently operational radio telescope in the world, much less in the U.S., that can replace its scientific abilities. It is essential that the Arecibo Observatory continue to operate in a manner as it has for decades in order for the U.S. to remain a world leader in radio astronomy. Additionally, the Arecibo Observatory has a large impact on high school, undergraduate, and graduate students within the U.S. My own PhD dissertation not only used data from Arecibo, but also involved getting high school and undergraduate students from a minority serving area (Brownsville, TX) involved in the scientific process early in their careers. Many of these students are now pursuing degrees in STEM fields and their interest in these fields is almost certainly the result of their experience working with real scientific data from the most sensitive radio telescope in the world. The success of these students shows the great socioeconomic impact of the Arecibo Observatory.</p> <p>In addition to its direct contribution to science and the development of the future STEM workforce within the U.S., the Arecibo Observatory is an iconic telescope known throughout the world. It attracts thousands of visitors every year and has been featured in popular media as well as many documentaries. As a scientist, Arecibo's public prominence make it a valuable tool for discussions that I have with members of the general public, who are in awe of the largest dish in the world.</p> <p>Thank you for the opportunity to express my opinion on this matter. I again urge the NSF Astronomical Sciences to continue contributing to the Arecibo Observatory.</p>	Against Closure	Email	6/23/2016	Arecibo_EIS (2).pdf

Arecibo Observatory -NSF Public Comments

Comment Number	First Name	Last Name	Affiliation	Comment	Category	Comment Source	Date Comment Received	Attachments
234	Joe	Swiggum	Postdoctoral Research Associate Center for Gravitation, Cosmology, and Astrophysics University of Wisconsin — Milwaukee 3135 N. Maryland Ave. Milwaukee, WI 53211 (608) 215-6734 swiggumj@uwm.edu	<p>I write to strongly urge that NSF choose to continue investment for science-focused operations at the Arecibo Observatory (option 1: no action alternative). Arecibo is the most sensitive radio telescope in the world and although the facility is over fifty years old, it has undergone two major upgrades, each of which created an essentially new, far more powerful telescope. Consequently, Arecibo remains a viable, cutting-edge scientific instrument for high-impact discoveries.</p> <p>I am a member of two collaborations (PALFA and NANOGrav) that rely significantly on Arecibo's unrivaled sensitivity to achieve their scientific goals and deliver high-impact results. PALFA is currently carrying out the deepest survey for pulsars in the Galactic plane and recently, discovered the first repeating Fast Radio Burst. NANOGrav, with continued use of the Arecibo radio telescope, will likely detect low-frequency gravitational waves within the next decade. The discovery of the first binary pulsar system (B1913+16) in 1974 benefited from Arecibo's sensitivity and earned its discoverers Joseph Taylor and Russel Hulse a Nobel Prize for providing a laboratory, opening up new possibilities for the study of gravitation. While Arecibo provided the first hints of the existence of gravitational waves, NANOGrav is now poised to use the telescope to directly detect them.</p> <p>Over the past decade, NANOGrav has involved a diverse group of hundreds of US high school and undergraduate students in Arecibo observations of pulsars and gravitational wave astronomy. The excitement of our students in personally operating Arecibo has propelled many of them into careers in physics, astronomy, engineering, and other STEM fields. As a young pulsar astronomer, I had the good fortune to attend the "Fab Five Fest," in 2011, a meeting held at Arecibo Observatory to honor five of the most influential scientists in the field (and one of the most influential telescopes!). I can attest to the fact that visiting and using the telescope has a significant impact on a young scientist's decisions to pursue STEM-related career paths.</p> <p>I urge you to consider these factors as you prepare the EIS for Arecibo Observatory: in addition to being a unique scientific facility, which will continue to make high-impact scientific discoveries, it serves as a model for interdisciplinary scientific and technical accomplishment — inspiration for a diverse group of students, our next generation of scientists.</p>	Against Closure	Email	6/23/2016	
235	Andrea	Tellez	Research Assistant B.S. in Physics UTRGV	<p>My name is Andrea Tellez and I am part of the Arecibo Remote Command Center (ARCC) at the University of Texas at Rio Grande Valley (UTRGV) in Brownsville, Texas. Arriving at this country [USA] four years ago, this program opened me the doors to education and to understand the mysteries of the universe. My first encounter with astronomy in my college education was with these fascinating rotating neutron stars called pulsars. I fell in love instantly with these celestial bodies. My passion was increasing by the day and with it, my thirst to observe more pulsars. Having the opportunity to detect these stars with the Arecibo Radio Telescope was like a dream come true. I have been part of this center for more than four years. I have monitored and directed many observations with the telescope at all hours. From a weekday in the afternoon to a Sunday at midnight. Arecibo is an essential part of my life, as well as, for all the students who are part of ARCC. It is my greatest desire continue to keep up this magnificent telescope that takes us to the depths of the beautiful universe.</p>	Against Closure	Email	6/23/2016	6232016ARCC.pdf
236	Bárbara	Trejo Ortega		<p>My name is Bárbara Trejo and the nature of this letter is to serve as a public comment in response to the Arecibo Observatory Review Process that is underway. The Arecibo Observatory made a lasting impression on my education in Puerto Rico, and I wish to express my strongest recommendation against detrimental changes to the Observatory's operations.</p> <p>I spent most of my childhood and adolescence in Arecibo's neighboring city, Hatillo. Since the age of five, I studied at the Colegio Nuestra Señora del Carmen, in Hatillo, and had the great fortune to share an educational upbringing with several classmates whose parents worked in the Arecibo Observatory. Visits to the Observatory, with classmates and my own family, were not uncommon, to the extent that being exposed to such amazing scientific breakthrough became a strong motivator for me to pursue studies in the sciences in the United States.</p> <p>I also fondly remember the many times that Observatory scientists were guest speakers at my school. Their impact goes beyond the content of the lectures they gave. They made science accessible to someone like me, who had grown up in a small town in Puerto Rico. The motivation to become a great scientist, very much like the ones I had the chance to interact with, led to my completing a Bachelor's degree in Stem Cell and Regenerative Biology at Harvard University in 2014.</p> <p>I strongly believe that, the presence of the Arecibo Observatory can motivate other students to pursue science as well. As a Latina woman, I cannot emphasize the importance of incentives like this one in environments that may otherwise lack incentivizing resources. As such, I hope that my experience helps shed some light on the socioeconomic impact of any decision regarding the Arecibo Observatory.</p> <p>It is my strongest wish that the initiative that has been a source of motivation and pride for me and for Puerto Rico, continues to have the resources it needs to thrive.</p>	Against Closure	Email	6/23/2016	NSF Letter-Arecibo Observatory 06-22-2016.pdf

Arecibo Observatory -NSF Public Comments

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237	Parker W.	Troischt	Associate Professor Hartwick College	<p>I write to strongly urge that NSF choose alternative 1 of its "Notice of Intent to Prepare an EIS . . .", namely "Continued NSF investment for science-focused operations (No-Action Alternative)." The National Astronomy and Ionosphere Center (NAIC) at Arecibo is an amazing teaching/science facility, which is not only used for astronomy, but is also used to monitor aspects of climate change through studies of the ionosphere and used to monitor the trajectories of near Earth asteroids with radar (which may threaten life on Earth itself). Its flexibility, combined with the sheer size of the 305m dish, make the this a powerful, unique and versatile scientific instrument. I have personally had over a dozen students directly benefit from the observatory, the research being done there, and the willingness of staff members to assist and instruct them. The NAIC is a tremendous research and teaching tool, and the largest radio dish in the world (~26 football fields in collecting area). It has minimal upkeep cost compared to the cost of re-constructing a similar facility (as China is investing in) or just about any the space based missions. The cost of dismantling it and returning the area to pre-observatory conditions is prohibitively expensive and incredibly difficult to do, so it seems financially unwise to begin this process. More than likely, the cost would increase significantly after the dismantling process has begun. The impact of stopping operations at Arecibo on science education and science collaborations throughout the United States would likely be severe, to say nothing of the repercussions on the education, financial status, and overall well being of the island of Puerto Rico.</p> <p>I have traveled regularly to Arecibo Observatory since 2008, and I typically bring students with me for research and educational purposes. While there, we work with students and faculty from several colleges and universities (George Mason University, Colgate University, Cornell University, Siena College, Skidmore College, Union College, University of Wisconsin- Madison, Saint Mary's College of California, Macalester College, Lafayette College, Georgia State University, University of Puerto Rico and others) as well as NAIC staff members. The observatory is profoundly inspiring for all users and especially the undergraduate students. All 6 of my summer research student alumni have gone on to receive awards and entrance into strong STEM based graduate programs. These students have gone on to many different areas of science including: nanotechnology, medical research, neuroscience and engineering. I am part of a large research collaborative team (The Undergraduate ALFALFA Team - UAT) and similar success has occurred at the other schools as well. Typically about 80% of the ALFALFA team alumni go on to attend STEM graduate programs or to work in STEM based companies. (For more information about the UAT and impact on undergraduate alumni, please see the Council of Undergraduate Research Summer Quarterly 2016). There is nothing is quite like the direct experience of working at a major observatory to prepare our science majors. This is especially true in light of the fact that the United States is currently falling behind (over twenty other countries) in STEM based education. There is no substitute for this type of meaningful research experience for undergraduate college students. These types of immersive, hands-on experiences have been recently touted as a "high impact" practices in a wide array of education literature, indicating they are one of the most important ways to prepare US students for careers in all sorts of STEM fields. Lastly, I'd like to emphasize that without the Arecibo Observatory, I have no doubt that all my physics majors at Hartwick would not have been able to participate in any type of high-impact research experience here at all. My Arecibo-based collaborative research has been the only option for students to be immersed in a summer research experience at my institution for over a decade. These experiences have propelled them in their careers to earn awards, acceptance into strong STEM graduate programs, and on to promising jobs in STEM disciplines. Please consider the severe negative impact on astronomy/STEM education without Arecibo. Thank you.</p>	Against Closure	Email	6/23/2016	areciboimpactletter edit.pdf
238	Ron	Verback		<p>Title: Probing asteroid complexity using infrared and radar observations</p> <p>PI: Ronald J. Verback, Jr. (JHU/APL), Co-Is: Ellen Howell and Mike Nolan (U. Arizona), Yanga Fernández (UCF), and Christopher Magri (U. Maine-Farmington)</p> <p>Near-Earth asteroids (NEAs) represent a wealth of scientific information for understanding the origin of the Earth and connections to meteorites, as well as accurately assessing the impact hazard to the Earth. Our program is one of the first systematic studies of NEAs that combines realistic shape models derived from Arecibo radar observations, thermal infrared measurements over multiple viewing geometries, and a thermophysical model to investigate asteroid properties in detail. The radar-derived shape models are a critical element of this project because they allow the effects of shape to be accurately accounted for, thus allowing us to focus on other physical effects contributing to the observed thermal flux from the asteroids. With Arecibo, we can measure the shapes of tens of asteroids each year; only spacecraft missions can provide more detailed shapes, but they do so at a significantly higher cost and for just a few asteroids. Understanding the NEAs for which we have radar-derived shapes is not just important for the inherent scientific gain but it provides valuable context for the large telescopic surveys such as NEOWISE that measure the vast majority of asteroid properties. Our work thus sheds valuable light on just what the surveys can tell us about those asteroids. Without Arecibo Observatory, this ongoing project would not be possible.</p>	Against Closure	Email	6/23/2016	

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239	Dan	Werthimer	Principal Investigator, SETI@home Chief Scientist, Berkeley SETI Program Director, Center for Astronomy Signal Processing and Electronics Research Associate Director, Berkeley Wireless Research Center	<p>I'm writing to provide you with an example of how Arecibo Observatory engages the public and school children, and also an example of how Arecibo continues to make important scientific discoveries. Arecibo Observatory is engaging the public and school children in a global science project. 95% of data for the SETI@home project comes from the Arecibo Observatory. SETI@home has built a following of nine million users in 226 countries, including about 200,000 children, who have volunteered their PCs and cell phones for scientific research. Thousands of K12 teachers are using SETI@home to get kids interested in astronomy, physics, biology and chemistry as they explore the question "Are we alone?". SETI@home is part of the Great Explorations and Math (GEMS) science curriculum developed by and the Lawrence Hall of Science, used in classrooms around the planet.</p> <p>Arecibo observatory continues to make astonishing discoveries about our universe, even just a few months ago: Fast Radio Bursts are one of astronomy's big mysteries. Astronomers don't understand what causes these incredibly powerful radio bursts that last only about 1/1000 of a second. There has been considerable speculation and theories – could the bursts be from cosmic strings? Evaporating primordial black holes? Some have even proposed these could be signals from ET. In March this year, using Arecibo, astronomer Laura Spitler announced the discovery of the first fast radio burst that repeats (Nature, March 2016). This Arecibo based discovery has ruled out most classes of the fast radio burst theories, and will soon enable astronomers to pinpoint the precise location of Arecibo's repeating fast radio burst and finally figure out what is causing these mysterious explosions.</p>	Against Closure	Email	6/23/2016	arecibo_environmental_impact_letter_from_dan_werthimer.pdf
240	Armando	Caussade	President, editor-in-chief and founding member	<p>This statement is to express our position on the proposed changes to Arecibo Observatory operations. We are issuing this as a response to an announcement by the National Science Foundation (NSF) posted on May 23, 2016 at http://federalregister.gov/a/2016-12036. Through this announcement the NSF has requested community responses for a Environmental Impact Statement (EIS) that will be drafted regarding changes to operations at the Arecibo Observatory. The specific area of concern to the Puerto Rico Astronomy Society (PRAS) is the detrimental effect that the proposed changes at the observatory might have on STEM education in the island. We contend that any change in Arecibo has to take into account its contributions to society, as the observatory provides informal STEM education for 100,000 visitors per year.</p> <p>Considering that the Arecibo Observatory is currently the only large-scale facility devoted to scientific research in the island, it is astonishing that anyone would even consider cutting funding. Historically Puerto Ricans have been an underserved population in STEM disciplines, and a reduction of research operations at the observatory has the potential to obliterate any semblance of research (or by extension, education) on STEM fields in Puerto Rico.</p> <p>Additionally—and as we publicly stated exactly ten years ago—the Arecibo Observatory adds significant value to our educational efforts. Through our visits to Arecibo, PRAS members are able to stay current with contemporary astronomical research, and changes at the observatory would significantly hamper our chances of interaction with professional scientists.</p> <p>While we ignore the exact details involved (or the specific reasons or policy behind) we strongly plea that Arecibo continue to enjoy NSF investment for science-focused operations. Decisions in this matter should not be taken from a purely economic point of view, but should also consider the social implications for STEM education in the Puerto Rican society as a whole.</p>	Against Closure	Email	6/23/2016	arecibo_observatory.pdf

5-E List of Research Papers

List of Research Papers

Adams, Johnathan. 2013. "The fourth age of research." *Nature*. Volume 497, pp. 557–560. May 29. <http://www.nature.com/nature/journal/v497/n7451/full/497557a.html>.

Ade, P.A.R., N. Aghanim, M. Arnaud, M. Ashdown, F. Atrio-Barandela, J. Aumont, C. Baccigalupi, A. Balbi, A.J. Banday, R.B. Barreiro, J.G. Bartlett, E. Battaner, K. Benabed, A. Benoît, J.P. Bernard, M. Bersanelli, I. Bikmaev, H. Böhringer, A. Bonaldi, J.R. Bond, J. Borrill, F.R. Bouchet, H. Bourdin, M.L. Brown, S.D. Brown, R. Burenin, C. Burigana, P. Cabella, J.F. Cardoso, P. Carvalho, A. Catalano, L. Cayón, L.Y. Chiang, G. Chon, P.R. Christensen, E. Churazov, D.L. Clements, S. Colafrancesco, L.P.L. Colombo, A. Coulais, B.P. Crill, F. Cuttaia, A. Da Silva, H. Dahle, L. Danese, R.J. Davis, P. de Bernardis, G. de Gasperis, A. de Rosa, G. de Zotti, J. Delabrouille, J. Démoclès, F.X. Désert, C. Dickinson, J.M. Diego, K. Dolag, H. Dole, S. Donzelli, O. Doré, U. Dörl, M. Douspis, X. Dupac, T.A. Enßlin, H.K. Eriksen, F. Finelli, I. Flores-Cacho, O. Forni, M. Frailis, E. Franceschi, M. Frommert, S. Galeotta, K. Ganga, R.T. Génova-Santos, M. Giard, M. Gilfanov, J. González-Nuevo, K.M. Górski, A. Gregorio, A. Gruppuso, F.K. Hansen, D. Harrison, S. Henrot-Versillé, C. Hernández-Monteagudo, S.R. Hildebrandt, E. Hivon, M. Hobson, W.A. Holmes, A. Hornstrup, W. Hovest, K.M. Huffenberger, G. Hurier, T.R. Jaffe, T. Jagemann, W.C. Jones, M. Juvela, E. Keihänen, I. Khamitov, R. Kneissl, J. Knoche, L. Knox, M. Kunz, H. Kurki-Suonio, G. Lagache, A. Lähteenmäki, J.M. Lamarre, A. Lasenby, C.R. Lawrence, M. Le Jeune, R. Leonardi, P.B. Lilje, M. Linden-Vørnle, M. López-Caniego, P.M. Lubin, J.F. Macías-Pérez, B. Maffei, D. Maino, N. Mandolesi, M. Maris, F. Marleau, E. Martínez-González, S. Masi, M. Massardi, S. Matarrese, F. Matthai, P. Mazzotta, S. Mei, A. Melchiorri, J.B. Melin, L. Mendes, A. Mennella, S. Mitra, M.A. Miville-Deschênes, A. Moneti, L. Montier, G. Morgante, D. Munshi, J.A. Murphy, P. Naselsky, P. Natoli, H.U. Nørgaard-Nielsen, F. Noviello, D. Novikov, I. Novikov, S. Osborne, F. Pajot, D. Paoletti, O. Perdereau, F. Perrotta, F. Piacentini, M. Piat, E. Pierpaoli, R. Piffaretti, S. Plaszczynski, E. Pointecouteau, G. Polenta, N. Ponthieu, L. Popa, T. Poutanen, G.W. Pratt, S. Prunet, J.L. Puget, J.P. Rachen, R. Rebolo, M. Reinecke, M. Remazeilles, C. Renault, S. Ricciardi, T. Riller, I. Ristorcelli, G. Rocha, M. Roman, C. Rosset, M. Rossetti, J.A. Rubiño-Martín, L. Rudnick, B. Rusholme, M. Sandri, G. Savini, B.M. Schaefer, D. Scott, G.F. Smoot, F. Stivoli, R. Sudiwala, R. Sunyaev, D. Sutton, A.S. Suur-Uski, J.F. Sygnet, J.A. Tauber, L. Terenzi, L. Toffolatti, M. Tomasi, M. Tristram, J. Tuovinen, M. Türler, G. Umana, L. Valenziano, B. Van Tent, P. Varis, P. Vielva, F. Villa, N. Vittorio, L.A. Wade, B.D. Wandelt, N. Welikala, S.D.M. White, D. Yvon, A. Zacchei, S. Zaroubi, A. Zonca. 2013. "Planck intermediate results: X. Physics of the hot gas in the Coma cluster." *EDP Sciences*. Volume 554. June. <http://www.aanda.org/articles/aa/ref/2013/06/aa20247-12/aa20247-12.html>.

Allen, B., B. Knispel, J.M. Cordes, J.S. Deneva, J.W.T. Hessels, D. Anderson, C. Aulbert, O. Bock, A. Brazier, S. Chatterjee, P.B. Demorest, H.B. Eggenstein, H. Fehrmann, E.V. Gotthelf, D. Hammer, V.M. Kaspi, M. Kramer, A.G. Lyne, B. Machenschalk, M.A. McLaughlin, C. Messenger, H.J. Pletsch, S.M. Ransom, I.H. Stairs, B.W. Stappers, N.D.R. Bhat, S. Bogdanov, F. Camilo, D.J. Champion, F. Crawford, G. Desvignes, P.C.C. Freire, G. Heald, F.A. Jenet, P. Lazarus, K.J. Lee, J. van Leeuwen, R. Lynch, M.A. Papa, R. Prix, R. Rosen, P. Scholz, X. Siemens, K. Stovall, A. Venkataraman, and W. Zhu. 2013. "Einstein@Home Search for Radio Pulsars and PSR J2007+2722 Discovery." *The Astrophysical Journal*. August 12. <https://arxiv.org/abs/1303.0028>.

Antoniadis, John, Paulo C.C. Freire, Norbert Wex, Thomas M. Tauris, Ryan S. Lynch, Marten H. van Kerkwijk, Michael Kramer, Cees Bassa, Vik S. Dhillon, Thomas Driebe, Jason W.T. Hessels, Victoria M. Kaspi, Vladislav I. Kondratiev, Norbert Langer, Thomas R. Marsh, Maura A. McLaughlin, Timothy T. Pennucci, Scott M. Ransom, Ingrid H. Stairs, Joeri van Leeuwen, Joris P.W. Verbiest, and David G. Whelan. 2013. "A Massive Pulsar in a Compact Relativistic Binary." *Science*. Volume 340, Issue 6131, pp. 448. <http://adsabs.harvard.edu/abs/2013Sci...340..448A>.

Becker, Tracy M., Ellen S. Howell, Michael C. Nolan, Christopher Magri, Petr Pravec, Patrick A. Taylor, Julian Oey, David Higgins, Jozef Világi, Leonard Kornoš, Adrián Galád, Štefan Gajdoš, Ninel M. Gaftonyuk, Yuriy N. Krugly, Igor E. Molotov, Michael D. Hicks, Albino Carbognani, Brian D. Warner, Frederic Vachier, Franck Marchis, and Joseph T. Pollock. 2015. "Physical modeling of triple near-Earth Asteroid (153591) 2001 SN₂₆₃ from radar and optical light curve observations." *Icarus*. Volume 248, pp. 499-515. <http://www.sciencedirect.com/science/article/pii/S0019103514006149>.

Clark, Susan E., J. Colin Hill, Joshua E.G. Peek, Mary E. Putman, and Brian L. Babler. 2015. "Neutral Hydrogen Structures Trace Dust Polarization Angle: Implications for Cosmic Microwave Background Foregrounds." December. <http://adsabs.harvard.edu/abs/2015PhRvL.115x1302C>.

Crawford, F., K. Stovall, A.G. Lyne, B.W. Stappers, D.J. Nice, I.H. Stairs, P. Lazarus, J.W.T. Hessels, P.C.C. Freire, B. Allen, N.D.R. Bhat, S. Bogdanov, A. Brazier, F. Camilo, D.J. Champion, S. Chatterjee, I. Cognard, J.M. Cordes, J.S. Deneva, G. Desvignes, F.A. Jenet, V.M. Kaspi, B. Knispel, M. Kramer, J. van Leeuwen, D. R. Lorimer, R. Lynch, M.A. McLaughlin, S.M. Ransom, P. Scholz, X. Siemens, and A. Venkataraman. 2012. "Four Highly Dispersed Millisecond Pulsars Discovered in the Arecibo PALFA Galactic Plane Survey." *The Astrophysical Journal*. Volume 757, Issue 90. August 6. <http://arxiv.org/abs/1208.1273>.

Cromartie, H.T., F. Camilo, M. Kerr, J.S. Deneva, S.M. Ransom, P.S. Ray, E.C. Ferrara, P.F. Michelson, and K.S. Wood. 2016. "Six New Millisecond Pulsars from Arecibo Searches of Fermi Gamma-Ray Sources." *Astrophysical Journal*. January 20. <http://arxiv.org/abs/1601.05343>

Deneva, J.S., P.C.C. Freire, J.M. Cordes, A.G. Lyne, S.M. Ransom, I. Cognard, F. Camilo, D.J. Nice, I.H. Stairs, B. Allen, N.D.R. Bhat, S. Bogdanov, A. Brazier, D.J. Champion, S. Chatterjee, F. Crawford, G. Desvignes, J.W.T. Hessels, F.A. Jenet, V.M. Kaspi, B. Knispel, M. Kramer, P. Lazarus, J. van Leeuwen, D.R. Lorimer, R.S. Lynch, M.A. McLaughlin, P. Scholz, X. Siemens, B.W. Stappers, K. Stovall, and A. Venkataraman. 2012. "Two Millisecond Pulsars Discovered by the PALFA Survey and a Shapiro Delay Measurement." *Astrophysical Journal*. Volume 757, Issue 90. August 6. <http://arxiv.org/abs/1208.1228>.

Djuth, F.T. and D.F. DuBois. 2015. "Temporal Development of HF-Excited Langmuir and Ion Turbulence at Arecibo." *Earth, Moon, and Planets*. October 20.

Eckert, Kathleen D., Sheila J. Kannappan, David V. Stark, Amanda J. Moffett, Andreas A. Berlind, and Mark A. Norris. 2016. "RESOLVE and ECO: The Halo Mass-dependent Shape of Galaxy Stellar and Baryonic Mass Functions." *The Astrophysical Journal*. Volume 824, Issue 2. June. <http://adsabs.harvard.edu/abs/2016arXiv160403957E>.

Eckert, Kathleen, Sheila J. Kannappan, David V. Stark, Amanda J. Moffett, Mark A. Norris, Elaine M. Snyder, and Erik A. Hoversten. 2015. "RESOLVE Survey Photometry and Volume-limited Calibration of the Photometric Gas Fractions Technique." *The Astrophysical Journal*. Volume 810, Issue 2. September. http://adsabs.harvard.edu/abs/2015ApJ...810..166E_

Fonseca, Emmanuel, Ingrid H. Stairs, and Stephen E. Thorsett. 2014. "A Comprehensive Study of Relativistic Gravity Using PSR B1534+12." *Astrophysical Journal*. Volume 787, Article 82. May. <http://iopscience.iop.org/article/10.1088/0004-637X/787/1/82>.

Franz, Kirsten, Wouter Vlemmings, Paulo Freire, Michael Kramer, Helge Rottmann, and Robert M. Campbell. 2014. "Precision astrometry of pulsars and other compact radio sources in the globular cluster M15." *Astronomy & Astrophysics*. Volume 565, id.A43. May. <http://adsabs.harvard.edu/abs/2014A%26A...565A..43K>.

Freire, P.C.C., C.G. Bassa, N. Wex, I.H. Stairs, D. J. Champion, S.M. Ransom, P. Lazarus, V.M. Kaspi, J.W.T. Hessels, M. Kramer, J.M. Cordes, J.P.W. Verbiest, P. Podsiadlowski, D. J. Nice, J.S. Deneva, D.R. Lorimer, B.W. Stappers, M.A. McLaughlin, and F. Camilo. 2010. "On the nature and evolution of the unique binary pulsar J1903+0327." *Monthly Notices of the Royal Astronomical Society*. November 26. <http://arxiv.org/abs/1011.5809>.

Freire, Paulo C.C., Norbert Wex, Gilles Esposito-Farèse, Joris P.W. Verbiest, Matthew Bailes, Bryan A. Jacoby, Michael Kramer, Ingrid H. Stairs, John Antoniadis, and Gemma H. Janssen. 2012. "The relativistic pulsar-white dwarf binary PSR J1738+0333 - II. The most stringent test of scalar-tensor gravity." *Monthly Notices of the Royal Astronomical Society*. Volume 423, Issue 4, pp. 3328-3343. July. <http://adsabs.harvard.edu/abs/2012MNRAS.423.3328F>.

Giovanelli, Riccardo, Martha P. Haynes, Brian R. Kent, Phillip Perillat, Amelie Saintonge, Noah Brosch, Barbara Catinella, G. Lyle Hoffman, Sabrina Stierwalt, Kristine Spekkens, Mikael S. Lerner, Karen L. Masters, Emmanuel Momjian, Jessica L. Rosenberg, Christopher M. Springob, Alessandro Boselli, Vassilis Charmandaris, Jeremy K. Darling, Jonathan Davies, Diego Garcia Lambas, Giuseppe Gavazzi, Carlo Giovanardi, Eduardo Hardy, Leslie K. Hunt, Angela Iovino, Igor D. Karachentsev, Valentina E. Karachentseva, Rebecca A. Koopmann, Christian Marinoni, Robert Minchin, Erik Muller, Mary Putman; Carmen Pantoja, John J. Salzer, Marco Scodreggio, Evan Skillman, Jose M. Solanes, Carlos Valotto, Wim van Driel, and Liese van Zee. 2005. "The Arecibo Legacy Fast ALFA Survey. I. Science Goals, Survey Design, and Strategy." December. <http://adsabs.harvard.edu/abs/2005AJ....130.2598G>.

Henning, P.A., C. M. Springob, R. F. Minchin, E. Momjian, B. Catinella, T. McIntyre, F. Day, E. Muller, B. Koribalski, J. L. Rosenberg, S. Schneider, L. Staveley-Smith, and W. van Driel. 2010. "The Arecibo L-band Feed Array Zone of Avoidance Survey. I. Precursor Observations Through the Inner and Outer Galaxy." *The Astronomical Journal*. Volume 139. April 13. <http://iopscience.iop.org/article/10.1088/0004-6256/139/6/2130/pdf>.

Henning, P.A., C.M. Springob, F. Day, R. Minchin, E. Momjian, B. Catinella, E. Muller, B.S. Koribalski, et al. 2008. "The ALFA Zone of Avoidance Survey". The Evolution of Galaxies Through the Neutral Hydrogen Window, Arecibo Observatory, Puerto Rico, 1-3 February 2008, AIP. Conf. Proc., 1035, 246-248.

Henning, P.A., L. Staveley-Smith, R. D. Ekers, A. J. Green, R. F. Haynes, S. Juraszek, M. J. Kesteven, B. Koribalski, R. C. Kraan-Korteweg, R.M. Price, E. M. Sadler, and A. Schröder. 2000. "H I-bright Galaxies in the Southern Zone of Avoidance." *The Astronomical Journal* 119 2686. February 29. <http://iopscience.iop.org/article/10.1086/301374/meta>.

Henning, P.A., W. van Driel, Monica Sanchez, R. Minchin, E. Momjian, J.L. Rosenberg, S. Schneider, Z. Butcher, L. Staveley-Smith, E. Viaz, C. Springob, and B. Koribalski. 2016. "Surveying the Zone of Avoidance with the Arecibo L-band Feed Array." University of New Mexico Department of Physics and Astronomy. Accessed June 29. <http://www.naic.edu/alfa/ealfa/papers/ZOA-AAS208.pdf>.

Hirschauer, Alec. S., John J. Salzer, Evan D. Skillman, Danielle Berg, Kristen B. W. McQuinn, John M. Cannon, Alex J. R. Gordon, Martha P. Haynes, Riccardo Giovanelli, Elizabeth A. K. Adams, Steven Janowiecki, Katherine L. Rhode, Richard W. Pogge, Kevin V. Croxall, and Erik Aver. 2016. "Alfalfa Discovery of the Most Metal-Poor Gas-Rich Galaxy Known: AGC 198691." May 12. <https://iopscience.iop.org/article/10.3847/0004-637X/822/2/108/meta;jsessionid=85C3DFD646A0E3120A8A8E69ED8F0842.c2.iopscience.cld.iop.org>.

Jacoby, B. A., P.B. Cameron, F.A. Jenet, S.B. Anderson, R.N. Murty, and S.R. Kulkarni. 2006. "Measurement of Orbital Decay in the Double Neutron Star Binary PSR B2127+11C." *The Astrophysical Journal*. Volume 644, Issue 2, pp. L113-L116. July. <http://adsabs.harvard.edu/abs/2006ApJ...644L.113J>.

Johnson, Michael D., Yuri Y. Kovalev, Carl R. Gwinn, Leonid I. Gurvits, Ramesh Narayan, Jean-Pierre Macquart, David L. Jauncey, Peter A. Voitsik, James M. Anderson, Kiril V. Sokolovsky, and Mikhail M. Lisakov. 2016. "Extreme Brightness Temperatures and Refractive Substructure in 3C273 with RadioAstron." *The Astrophysical Journal Letters*. Volume 820. March. <http://adsabs.harvard.edu/abs/2016ApJ...820L..10J>.

Keenan, Olivia, Jonathan Davies, Rhys Taylor, and Robert Minchin. 2015. "The Arecibo Galaxy Environment Survey X: The Structure of Halo Gas Around M33." November. <http://arxiv.org/abs/1511.02710>.

Knispel, B., B. Allen, J.M. Cordes, J.S. Deneva, D. Anderson, C. Aulbert, N.D.R. Bhat, O. Bock, S. Bogdanov, A. Brazier, F. Camilo, D.J. Champion, S. Chatterjee, F. Crawford, P.B. Demorest, H. Fehrmann, P.C.C. Freire, M.E. Gonzalez, D. Hammer, J.W.T. Hessels, F.A. Jenet, L. Kasian, V.M. Kaspi, M. Kramer, P. Lazarus, J. van Leeuwen, D.R. Lorimer, A.G. Lyne, B. Machenschalk, M.A. McLaughlin, C. Messenger, D.J. Nice, M.A. Papa, H.J. Pletsch, R. Prix, S.M. Ransom, X. Siemens, I.H. Stairs, B.W. Stappers, K. Stovall, and A. Venkataraman. 2010. "Pulsar Discovery by Global Volunteer Computing." *Science*. Volume 329, Issue 5997. September 10. <http://science.sciencemag.org/content/329/5997/1305>.

Knispel, B., Lyne, A.G. Lyne, B.W. Stappers, P.C.C. Freire, P. Lazarus, B. Allen, C. Aulbert, O. Bock, S. Bogdanov, A. Brazier, F. Camilo, F. Cardoso, S. Chatterjee, J.M. Cordes, F. Crawford, J.S. Deneva, H.-B. Eggenstein, H. Fehrmann, R. Ferdman, J.W.T. Hessels, F.A. Jenet, C. Karako-Argaman, V.M. Kaspi, J. van Leeuwen, D.R. Lorimer, R. Lynch, B. Machenschalk, E. Madsen, M.A. McLaughlin, C. Patel, S.M. Ransom, P. Scholz, X. Siemens, L.G. Spitler, I.H. Stairs, K. Stovall, J.K. Swiggum, A. Venkataraman, R.S. Wharton, and W.W. Zhu. 2015. "Einstein@Home Discovery of a PALFA Millisecond Pulsar in an Eccentric Binary Orbit." *The Astrophysical Journal*. April 30.

Knispel, B., P. Lazarus, B. Allen, D. Anderson, C. Aulbert, N.D.R. Bhat, O. Bock, S. Bogdanov, A. Brazier, F. Camilo, S. Chatterjee, J.M. Cordes, F. Crawford, J.S. Deneva, G. Desvignes, H. Fehrmann, P.C.C. Freire, D. Hammer, J.W.T. Hessels, F.A. Jenet, V.M. Kaspi, M. Kramer, J. van Leeuwen, D.R. Lorimer, A.G. Lyne, B. Machenschalk, M.A. McLaughlin, C. Messenger, D.J. Nice, M. A. Papa, H.J. Pletsch, R. Prix, S.M. Ransom, X. Siemens, I.H. Stairs, B.W. Stappers, K. Stovall, and A. Venkataraman. 2011. "Arecibo PALFA Survey and Einstein@Home: Binary Pulsar Discovery by Volunteer Computing." *Astrophysical Journal Letters*. April 7. <http://arxiv.org/abs/1102.5340>.

Kovalev, Y., N.S. Kardashev, K.I. Kellermann, A.P. Lobanov, M.D. Johnson, L.I. Gurvits, P.A. Voitsik, J.A. Zensus, J.M. Anderson, U. Bach, D.L. Jauncey, F. Ghigo, T. Ghosh, A. Kraus, Yu. Kovalev, M.M. Lisakov, L. Yu. Petrov, J.D. Romney, C.J. Salter, and K.V. Sokolovsky. 2016. "RadioAstron Observations of the Quasar 3C273: A Challenge to the Brightness Temperature Limit." *The Astrophysical Journal Letters*. March. <http://adsabs.harvard.edu/abs/2016ApJ...820L...9K>.

Kronberg, P.P., R. Kothes, C.J. Salter, and P. Perillat. 2007. "Discovery of New Faint Radio Emission on 8 deg to 3' Scales in the Coma Field, and Some Galactic and Extragalactic Implications." *American Astronomical Society*. https://ned.ipac.caltech.edu/cgi-bin/ex_refcode?refcode=2007ApJ...659..267K.

Lazarus, P., A. Brazier, J. W. T. Hessels, C. Karako-Argaman, V. M. Kaspi, R. Lynch, E. Madsen, C. Patel, S. M. Ransom, P. Scholz, J. Swiggum, W. W. Zhu, B. Allen, S. Bogdanov, F. Camilo, F. Cardoso, S. Chatterjee, J. M. Cordes, F. Crawford, J. S. Deneva, R. Ferdman, P. C. C. Freire, F. A. Jenet, B. Knispel, K. J. Lee, J. van Leeuwen, D. R. Lorimer, A. G. Lyne, M. A. McLaughlin, X. Siemens, L. G. Spitler, I. H. Stairs, K. Stovall, and A. Venkataraman. 2015. "Arecibo Pulsar Survey Using ALFA. IV. Mock Spectrometer Data Analysis, Survey Sensitivity, and the Discovery of 40 Pulsars." *The Astrophysical Journal*. Volume 812, Issue 1 October. <http://adsabs.harvard.edu/abs/2015ApJ...812...81L>.

Lee, K. J., K. Stovall, F.A. Jenet, J. Martinez, L.P. Dartez, A. Mata, G. Lunsford, S. Cohen, C.M. Biwer, M. Rohr, J. Flanigan, A. Walker, S. Banaszak, B. Allen, E. D. Barr, N.D.R. Bhat, S. Bogdanov, A. Brazier, F. Camilo, D.J. Champion, S. Chatterjee, J. Cordes, F. Crawford, J. Deneva, G. Desvignes, R.D. Ferdman, P. Freire, J.W.T. Hessels, R. Karuppusamy, V.M. Kaspi, B. Knispel, M. Kramer, P. Lazarus, R. Lynch, A. Lyne, M. McLaughlin, S. Ransom, P. Scholz, X. Siemens, L. Spitler, I. Stairs, M. Tan, J. van Leeuwen, and W.W. Zhu. 2013. "PEACE: Pulsar Evaluation Algorithm for Candidate Extraction - a Software Package for Postanalysis Processing of Pulsar Survey Candidates." *Monthly Notices of the Royal Astronomical Society*. May 2. <http://arxiv.org/abs/1305.0447>.

- Lee, M.C., R. Pradipta, L.A. Rooker, L.N. Whitehurst, L.M. Ross, M.P. Sulzer, C. Tepley, N. Aponte, S.A. Gonzalez, C. Brum, J. Friedman, W.J. Burke, K.P. Hu, S.P. Kuo, and J. Kalkavage. 2014. "Whistler Wave Propagation and Interaction Experiments at Arecibo Observatory since 1989 (Past, Ongoing, and Proposed Research)." *Arecibo Observatory 50th Anniversary Symposium Paper*.
- Liu, B., T. McIntyre, Y. Terzian, R. Minchin, L. Anderson, E. Churchwell, M. Lebron, and D. Anish Roshi. 2013. "SIGGMA: A Survey of Ionized Gas in the Galaxy, Made with the Arecibo Telescope." August. <http://arxiv.org/abs/1308.3122>.
- Martinez, J. G., K. Stovall, P.C.C. Freire, J.S. Deneva, F.A. Jenet, M.A. McLaughlin, M. Bagchi, S.D. Bates, and A. Ridolfi. 2015. "Pulsar J0453+1559: A Double Neutron Star System with a Large Mass Asymmetry." *Astrophysical Journal*. Volume 812, Issue 2. October. <http://adsabs.harvard.edu/abs/2015ApJ...812..143M>.
- McIntyre, T. P., R.F. Minchin, E. Momjian, P.A. Henning, A. Kaur, and B. Parton. 2011a. "Discovery and Follow-up of a Nearby Galaxy from the Arecibo Zone of Avoidance Survey." *The Astrophysical Journal Letters*. Volume 739, Issue 1. September. <http://adsabs.harvard.edu/abs/2011ApJ...739L..26M>.
- McIntyre, Travis P., P.A. Henning, R. Minchin, and E. Momjian. 2011b. "The Arecibo Zone of Avoidance Survey." American Astronomical Society, AAS Meeting #217. *Bulletin of the American Astronomical Society*. Volume 43. January. <http://adsabs.harvard.edu/abs/2011AAS...21724618M>.
- Nice, D. J., E. Altieri, S. Bogdanov, J.M. Cordes, D. Farrington, J.W.T. Hessels, V.M. Kaspi, A.G. Lyne, L. Popa, S. M. Ransom, S. Sanpa-arsa, B.W. Stappers, Y. Wang, B. Allen, N.D.R. Bhat, A. Brazier, F. Camilo, D.J. Champion, S. Chatterjee, F. Crawford, J.S. Deneva, G. Desvignes, P.C.C. Freire, F.A. Jenet, B. Knispel, P. Lazarus, K.J. Lee, J. van Leeuwen, D.R. Lorimer, R. Lynch, M.A. McLaughlin, P. Scholz, X. Siemens, I.H. Stairs, K. Stovall, A. Venkataraman, and W. Zhu. 2013. "Timing and Interstellar Scattering of 35 Distant Pulsars Discovered in the PALFA Survey." *The Astrophysical Journal*. Volume 772, Issue 50. July 8. <http://arxiv.org/abs/1304.7370>.
- Odekon, Mary Crone, Rebecca A. Koopmann, Martha P. Haynes, Rose A. Finn, Christopher McGowan, Adina Micula, Lyle Reed, Riccardo Giovanelli, and Gregory Hallenbeck. 2016. "The HI Content of Galaxies in Groups and Clusters as Measured by ALFALFA." *The Astrophysical Journal*. May 9.
- Odekon, Mary Crone. 2015. "Harvesting ALFALFA." *Mercury*, Volume 44, No. 3. <https://www.astrosociety.org/publications/mercury-magazine-summer-2015/#3>.
- Patterson, G.W. Patterson, A.M. Stickle, F.S. Turner, J.R. Jensen, D.B.J. Bussey, P. Spudis, R.C. Espiritu, R.C. Schulze, D.A. Yocky, D.E. Wahl, M. Zimmerman, J.T.S. Cahill, M. Nolan, L. Carter, C.D. Neish, R.K. Raney, B. J. Thomson, R. Kirk, T.W. Thompson, B.L. Tise, I.A. Erteza, and C.V. Jakowatz. 2016. "Bistatic Radar Observations of the Moon using Mini-RF on LRO and the Arecibo Observatory." *Icarus*. May 18. <http://dx.doi.org/10.1016/j.icarus.2016.05.017>
- Ransom, S.M., I.H. Stairs, A.M. Archibald, J.W.T. Hessels, D.L. Kaplan, M.H. van Kerkwijk, J. Boyles, A.T. Deller, S. Chatterjee, A. Schechtman-Rook, A. Berndsen, R.S. Lynch, D.R. Lorimer, C. Karako-Argaman, V.M. Kaspi, V.I. Kondratiev, M.A. McLaughlin, J. van Leeuwen, R. Rosen, M.S.E. Roberts, and K. Stovall. 2014. "A millisecond pulsar in a stellar triple system." *Nature*. Volume 505, Issue 7484, pp. 520-524. January. <http://adsabs.harvard.edu/abs/2014Natur.505..520R>.
- Scholz, P., V.M. Kaspi, A.G. Lyne, B.W. Stappers, S. Bogdanov, J.M. Cordes, F. Crawford, R.D. Ferdman, P.C.C. Freire, J.W.T. Hessels, D.R. Lorimer, I.H. Stairs, B. Allen, A. Brazier, F. Camilo, R.F. Cardoso, S. Chatterjee, J.S. Deneva, F.A. Jenet, C. Karako-Argaman, B. Knispel, P. Lazarus, K.J. Lee, J. van Leeuwen, R. Lynch, E.C. Madsen, M.A. McLaughlin, S.M. Ransom, X. Siemens, L.G. Spitler, K. Stovall, J.K. Swiggum, A. Venkataraman, and W.W. Zhu. 2015. "Timing of Five Millisecond Pulsars Discovered in the PALFA Survey." *The Astrophysical Journal*. January 15. <http://arxiv.org/abs/1501.03746>.

Skillman, Evan D., John J. Salzer, Danielle A. Berg, Richard W. Pogge, Nathalie C. Haurberg, John M. Cannon, Erik Aver, Keith A. Olive, Riccardo Giovanelli, Martha P. Haynes, Elizabeth A. K. Adams, Kristen B. W. McQuinn, and Katherine L. Rhode. 2013. "Alfalfa Discovery of the Nearby Gas-Rich Dwarf Galaxy Leo P. III. An Extremely Metal Deficient Galaxy." *The American Astronomical Society*. May 29. <http://iopscience.iop.org/article/10.1088/0004-6256/146/1/3/meta>.

Spitler, L. G., P. Scholz, J.W.T. Hessels, S. Bogdanov, A. Brazier, F. Camilo, S. Chatterjee, J.M. Cordes, F. Crawford, J. Deneva, R.D. Ferdman, P.C.C. Freire, V.M. Kaspi, P. Lazarus, R. Lynch, E.C. Madsen, M.A. McLaughlin, C. Patel, S.M. Ransom, A. Seymour, I.H. Stairs, B.W. Stappers, J. van Leeuwen, and W.W. Zhu. 2016. "A repeating fast radio burst." *Nature*. Volume 531, Issue 7593, pp. 202-205. March 2. <http://adsabs.harvard.edu/abs/2016Natur.531..202S>.

Spitler, L.G., J.M. Cordes, J.W.T. Hessels, D.R. Lorimer, M.A. McLaughlin, S. Chatterjee, F. Crawford, J.S. Deneva, V.M. Kaspi, R.S. Wharton, B. Allen, S. Bogdanov, A. Brazier, F. Camilo, P.C.C. Freire, F.A. Jenet, C. Karako-Argaman, B. Knispel, P. Lazarus, K.J. Lee, J. van Leeuwen, R. Lynch, A.G. Lyne, S.M. Ransom, P. Scholz, X. Siemens, I.H. Stairs, K. Stovall, J.K. Swiggum, A. Venkataraman, W.W. Zhu, C. Aulbert, and H. Fehrmann. 2014. "Fast Radio Burst Discovered in the Arecibo Pulsar ALFA Survey." *The Astrophysical Journal*. April. <http://arxiv.org/abs/1404.2934>.

Springob, C.M., P.A. Henning, B. Catinella, F. Day, R. Minchin, E. Momjian, B. Koribalski, K.L. Masters, E. Muller, C. Pantoja, M. Putman, J.L. Rosenberg, S. Schneider, and L. Staveley-Smith. 2008. "The ALFA Zone of Avoidance Survey: Results from the Precursor Observations." *Dark Galaxies and Lost Baryons, Proceedings of the International Astronomical Union*. International Astronomical Union Symposium. Volume 244, 383. http://journals.cambridge.org/download.php?file=%2FIAU%2FIAU3_S244%2FS174392130701438Xa.pdf&code=849e32f53137e94f0e7fa9d615b280fd.

Stark, David V., Sheila J. Kannappan, Kathleen D. Eckert, Jonathan Florez, Kirsten R. Hall, Linda C. Watson, Erik A. Hoversten, Joseph N. Burchett, David T. Guynn, Ashley D. Baker, Amanda J. Moffett, Andreas A. Berlind, Mark A. Norris, Martha P. Haynes, Riccardo Giovanelli, Adam K. Leroy, D. J. Pisano, Lisa H. Wei, Roberto E. Gonzalez, and Victor F. Calderon. 2016. *American Astronomical Society, AAS Meeting #227 "The RESOLVE Survey Gas Census and Environmental Influences on Galaxy Gas Content."* January. <http://adsabs.harvard.edu/abs/2016AAS...22731105S>.

Swiggum, J. K., D.R. Lorimer, M.A. McLaughlin, S.D. Bates, D.J. Champion, S.M. Ransom, P. Lazarus, A. Brazier, J.W.T. Hessels, D.J. Nice, J. Ellis, T.R. Senty, B. Allen, N.D.R. Bhat, S. Bogdanov, F. Camilo, S. Chatterjee, J.M. Cordes, F. Crawford, J.S. Deneva, P.C.C. Freire, F.A. Jenet, C. Karako-Argaman, V.M. Kaspi, B. Knispel, K.J. Lee, J. Van Leeuwen, R. Lynch, A.G. Lyne, P. Scholz, X. Siemens, I.H. Stairs, B.W. Stappers, K. Stovall, A. Venkataraman, and W.W. Zhu. 2014. "Arecibo Pulsar Survey Using ALFA. III. Precursor Survey and Population Synthesis." *The Astrophysical Journal*. June 2. <http://arxiv.org/abs/1405.7953>.

Troisht, Parker, Rebecca Koopmann, Aileen O'Donoghue, Mary Crone Odekon, and Martha Haynes. 2016. "The Undergraduate ALFALFA Team: A Collaborative Model for Undergraduate Research in Major Legacy Projects." 2016 CUR Quarterly on Undergraduate Research Collaborations: Partnering for High(er) Impact.

Truebenbach, Alexandra, T.P. McIntyre, R.F. Minchin, and P.A. Henning. 2012. "First Results From The C Field Of The ALFA ZOA Survey." *American Astronomical Society, AAS Meeting #219*, id.252.18. January. <http://adsabs.harvard.edu/abs/2012AAS...21925218T>.

Vartorella, William F. 2016. "Arecibo Science Advocacy Partnership Response to the NSF 'Dear Colleague' Letter." February. http://www.areciboscience.org/ASAP_DCL_Reply_Post.pdf.

Zhu, W.W., A. Berndsen, E.C. Madsen, M. Tan, I.H. Stairs, A. Brazier, P. Lazarus, R. Lynch, P. Scholz, K. Stovall, S.M. Ransom, S. Banaszak, C.M. Biwer, S. Cohen, L.P. Dartez, J. Flanigan, G. Lunsford, J.G. Martinez, A. Mata, M. Rohr, A. Walker, B. Allen, N.D.R. Bhat, S. Bogdanov, F. Camilo, S. Chatterjee, J.M. Cordes, F. Crawford, J.S. Deneva, G. Desvignes, R.D. Ferdman, P.C.C. Freire, J.W.T. Hessels, F.A. Jenet, D. L. Kaplan, V.M. Kaspi, B. Knispel, K.J. Lee, J. van Leeuwen, A.G. Lyne, M.A. McLaughlin, X. Siemens, L.G. Spitler, and A. Verkataraman. 2013. "Searching for Pulsars Using Image Pattern Recognition." *The Astrophysical Journal*. December 18. <http://arxiv.org/abs/1309.0776>.

**5-F- Natural Resource Agency
Correspondance**

**NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230**



**DIVISION OF ASTRONOMICAL
SCIENCES**

June 17, 2016

Mr. Julio Mendez, Subsecretary
Departamento de Recursos Naturales y Ambientales
P.O. Box 366147
San Juan, Puerto Rico 00936

Subject: NEPA Analysis for Proposed Changes to Arecibo Observatory Operations, Arecibo, Puerto Rico

Dear Mr. Mendez:

In compliance with the National Environmental Policy Act of 1969 (NEPA), as amended, the National Science Foundation (NSF) intends to prepare an Environmental Impact Statement (EIS) to evaluate potential environmental effects of proposed changes to operations at Arecibo Observatory, in Arecibo, Puerto Rico. The Notice of Intent for this EIS was published in the Federal Register on May 24, to initiate the public scoping for the EIS.

At present, alternatives under consideration for inclusion in the EIS include the following:

- Continued NSF investment for science-focused operations (No Action Alternative)
- Collaboration with interested parties for continued science-focused operations
- Collaboration with interested parties for transition to education-focused operations
- Mothballing of facilities (suspension of operations in a manner such that operations could resume efficiently at some future date)
- Deconstruction and site restoration

At this time, NSF is soliciting scoping comments from your agency to determine relevant issues that will influence the scope of the environmental analysis, including identification of viable alternatives, and guide the process for developing the EIS. At present, NSF has identified the following preliminary resource areas for analysis of potential impacts: air quality, biological resources, cultural resources, geological resources, solid waste generation, health and safety, socioeconomics, traffic, and groundwater resources.

NSF conducted scoping meetings on Tuesday, June 7, 2016 at the locations shown below:

Daytime meeting: June 7, 2016, 9:30 am to 11:30 am
DoubleTree by Hilton San Juan
105 Avenida De Diego
San Juan, Puerto Rico
Phone: (787) 721-6500

Evening meeting:

June 7, 2016, 6:00 pm to 8:00 pm
Colegio de Ingenieros y Agrimensores de Puerto Rico/
Puerto Rico Professional College of Engineers and Land Surveyors
(Arecibo Chapter)

Ave. Manuel T. Guillán Urdáz
Conector 129 Carr. 10
Arecibo, Puerto Rico
Phone: (787) 758-2250

Your agency may provide comments at any time during the development of the EIS. However, if you would like your comments to be considered and included in the Draft EIS that will be provided for public and agency review, please provide your comments by July 22, 2016.

The NSF point of contact for the NEPA analysis is Ms. Elizabeth Pentecost, National Science Foundation, Division of Astronomical Sciences, Suite 1045, 4201 Wilson Blvd., Arlington, Virginia 22230; telephone: (703) 292-4907; email: epenteco@nsf.gov.

We appreciate your assistance in this matter and look forward to your response. If you require any additional information or documentation, please contact Ms. Pentecost.

Sincerely,



James S. Ulvestad
Division Director
Division of Astronomical Sciences

cc (w/enclosure):



JUL 21 2016

MS ELIZABETH PENTECOST
DIVISION OF ASTRONOMICAL SCIENCES
NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD STE 1045
ARLINGTON VA 22230

Dear Ms. Pentecost:

**NEPA Analysis for Proposed Changes
to Arecibo Observatory Operations
Road PR-625
Esperanza Ward, Arecibo**

This is in reply to the letter addressed by Dr. James S. Ulvestad, on June 17, 2016, concerning the above referenced matter. The National Science Foundation's (NSF) Division of Astronomical Sciences is requesting comments from the Puerto Rico Department of Natural and Environmental Resources (DNER) on its intention to prepare a Tier I Environmental Impact Statement (EIS) evaluating the potential environmental effects of proposed changes to the operations of the Arecibo Observatory (as published in 81 *Federal Register* 32349, May 23, 2016). Alternatives currently being considered for inclusion in the EIS include the following:

- Continued NSF investment for science-focused operations ("No Action");
- Collaboration with interested parties for continued science-focused operations;
- Collaboration with interested parties for transition to education-focused operations;
- Suspension of operations so that these could resume efficiently at some future date ("Mothballing"); and
- Deconstruction and site restoration.

Dr. Ulvestad's letter states that the NSF is in the process of determining the relevant issues that will influence the scope of the environmental analysis and guide the development process for the EIS. The letter states that NSF has identified several preliminary resource areas for the analysis of potential impacts, including biological, geological, and groundwater resources.

For the purposes of the following comments, we consider the potential impacts of the deconstruction and site restoration alternative, assuming that these impacts are absent from the No-Action, scientific and educational collaboration and "mothballing" alternatives.



According to the DNER's Biological and Conservation Database (BCD), the Arecibo Observatory is located within the Río Abajo Karst Conservation Priority Area. Conservation Priority Areas are those areas recognized by the DNER's Puerto Rico Natural Heritage Program, which satisfy several or all of the criteria stated in Law No. 150 of August 4, 1988. For the Arecibo Observatory, these criteria include its habitat value for threatened or endangered flora and fauna, and the presence of best examples of natural communities in the wild.

Some of the threatened or endangered species present within the Río Abajo Karst Conservation Priority Area are listed by the Boquerón Field Office of the U.S. Fish and Wildlife Service (USFWS), in its letter addressed to you on June 24, 2016. These species include endemic faunal species like the Puerto Rican Parrot (*Amazona vittata*) and the Puerto Rican Boa (*Chilabothrus inornatus*, formerly under genus *Epicrates*), which have been recorded on the forested hills surrounding the Arecibo Observatory. Both species are listed as Endangered, under the protection of the *Endangered Species Act* of 1973 (ESA). However, under Law No. 241 of August 15, 1999, as amended, the Puerto Rican Parrot is listed as Critically Endangered (as defined by the International Union for the Conservation of Nature, IUCN), while the Puerto Rican Boa is listed as Vulnerable (the local equivalent for ESA's Threatened classification). Reasons for listing include habitat loss and disturbance, as well as poaching, among others.

It should be noted that the Puerto Rican Boa, while able to tolerate a wide range of environments in Puerto Rico, from wet humid to subtropical dry forest, is found mostly on karst formations (especially on or around limestone hills, called "*mogotes*" in Spanish), under adequate habitat conditions. Individual boas may often be seen regulating their body temperature by basking on open areas in the forest and at forest edges, and also under low-temperature, high-humidity conditions throughout their habitat's geographic range (see: USFWS 1986: 2-3; Rivero 1998: 147-149 in Spanish, 432-433 in English; Reagan 1984: 121-122; Wiley 2003: 190 and Table 1).

new
The Arecibo Observatory is located within the Restricted Special Planning Area of the Puerto Rican Karst (APE-RC, by its initials in Spanish), as illustrated on Map No. 2 of the Delineation Maps for the Karst Special Planning Area, adopted by the DNER and the Puerto Rico Planning Board (JP, by its initials in Spanish), with an effective date of July 4, 2014. The APE-RC is established by Section 4.1 of Regulation No. 8486 of June 16, 2014 (also with an effective date of July 4, 2014), for the purpose of protecting lands within the restricted karst area. Regulation No. 8486, *supra*, prohibits ecosystem fragmentation, as well as selective or total deforestation, native and endemic vegetation removal for landscaping, and removal of live material for uses like charcoal production, without a review pursuant to Law No. 292 of August 21, 1999, as amended, which governs the protection and conservation of the karst physiography of Puerto Rico.

Within the APE-RC, Map No. 2 shows that the Arecibo Observatory lands are zoned as "*Dotacional General*" or DT-G ("Non-residential, General"), a zoning district regulated by Rule 17.14 in the 2015 Revision of Planning Regulation No. 31 (Regulation No. 8573, with an effective date of March 24, 2015). This district classifies public or private lands in use or to be used for non-residential uses other than parks (which are covered by a separate rule), including institutional, scientific and educational uses. According to Map No. 2, the observatory lands are surrounded by zoning districts of Resource Conservation (CR) to the east and to the west and

Resource Preservation (PR) to the south, which are regulated by Rules 17.26 and 17.33 of Planning Regulation No. 31, *supra*, respectively. Section 17.26.1.b under Rule 17.26 states that CR zoning classifies specific areas where caves, sinkholes and karst zones are located, as well as their flora, fauna and groundwater, for the purpose of protecting these resources for scientific study, recreation and tourism, and for the general development of the area, consistent with the protection of existing resources. On the other hand, PR zoning classifies and designate specific areas where natural resources exist in a unique, fragile, endangered condition, in need to be protected for contemplation or scientific study. Land use policy for PR zoning districts involves maximizing preservation of the existing condition of these areas. Thus, uses in PR districts include scientific studies overseen by educational institutions, or by scientists, scientific associations or *bona fide* groups, as acknowledged and certified by the corresponding professional organizations, and resource contemplation under the supervision of resource custodians. Construction is not allowed in PR districts, except of those structures related to scientific studies.

Also, the entrance to the observatory from the north (via Road PR-625) is located on the Buffer Zone surrounding the APE-RC. This Buffer Zone, established by Section 4.2 of Regulation No. 8486, *supra*, is a 50-meter wide land strip (measured from the APE-RC boundary) created to alert about proximity to the restricted karst area, and to provide for the consideration of possible impacts and risks in the agency review of proposed activities in adjacent areas. Activities proposed within the Buffer Zone can be performed under adequate conditions, as long as those activities comply with applicable federal or local laws and regulations and do not undermine the policy of Law No. 292, *supra*.

We should note that, as stated in Regulation No. 8486, *supra*, acquired rights in lands on the APE-RC and its Buffer Zone may not be undermined for the duration of the activities or uses benefitting natural or legal persons with those rights.

NM

The Arecibo Observatory is also within the Caonillas-Dos Bocas Forest Legacy Area. According to the Forest Legacy Program for Puerto Rico, important environmental values in the Caonillas-Dos Bocas Forest Legacy Area include: the Caonillas and Dos Bocas reservoirs, managed by the Puerto Rico Electric Power Authority (PREPA); the Río Abajo and Toro Negro Commonwealth Forests, managed by the Division of Ecological and Forest Services of the DNER's Bureau of Protected Natural Area Management and Forest Services; and the Arrozal-Biáfara Karst Conservation Priority Area, which contains several species of threatened and endangered trees under conditions of low or no disturbance. The objectives for the Caonillas-Dos Bocas Forest Legacy Area include the establishment of buffer zones for the aforementioned Commonwealth forests and other lands in similar use, the protection of endangered species habitat, the protection of scenic quality, conservation of wildlife habitat, public access for recreation, continuation of traditional forest uses, and the protection of water supply from the Caonillas and Dos Bocas reservoirs. (See: DNER and IITF. 2000. *Forest Legacy for Puerto Rico. An Assessment of Need*. July 2000. San Juan, P.R.: Department of Natural and Environmental Resources; and U.S. Department of Agriculture, Forest Service, International Institute of Tropical Forestry.)

The DNER acknowledges that the NSF is facing funding limitations which may affect its continued operation of the Arecibo Observatory. However, based on the best information

JUL 21 2016

Ms. Elizabeth Pentecost
NEPA Analysis for Proposed Changes
to Arecibo Observatory Operations
Page 4 of 4

available from the standpoint of natural resources, the DNER understands that alternatives other than deconstruction and site restoration at the Arecibo Observatory could best serve the purposes of this project, since those alternatives will be performed, contingent on the availability of funds committed to this purpose, over an already developed footprint, and no significant impacts on natural and environmental resources under our jurisdiction should be expected as a result.

Notwithstanding the preceding, in the event that the NSF chooses deconstruction and site restoration as the Preferred Alternative for the Arecibo Observatory, the EIS to be prepared must address the environmental conditions at the site, which must be validated through the corresponding groundtruthing at the site. The preparation of this EIS must pay special attention to the presence of the ESA-listed endemic Puerto Rican Parrot and Puerto Rican Boa, and other threatened or endangered flora or fauna. In this respect, it is worth noting that the nearby Río Abajo Commonwealth Forest is one of the areas in Puerto Rico where the DNER has an active program for the reintroduction of the Puerto Rican Parrot, under the appropriate environmental conditions for nesting (cavities in primary forests) and feeding (in secondary forested areas). The EIS must also pay special attention to the presence of karst-related features, especially sinkholes and features of importance for aquifer recharge. As part of the preparation of the EIS, the corresponding studies must be performed for determining the stability of soils and the vertical and horizontal projection of sinkholes that may be present at the observatory site, as well as identifying land areas where the subsoil is likely to fail due to collapses induced by the solution-collapse dynamics typical of karst zones.

Once the EIS is issued and submitted for comments, the DNER will be in a position to review the document and issue its recommendations on the alternatives proposed by the NSF for the changes in the operation of the Arecibo Observatory. Please be aware that the EIS must also be submitted to the Environmental Compliance Division of the Office of Permit Management ("*Oficina de Gerencia de Permisos*" or OGPe), as required by Rule 2.3 in the 2015 Revision of Planning Regulation No. 31, *supra*.

The DNER thanks you for the opportunity to comment on this matter and expresses its willingness to collaborate with the NSF's Division of Astronomical Sciences in the planning and development of the proposed changes in the operation of the Arecibo Observatory, especially concerning the avoidance of adverse environmental impacts to natural resources under our jurisdiction.

Cordially,



Nelson Velázquez-Reyes
Assistant Secretary
Office of the Assistant Secretary of Permits,
Endorsements and Specialized Services

NVR/GFS/LDB/ldb

**NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230**



**DIVISION OF ASTRONOMICAL
SCIENCES**

June 17, 2016

Mr. Alberto Lastra, President
Oficina de Gerencia de Permisos (OGPe)
P.O. Box 41179
San Juan, PR 00940-1179

Subject: NEPA Analysis for Proposed Changes to Arecibo Observatory Operations, Arecibo, Puerto Rico

Dear Mr. Lastra:

In compliance with the National Environmental Policy Act of 1969 (NEPA), as amended, the National Science Foundation (NSF) intends to prepare an Environmental Impact Statement (EIS) to evaluate potential environmental effects of proposed changes to operations at Arecibo Observatory, in Arecibo, Puerto Rico. The Notice of Intent for this EIS was published in the Federal Register on May 24, to initiate the public scoping for the EIS.

At present, alternatives under consideration for inclusion in the EIS include the following:

- Continued NSF investment for science-focused operations (No Action Alternative)
- Collaboration with interested parties for continued science-focused operations
- Collaboration with interested parties for transition to education-focused operations
- Mothballing of facilities (suspension of operations in a manner such that operations could resume efficiently at some future date)
- Deconstruction and site restoration

At this time, NSF is soliciting scoping comments from your agency to determine relevant issues that will influence the scope of the environmental analysis, including identification of viable alternatives, and guide the process for developing the EIS. At present, NSF has identified the following preliminary resource areas for analysis of potential impacts: air quality, biological resources, cultural resources, geological resources, solid waste generation, health and safety, socioeconomics, traffic, and groundwater resources.

NSF conducted scoping meetings on Tuesday June 7, 2016 at the locations shown below:

Daytime meeting: June 7, 2016, 9:30 am to 11:30 am
DoubleTree by Hilton San Juan
105 Avenida De Diego
San Juan, Puerto Rico
Phone: (787) 721-6500

Evening meeting:

June 7, 2016, 6:00 pm to 8:00 pm
Colegio de Ingenieros y Agrimensores de Puerto Rico/
Puerto Rico Professional College of Engineers and Land Surveyors
(Arecibo Chapter)

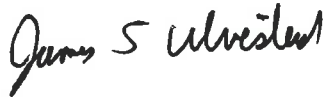
Ave. Manuel T. Guillán Urdáz
Conector 129 Carr. 10
Arecibo, Puerto Rico
Phone: (787) 758-2250

Your agency may provide comments at any time during the development of the EIS. However, if you would like your comments to be considered and included in the Draft EIS that will be provided for public and agency review, please provide your comments by July 22, 2016.

The NSF point of contact for the NEPA analysis is Ms. Elizabeth Pentecost, National Science Foundation, Division of Astronomical Sciences, Suite 1045, 4201 Wilson Blvd., Arlington, Virginia 22230; telephone: (703) 292-4907; email: epenteco@nsf.gov.

We appreciate your assistance in this matter and look forward to your response. If you require any additional information or documentation, please contact Ms. Pentecost.

Sincerely,



James S. Ulvestad
Division Director
Division of Astronomical Sciences

cc (w/enclosure):

**NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230**



**DIVISION OF ASTRONOMICAL
SCIENCES**

June 17, 2016

Mr. Weldin F. Ortiz Franco, President
Puerto Rico Environmental Quality Board
Edificio de Agencias Ambientales Cruz A. Matos
Urbanización San José Industrial Park
Avenida Ponce de León 1375
San Juan, PR 00929-2604

Subject: NEPA Analysis for Proposed Changes to Arecibo Observatory Operations, Arecibo, Puerto Rico

Dear Mr. Ortiz:

In compliance with the National Environmental Policy Act of 1969 (NEPA), as amended, the National Science Foundation (NSF) intends to prepare an Environmental Impact Statement (EIS) to evaluate potential environmental effects of proposed changes to operations at Arecibo Observatory, in Arecibo, Puerto Rico. The Notice of Intent for this EIS was published in the Federal Register on May 24, to initiate the public scoping for the EIS.

At present, alternatives under consideration for inclusion in the EIS include the following:

- Continued NSF investment for science-focused operations (No Action Alternative)
- Collaboration with interested parties for continued science-focused operations
- Collaboration with interested parties for transition to education-focused operations
- Mothballing of facilities (suspension of operations in a manner such that operations could resume efficiently at some future date)
- Deconstruction and site restoration

At this time, NSF is soliciting scoping comments from your agency to determine relevant issues that will influence the scope of the environmental analysis, including identification of viable alternatives, and guide the process for developing the EIS. At present, NSF has identified the following preliminary resource areas for analysis of potential impacts: air quality, biological resources, cultural resources, geological resources, solid waste generation, health and safety, socioeconomics, traffic, and groundwater resources.

NSF conducted scoping meetings on Tuesday, June 7, 2016 at the locations shown below:

Daytime meeting: June 7, 2016, 9:30 am to 11:30 am
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Phone: (787) 721-6500

Evening meeting:

June 7, 2016, 6:00 pm to 8:00 pm
Colegio de Ingenieros y Agrimensores de Puerto Rico/
Puerto Rico Professional College of Engineers and Land Surveyors
(Arecibo Chapter)

Ave. Manuel T. Guillán Urdáz
Conector 129 Carr. 10
Arecibo, Puerto Rico
Phone: (787) 758-2250

Your agency may provide comments at any time during the development of the EIS. However, if you would like your comments to be considered and included in the Draft EIS that will be provided for public and agency review, please provide your comments by July 22, 2016.

The NSF point of contact for the NEPA analysis is Ms. Elizabeth Pentecost, National Science Foundation, Division of Astronomical Sciences, Suite 1045, 4201 Wilson Blvd., Arlington, Virginia 22230; telephone: (703) 292-4907; email: epenteco@nsf.gov.

We appreciate your assistance in this matter and look forward to your response. If you require any additional information or documentation, please contact Ms. Pentecost.

Sincerely,



James S. Ulvestad
Division Director
Division of Astronomical Sciences

cc (w/enclosure):

**NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230**



**DIVISION OF ASTRONOMICAL
SCIENCES**

June 17, 2016

U.S. Fish and Wildlife Service
Caribbean Ecological Services Field Office
ATTN: Edwin E. Muñiz, Esq., Field Supervisor
P.O. Box 491
Road 301 Km 5.1
Boquerón, Puerto Rico 00622

Subject: NEPA analysis for divestment of the Arecibo Observatory

Dear Mr. Muñiz:

The National Science Foundation (NSF) Directorate for Mathematical and Physical Sciences (MPS), Division of Astronomical Sciences (AST) is preparing an Environmental Impact Statement (EIS) to assess potential future use of the Arecibo Observatory in Puerto Rico. The Notice of Intent for the EIS was published in the Federal Register on May 24, 2016. NSF will be working with the firm of CH2M HILL in preparing the EIS and completing the Endangered Species Act (ESA) Section 7 consultation.

Some of the alternatives under consideration would include removal of various amounts of buildings and infrastructure from the site, which would have potential to affect species listed under the Endangered Species Act or their habitats.

We request information from your office on the species with potential to occur at or adjacent to the Observatory. A map of the Observatory property area is attached. We request that you provide this information within 30 days.

The NSF POC for the NEPA analysis is Ms. Elizabeth Pentecost, National Science Foundation, Division of Astronomical Sciences, Suite 1045, 4201 Wilson Blvd., Arlington, VA 22230; telephone: (703) 292-4907; email: epenteco@nsf.gov.

We appreciate your assistance in this matter and look forward to your response. If you require any additional information or documentation, please contact Ms. Pentecost.

Sincerely,

James S. Ulvestad
Division Director
Division of Astronomical Sciences

cc (w/enclosure):



Google earth

© 2016 Google

Image © 2016 DigitalGlobe

1,455 ft.

Approximate Study Area.



United States Department of the Interior



FISH AND WILDLIFE SERVICE

Caribbean Ecological Services
Field Office
P.O. Box 491
Boqueron, PR 00622

JUN 24 2016

In Reply Refer to:
FWS/R4/CESFO/72013-035

Dear Ms. Elizabeth Pentecost
National Science Foundation
Suite 1045, 4201 Wilson Blvd.
Arlington, VA 22230

Re: ER 16/0294 Notice of Intent (NOI) to
Prepare a Tier 1 Environmental Impact
Statement for Proposed Changes to the
Arecibo Observatory Operations, Arecibo,
Puerto Rico.

Dear Ms. Pentecost:

The following comments are provided as technical assistance in response to the Notice of Intent for the above mentioned project, published on May 23, 2016. Our comments are provided under the Endangered Species Act (ESA)(87 Stat. 884, as amended; 16 United States Code 1531 et seq.) and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

The Arecibo Observatory (AO) is a National Science Foundation (NSF)-owned scientific research and education facility located in Puerto Rico. In compliance with the National Environmental Policy Act of 1969, as amended, the NSF intends to prepare an Environmental Impact Statement (EIS) to evaluate potential environmental effects of proposed changes to operations at AO, in Arecibo, Puerto Rico. Preliminary alternatives to be evaluated in the EIS include the following:

1. Continued NSF investment for science-focused operations (No Action Alternative).
2. Collaboration with interested parties for continued science-focused operations.
3. Collaboration with interested parties for transition to education-focused operations.
4. Mothballing of facilities (suspension of operations in a manner such that operations could resume efficiently at some future date).
5. Deconstruction and site restoration.

The AO is located within the moist karst region in northern Puerto Rico, adjacent to the Tanamá River and the Río Abajo Commonwealth Forest. The AO is a known locality for the endangered

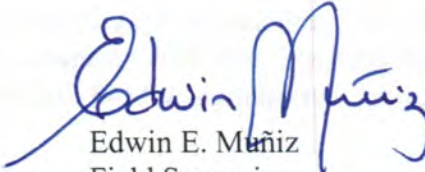
Dear Ms. Pentecost:

2

plants *Cornutia obovata* (palo de nigua) and *Tectarea estremerana*. Also, the Puerto Rican parrot (*Amazona vittata*), the Puerto Rican broad-winged hawk (*Buteo platypterus brunnescens*) and the Puerto Rican boa (*Epicrates inornatus*) have been recorded on the forested hills surrounding the AO. In addition, the forested hills may harbor unknown populations of the following species; *Accipiter striatus venator* (Puerto Rican sharp-shinned hawk), *Cordia bellonis*, *Daphnopsis hellerana*, *Eugenia haematocarpa* (uvillo), *Goetzea elegans*, *Myrcia paganii*, *Ottoschulzia rhodoxylon* (palo de rosa), *Shoepfia arenaria*, *Solanum drymophilum* (erubia), *Pleodendron macranthum* (chupacallos) and *Thelypteris verecunda*. The site does not harbor designated critical habitat for listed species.

The Service acknowledges the early coordination to address possible impacts to federally listed species or their habitat. Our office can provide technical assistance for the development of conservation measures for the above-mentioned species within the property. We look forward for the scheduled site visit to the AO on July 20, 2016, in coordination with Richard Reaves from CH2M. You can obtain further information and supporting documents on the above mentioned species on the following link (<https://www.fws.gov/caribbean/es>). If you have any additional question regarding this issue, please do not hesitate to contact Omar A. Monsegur Rivera from our staff at 787-851-7297 extension 217.

Sincerely yours,



Edwin E. Muñiz
Field Supervisor

oamr

cc: PRDNER, San Juan
CH2M, Richard Reaves

**NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230**



**DIVISION OF ASTRONOMICAL
SCIENCES**

May 4, 2017

U.S. Fish and Wildlife Service
Caribbean Ecological Services Field Office
ATTN: José Cruz-Burgos, Biologist
P.O. Box 491
Road 301 Km 5.1
Boquerón, Puerto Rico 00622

Subject: Biological Assessment and request for concurrence

Dear Mr. Cruz-Burgos:

The National Science Foundation (NSF) Directorate for Mathematical and Physical Sciences (MPS), Division of Astronomical Sciences (AST), has prepared the attached Biological Assessment, which includes a determination of effects, in support of Endangered Species Act (ESA) Section 7 consultation for the Environmental Impact Statement (EIS) regarding changes in operations at the Arecibo Observatory in Puerto Rico.

The Biological Assessment analyzes potential impacts of five proposed Alternatives on 16 species listed as threatened or endangered under the ESA that the U.S. Fish and Wildlife Service (USFWS) identified as potentially occurring in the project area. Proposed Alternatives 1, 2, 3, and 4 result in the determination of “no effect” or “not likely to adversely affect,” each of the 16 species. NSF commits to implementing avoidance and minimization measures that are specified to further reduce the potential for impacts. This commitment will be specified in the Record of Decision (ROD) for the EIS, should any of these proposed Alternatives be selected.

Proposed Alternative 5 has a “likely to adversely affect” determination for the Puerto Rican boa and the Puerto Rican broad-winged hawk. The other 14 species have determinations of “no effect” or “not likely to adversely affect,” and avoidance and minimization measures that are specified to further reduce the potential for impacts to these 14 species. NSF commits to implementing these avoidance and minimization measures should proposed Alternative 5 be selected. Because the specific work plan for Alternative 5 would be developed after a contract is awarded, it is not possible to fully identify appropriate avoidance and minimization measures for the Puerto Rican boa and the Puerto Rican broad-winged hawk prior to the time when NSF must decide on the EIS via the ROD. Because of that uncertainty, NSF commits to further consultation with USFWS prior to the implementation of Alternative 5, should that alternative be selected. To support this consultation, NSF also commits to implementing any surveys that may be specified by USFWS. These commitments will be specified in the ROD, should proposed Alternative 5 be selected.

Because there has been no critical habitat for any listed species designated on Arecibo Observatory, there would be no potential for adverse modification of critical habitat.

NSF is requesting concurrence with the determinations presented in the Biological Assessment.

The NSF point-of-contact for ESA Section 7 compliance is Ms. Kristen Hamilton, Office of the General Counsel, National Science Foundation, Suite 1265, 4201 Wilson Blvd., Arlington, VA 22230; telephone: (703) 292-4820; email: krihamil@nsf.gov.

We appreciate your assistance in this matter and look forward to your response. If you require any additional information or documentation, please contact Ms. Hamilton.

Sincerely,

A handwritten signature in black ink that reads "Ralph A. Gaume". The signature is written in a cursive style with a long, sweeping underline.

Ralph A. Gaume
Acting Division Director

cc (via email): Ms. Rosanna Vidal, DRNA
Mr. Jose Sustache, DRNA

Attachments: Figures 1-6
Puerto Rican Boa Protocols to be Implemented Prior to Intrusive Work at Arecibo
Observatory, Puerto Rico

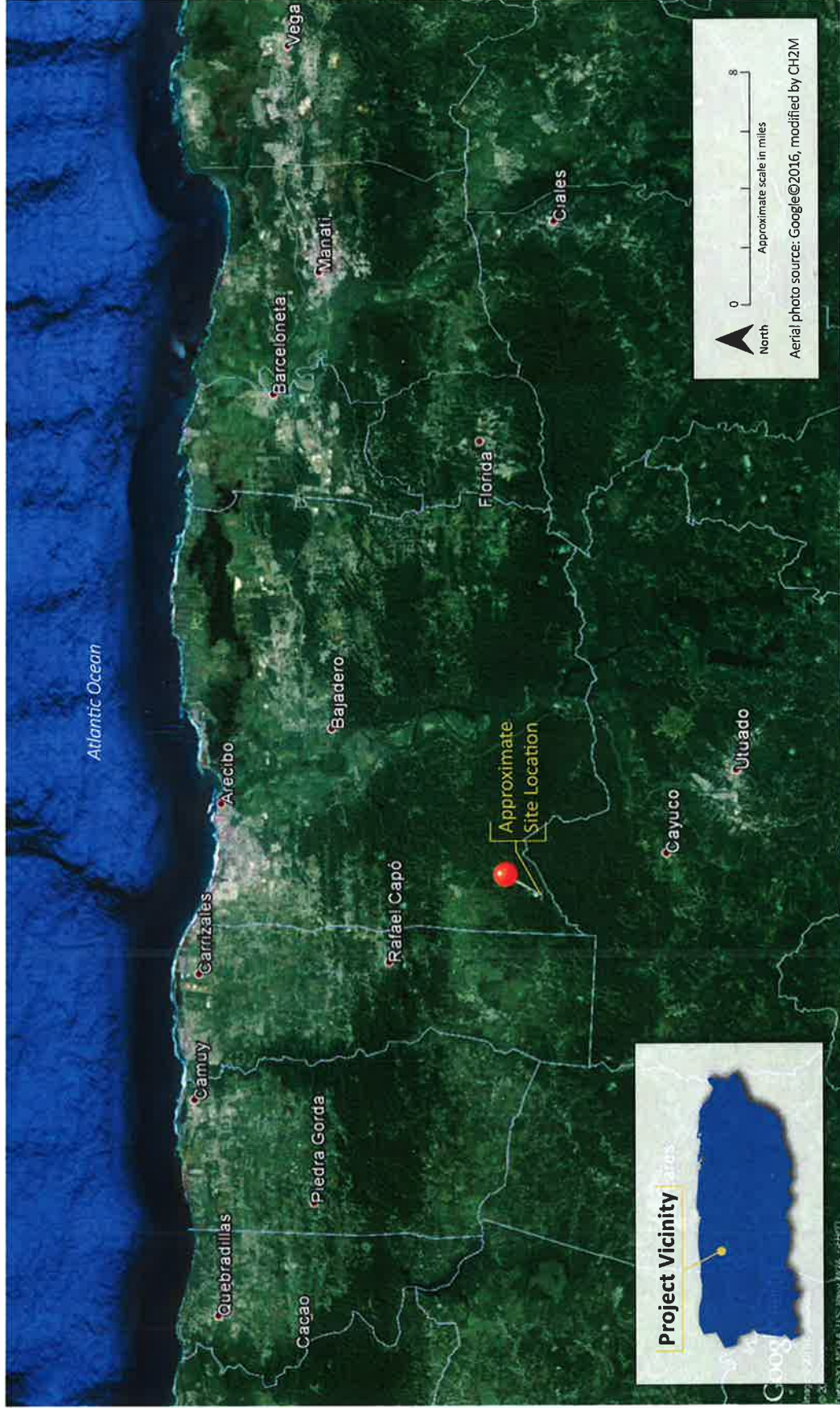


Figure 1.
Project Location
 Arecibo Observatory
 Puerto Rico





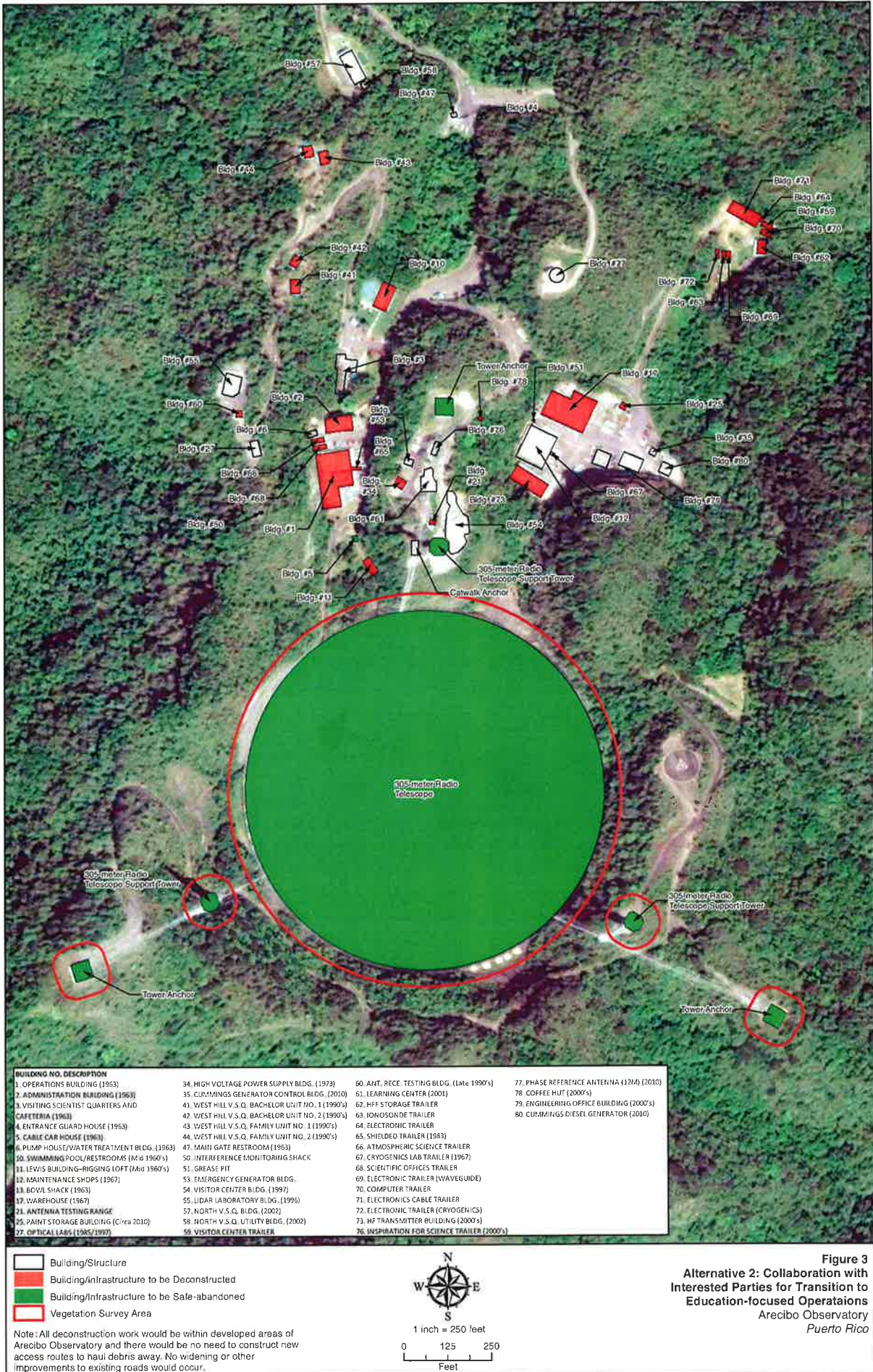
BUILDING NO. DESCRIPTION			
1. OPERATIONS BUILDING (1963)	34. HIGH VOLTAGE POWER SUPPLY BLDG. (1973)	60. ANT. RECC. TESTING BLDG. (Late 1990's)	77. PHASE REFERENCE ANTENNA (12M) (2010)
2. ADMINISTRATION BUILDING (1963)	35. CUMMINGS GENERATOR CONTROL BLDG. (2010)	61. LEARNING CENTER (2001)	78. COFFEE HUT (2000's)
3. VISITING SCIENTIST QUARTERS AND CATERERIA (1963)	41. WEST HILL V.S.Q. BACHELOR UNIT NO. 1 (1990's)	62. HFF STORAGE TRAILER	79. ENGINEERING OFFICE BUILDING (2000's)
4. ENTRANCE GUARD HOUSE (1963)	42. WEST HILL V.S.Q. BACHELOR UNIT NO. 2 (1990's)	63. IONOSPHERE TRAILER	80. CUMMINGS DIESEL GENERATOR (2010)
5. CABLE CAR HOUSE (1963)	43. WEST HILL V.S.Q. FAMILY UNIT NO. 1 (1990's)	64. ELECTRONIC TRAILER	
6. PUMP HOUSE/WATER TREATMENT BLDG. (1963)	44. WEST HILL V.S.Q. FAMILY UNIT NO. 2 (1990's)	65. SHIELDED TRAILER (1983)	
10. SWIMMING POOL/RESTROOMS (Mid 1960's)	47. MAIN GATE RESTROOM (1963)	66. ATMOSPHERIC SCIENCE TRAILER	
11. LEVI'S BUILDING-RIGGING LOFT (Mid 1960's)	50. INTERFERENCE MONITORING SHACK	67. CRYOGENICS LAB TRAILER (1967)	
12. MAINTENANCE SHOPS (1967)	51. GREASE PIT	68. SCIENTIFIC OFFICES TRAILER	
13. BLDG. SHACK (1963)	53. EMERGENCY GENERATOR BLDG.	69. ELECTRONIC TRAILER (WAVEGUIDE)	
17. WAREHOUSE (1967)	54. VISITOR CENTER BLDG. (1997)	70. COMPUTER TRAILER	
21. ANTENNA TESTING RANGE	55. LIBRAR LABORATORY BLDG. (1996)	71. ELECTRONICS CABLE TRAILER	
25. PAINT STORAGE BUILDING (C. 2010)	57. NORTH V.S.Q. BLDG. (2002)	72. ELECTRONIC TRAILER (CRYOGENICS)	
27. OPTICAL LABS (1965/1997)	58. NORTH V.S.Q. UTILITY BLDG. (2002)	73. HF TRANSMITTER BUILDING (2000's)	
	59. VISITOR CENTER TRAILER	76. INSPIRATION FOR SCIENCE TRAILER (2000's)	

- Building/Structure
- Building/Infrastructure to be Deconstructed
- Vegetation Survey Area

Note: All deconstruction work would be within developed areas of Arecibo Observatory and there would be no need to construct new access routes to haul debris away. No widening or other improvements to existing roads would occur.



Figure 2
Alternative 1: Collaboration with Interested Parties for Continued Science-focused Operations Arecibo Observatory Puerto Rico



BUILDING NO. DESCRIPTION		
1. OPERATIONS BUILDING (1963)	34. HIGH VOLTAGE POWER SUPPLY BLDG. (1973)	60. ANT. RECE. TESTING BLDG. (Late 1990's)
2. ADMINISTRATION BUILDING (1963)	35. CURRAMINGS GENERATOR CONTROL BLDG. (2010)	61. LEARNING CENTER (2001)
3. VISITING SCIENTIST QUARTERS AND CATERING (1968)	41. WEST HILL V.S.Q. BACHELOR UNIT NO. 1 (1990's)	62. HFF STORAGE TRAILER
4. ENTRANCE GUARD-HOUSE (1963)	42. WEST HILL V.S.Q. BACHELOR UNIT NO. 2 (1990's)	63. HOMOSONDE TRAILER
5. CABLE CAR HOUSE (1963)	43. WEST HILL V.S.Q. FAMILY UNIT NO. 1 (1990's)	64. ELECTRONIC TRAILER
6. PUMP HOUSE/WATER TREATMENT BLDG. (1963)	44. WEST HILL V.S.Q. FAMILY UNIT NO. 2 (1990's)	65. SHIELDED TRAILER (1983)
10. SWIMMING POOL/RESTROOMS (M:6 1960's)	47. MAIN GATE RESTROOM (1963)	66. ATMOSPHERIC SCIENCE TRAILER
11. LEWIS BUILDING-RIGGING LOFT (Mid 1960's)	50. INTERFERENCE MONITORING SHACK	67. CRYOGENICS LAB TRAILER (1967)
12. MAINTENANCE SHOPS (1967)	51. GREASE PIT	68. SCIENTIFIC OFFICES TRAILER
13. BOVIL SHACK (1963)	53. EMERGENCY GENERATOR BLDG.	69. ELECTRONIC TRAILER (WAVEGUIDE)
17. WAREHOUSE (1967)	54. VISITOR CENTER BLDG. (1997)	70. COMPUTER TRAILER
21. ANTENNA TESTING RANGE	55. LIDAR LABORATORY BLDG. (1996)	71. ELECTRONICS CABLE TRAILER
25. PAINT STORAGE BUILDING (Circa 2010)	57. NORTH V.S.Q. BLDG. (2002)	72. ELECTRONIC TRAILER (CRYOGENICS)
27. OPTICAL LABS (1987/1997)	58. NORTH V.S.Q. UTILITY BLDG. (2002)	73. HF TRANSMITTER BUILDING (2000's)
	59. VISITOR CENTER TRAILER	76. INSPIRATION FOR SCIENCE TRAILER (2000's)
		77. PHASE REFERENCE ANTENNA (12M) (2010)
		78. COFFEE HUT (2000's)
		79. ENGINEERING OFFICE BUILDING (2000's)
		80. CURRAMINGS DIESEL GENERATOR (2010)

- Building/Structure
- Building/Infrastructure to be Deconstructed
- Building/Infrastructure to be Sale-abandoned
- Vegetation Survey Area

Note: All deconstruction work would be within developed areas of Arecibo Observatory and there would be no need to construct new access routes to haul debris away. No widening or other improvements to existing roads would occur.

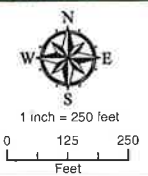
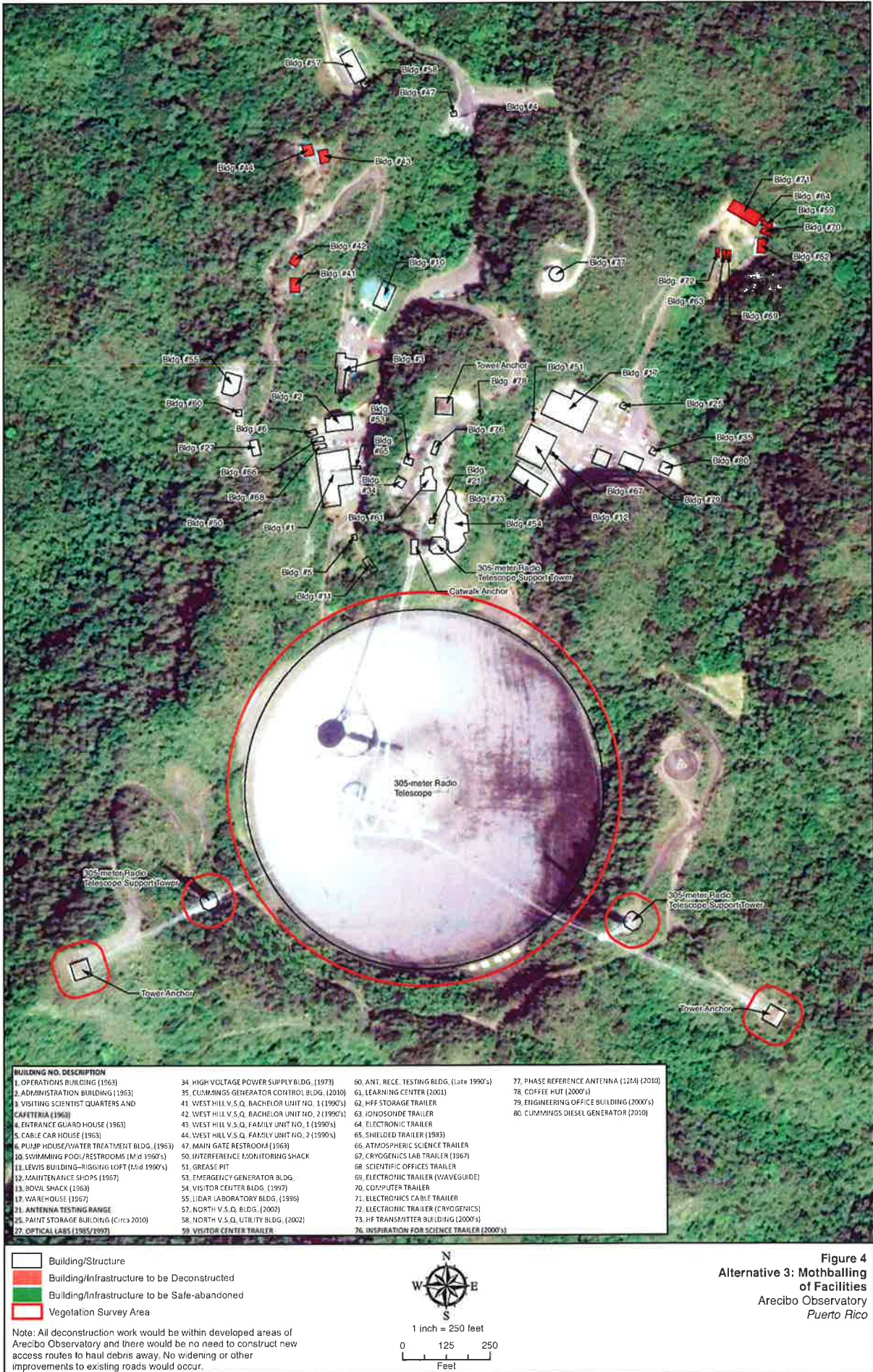


Figure 3
Alternative 2: Collaboration with Interested Parties for Transition to Education-focused Operations
 Arecibo Observatory
 Puerto Rico



BUILDING NO.	DESCRIPTION	BUILDING NO.	DESCRIPTION	BUILDING NO.	DESCRIPTION
1.	OPERATIONS BUILDING (1963)	34.	HIGH VOLTAGE POWER SUPPLY BLDG. (1973)	60.	ANT. RECC. TESTING BLDG. (Late 1990's)
2.	ADMINISTRATION BUILDING (1963)	35.	CUMMINGS GENERATOR CONTROL BLDG. (2010)	61.	LEARNING CENTER (2003)
3.	VISITING SCIENTIST QUARTERS AND CAFE/TERIA (1963)	41.	WEST HILL V.S.Q. BACHELOR UNIT NO. 1 (1990's)	62.	HFF STORAGE TRAILER
4.	ENTRANCE GUARD HOUSE (1963)	42.	WEST HILL V.S.Q. BACHELOR UNIT NO. 2 (1990's)	63.	IONOSPHERE TRAILER
5.	CABLE CAR HOUSE (1963)	43.	WEST HILL V.S.Q. FAMILY UNIT NO. 1 (1990's)	64.	ELECTRONIC TRAILER
6.	PUMP HOUSE/WATER TREATMENT BLDG. (1963)	44.	WEST HILL V.S.Q. FAMILY UNIT NO. 2 (1990's)	65.	SHIELDED TRAILER (1983)
10.	SWIMMING POOL/RESTROOMS (Mid 1960's)	47.	MAIN GATE RESTROOM (1968)	66.	ATMOSPHERIC SCIENCE TRAILER
11.	LEWIS BUILDING-RIGGING LOFT (Mid 1960's)	50.	INTERFERENCE MONITORING SHACK	67.	CRYOGENICS LAB TRAILER (1967)
12.	MAINTENANCE SHOPS (1967)	51.	GREASE PIT	68.	SCIENTIFIC OFFICES TRAILER
13.	BOVAL SHACK (1963)	53.	EMERGENCY GENERATOR BLDG.	69.	ELECTRONIC TRAILER (WAVEGUIDE)
17.	WAREHOUSE (1967)	54.	VISITOR CENTER BLDG. (1997)	70.	COMPUTER TRAILER
21.	ANTENNA TESTING RANGE	55.	LIDAR LABORATORY BLDG. (1996)	71.	ELECTRONICS CABLE TRAILER
25.	PAINT STORAGE BUILDING (Circa 2010)	57.	NORTH V.S.Q. BLDG. (2002)	72.	ELECTRONIC TRAILER (CRYOGENICS)
27.	OPTICAL LABS (1985/1997)	58.	NORTH V.S.Q. UTILITY BLDG. (2002)	73.	HIF TRANSMITTER BUILDING (2007's)
		59.	VISITOR CENTER TRAILER	76.	INSPIRATION FOR SCIENCE TRAILER (2000's)
				77.	PHASE REFERENCE ANTENNA (1214) (2010)
				78.	COFFEE HUT (2000's)
				79.	ENGINEERING OFFICE BUILDING (2000's)
				80.	CUMMINGS DIESEL GENERATOR (2010)

- Building/Structure
- Building/Infrastructure to be Deconstructed
- Building/Infrastructure to be Safe-abandoned
- Vegetation Survey Area

Note: All deconstruction work would be within developed areas of Arecibo Observatory and there would be no need to construct new access routes to haul debris away. No widening or other improvements to existing roads would occur.

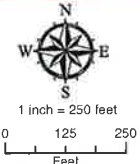
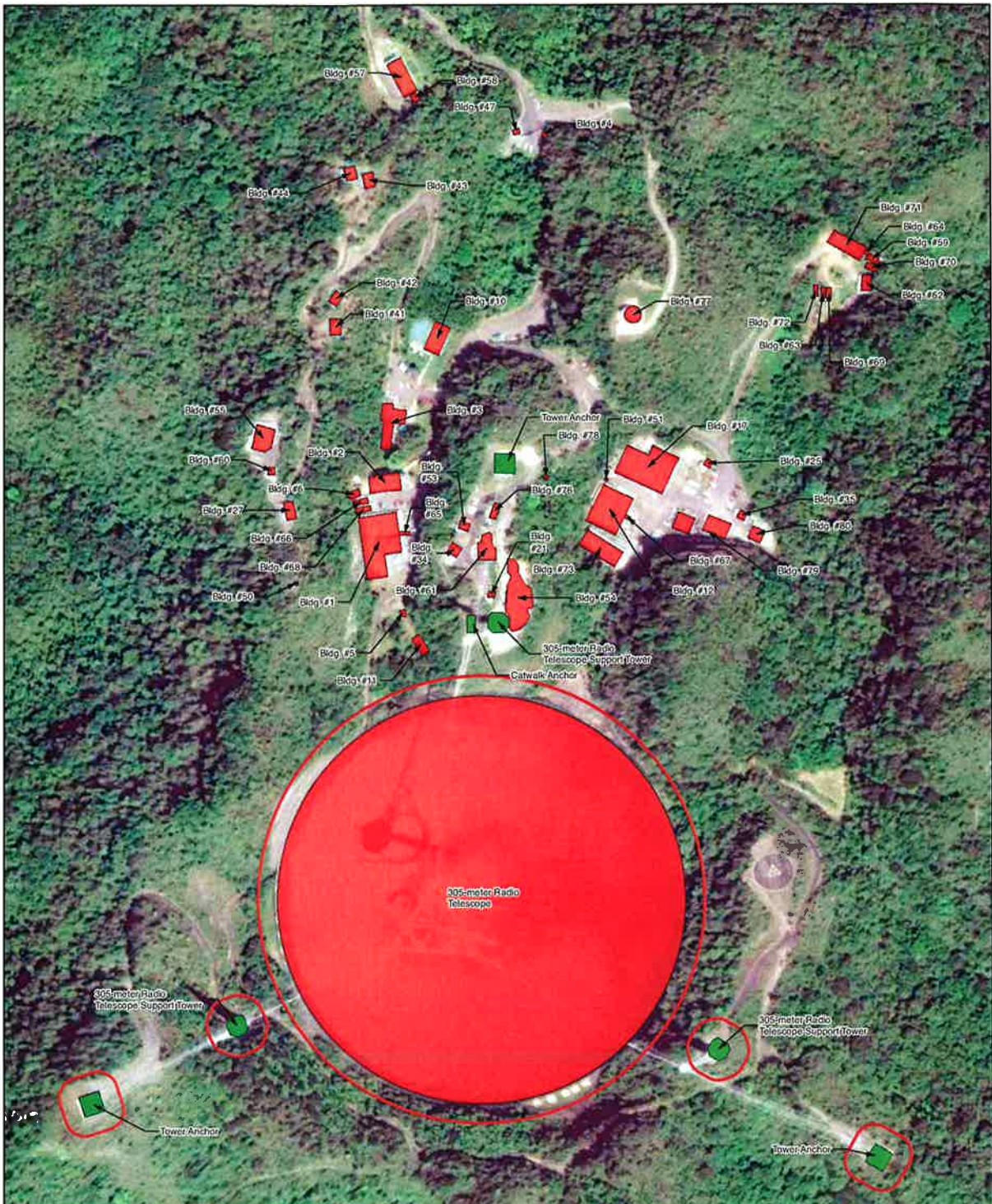


Figure 4
Alternative 3: Mothballing of Facilities
Arecibo Observatory
Puerto Rico



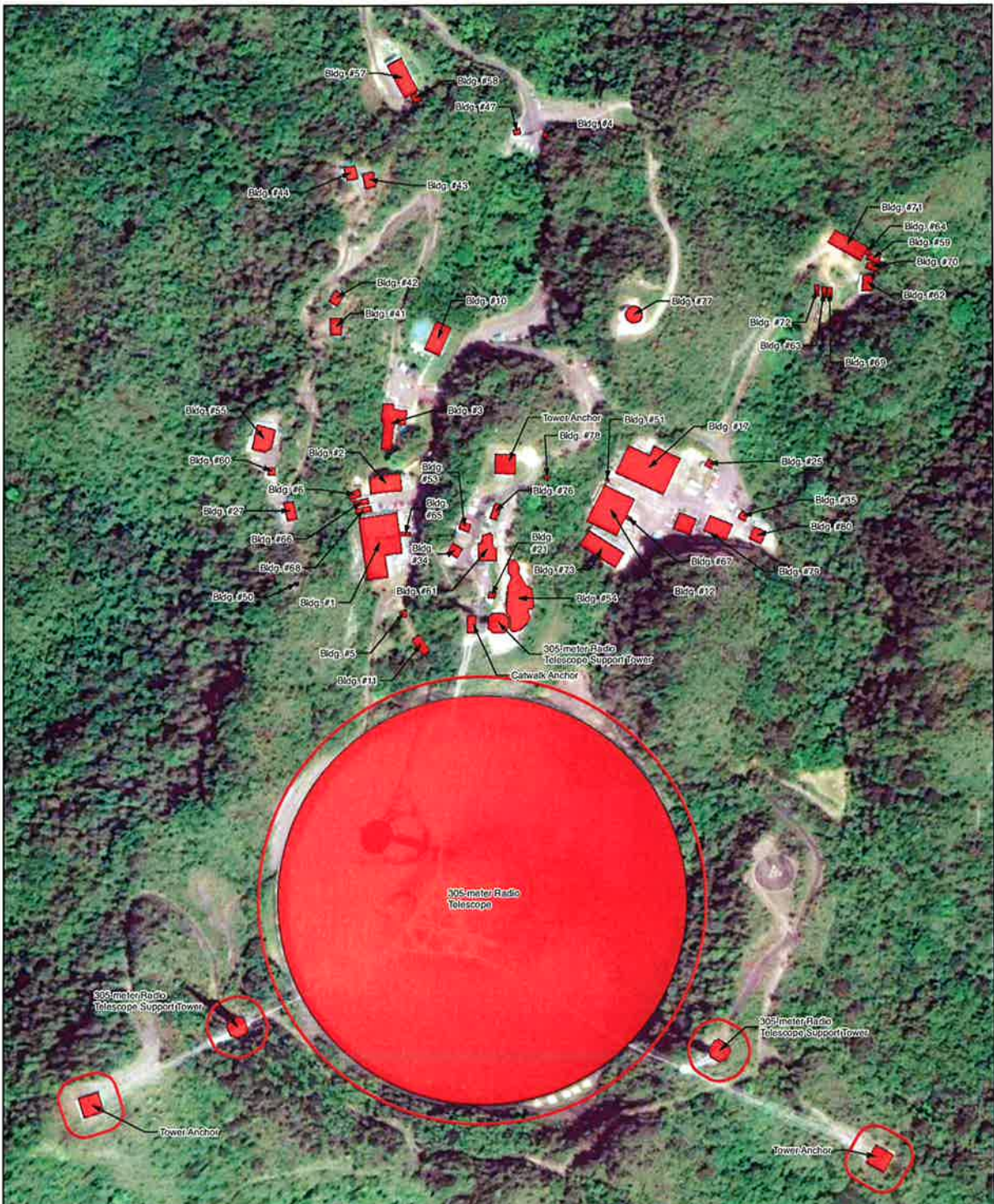
BUILDING NO. DESCRIPTION			
1. OPERATIONS BUILDING (1963)	34. HIGH VOLTAGE POWER SUPPLY BLDG. (1973)	60. ANT. RECC. TESTING BLDG. (Late 1950's)	77. PHASE REFERENCE ANTENNA (12M) (2010)
2. ADMINISTRATION BUILDING (1963)	35. CUMMINGS GENERATOR CONTROL BLDG. (2010)	61. LEARNING CENTER (2001)	78. COFFEE HUT (2000's)
3. VISITING SCIENTIST QUARTERS AND CATERERIA (1964)	41. WEST HILL V.S.Q. BACHELOR UNIT NO. 1 (1990's)	62. HFF STORAGE TRAILER	79. ENGINEERING OFFICE BUILDING (2000's)
4. ENTRANCE GUARD HOUSE (1963)	42. WEST HILL V.S.Q. BACHELOR UNIT NO. 2 (1990's)	63. IONOSPHERE TRAILER	80. CUMMINGS DIESEL GENERATOR (2010)
5. CABLE CAR HOUSE (1963)	43. WEST HILL V.S.Q. FAMILY UNIT NO. 1 (1990's)	64. ELECTRONIC TRAILER	
6. PUMP HOUSE/WATER TREATMENT BLDG. (1963)	44. WEST HILL V.S.Q. FAMILY UNIT NO. 2 (1990's)	65. SHIELDED TRAILER (1983)	
10. SWIMMING POOL/RESTROOMS (Mid 1960's)	47. MAIN GATE RESTROOM (1963)	66. ATMOSPHERIC SCIENCE TRAILER	
11. LEWIS BUILDING—RIGGING LOFT (Mid 1960's)	50. INTERFERENCE MONITORING SHACK	67. CRYOGENICS LAB TRAILER (1967)	
12. MAINTENANCE SHOPS (1967)	51. GREASE PIT	68. SCIENTIFIC OFFICES TRAILER	
13. BOVAL SHACK (1963)	53. EMERGENCY GENERATOR BLDG.	69. ELECTRONIC TRAILER (WAVEGUIDE)	
17. WAREHOUSE (1967)	54. VISITOR CENTER BLDG. (1997)	70. COMPUTER TRAILER	
21. ANTENNA TESTING RANGE	55. LIDAR LABORATORY BLDG. (1996)	71. ELECTRONICS CABLE TRAILER	
25. PAINT STORAGE BUILDING (Circa 2010)	57. NORTH V.S.Q. BLDG. (2002)	72. ELECTRONIC TRAILER (CRYOGENICS)	
27. OPTICAL LABS (1985/1997)	58. NORTH V.S.Q. UTILITY BLDG. (2002)	73. HF TRANSMITTER BUILDING (2000's)	
	59. VISITOR CENTER TRAILER	76. INSPIRATION FOR SCIENCE TRAILER (2000's)	

- Building/Structure
- Building/Infrastructure to be Deconstructed
- Building/Infrastructure to be Safe-abandoned
- Vegetation Survey Area

Note: Rimwall infrastructure would be safe abandoned.
 All deconstruction work would be within developed areas of Arecibo Observatory and there would be no need to construct new access routes to haul debris away. No widening or other improvements to existing roads would occur.



Figure 5
 Alternative 4: Partial
 Deconstruction and Site
 Restoration
 Arecibo Observatory
 Puerto Rico



BUILDING NO. DESCRIPTION		
1. OPERATIONS BUILDING (1953)	34. HIGH VOLTAGE POLYMER SUPPLY BLDG. (1973)	60. ANT. RECE. TESTING BLDG. (Late 1990's)
2. ADMINISTRATION BUILDING (1963)	35. CUMMINGS GENERATOR CONTROL BLDG. (2010)	61. LEARNING CENTER (2001)
3. VISITING SCIENTIST QUARTERS AND CAFETERIA (1953)	41. WEST HILL V.S.Q. BACHELOR UNIT NO. 1 (1990's)	62. HFF STORAGE TRAILER
4. ENTRANCE GUARD HOUSE (1963)	42. WEST HILL V.S.Q. BACHELOR UNIT NO. 2 (1990's)	63. IONOSPHERE TRAILER
5. CABLE CAR HOUSE (1963)	43. WEST HILL V.S.Q. FAMILY UNIT NO. 1 (1990's)	64. ELECTRONIC TRAILER
6. PUMP HOUSE/WATER TREATMENT BLDG. (1963)	44. WEST HILL V.S.Q. FAMILY UNIT NO. 2 (1990's)	65. SHIELDED TRAILER (1983)
10. SWIMMING POOL/RESTROOMS (Mid 1960's)	47. MAIN GATE RESTROOM (1963)	66. ATMOSPHERIC SCIENCE TRAILER
11. LEVVIS BUILDING-RIGGING LOFT (Mid 1960's)	50. INTERFERENCE MONITORING SHACK	67. CRYOGENICS LAB TRAILER (1967)
12. MAINTENANCE SHOPS (1967)	51. GREASE PIT	68. SCIENTIFIC OFFICES TRAILER
13. BOYS' SHACK (1963)	53. EMERGENCY GENERATOR BLDG.	69. ELECTRONIC TRAILER (WAVEGUIDE)
17. WAREHOUSE (1967)	54. VISITOR CENTER BLDG. (1997)	70. COMPUTER TRAILER
21. ANTENNA TESTING RANGE	55. LIDAR LABORATORY BLDG. (1996)	71. ELECTRONICS CABLE TRAILER
25. PAINT STORAGE BUILDING (Circa 2010)	57. NORTH V.S.Q. BLDG. (2002)	72. ELECTRONIC TRAILER (CRYOGENICS)
27. OPTICAL LARS (1985/1997)	58. NORTH V.S.Q. UTILITY BLDG. (2002)	73. HF TRANSMITTER BUILDING (2000's)
	59. VISITOR CENTER TRAILER	76. INSPIRATION FOR SCIENCE TRAILER (2007's)
		77. PHASE REFERENCE ANTENNA (12M) (2010)
		78. COFFEE HUT (2000's)
		79. ENGINEERING OFFICE BUILDING (2000's)
		80. CUMMINGS DIESEL GENERATOR (2010)

- Building/Structure
- Building/Infrastructure to be Deconstructed
- Building/Infrastructure to be Safe-abandoned
- Vegetation Survey Area

Note: All deconstruction work would be within developed areas of Arcicco Observatory and there would be no need to construct new access routes to haul debris away. No widening or other improvements to existing roads would occur.

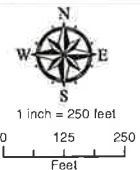


Figure 6
Alternative 5: Complete Deconstruction and Site Restoration Arcicco Observatory Puerto Rico

5-G- DEIS Transcripts

PUBLIC MEETING ON THE DRAFT
ENVIRONMENTAL IMPACT STATEMENT
IN ARECIBO, PUERTO RICO

held on Wednesday, November 16, 2016, at the College of
Engineers and Surveyors, Manuel T. Gillán Avenue,
Arecibo, Puerto Rico, beginning at 6:15 p.m.

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IN ARECIBO, PUERTO RICO
WEDNESDAY, NOVEMBER 16, 2016
PROCEEDINGS

MS. HAMILTON: Good evening. The meeting will begin shortly. If everybody could take their seats, please. Thank you.

MR. GAUME: Thank you for coming tonight. In case you're at the wrong meeting, this is the public meeting on the Draft Environmental Impact Statement for the Observatory Arecibo.

I have a brief presentation this evening. But first I will be introducing the team members and will describe the materials that we have. We'll talk about the purpose of the meeting. We'll talk about the Draft Environmental Impact Statement, a summary. And then we'll turn it over to you guys to provide us with your comments. If you haven't already signed up to speak and you would like to speak, please do so now, right over here.

So I would like to do the introductions now. My name is Ralph Gaume

1 and I'm the Arecibo Observatory Program
2 director for the National Science
3 Foundation. This is Caroline Blanco,
4 assistant general counsel for NSF. This is
5 Kristen Hamilton, the Environmental
6 Compliance officer for NSF. The person
7 with the green laser dot on her vest is Ivy
8 Kupec, our Public Affairs specialist. And
9 that's Karen Pearce, our senior Legislative
10 Affairs specialist for the National Science
11 Foundation.

12 CH2M Hill is providing contractor
13 support to NSF for preparation of the EIS.
14 And sitting at the back table is Lori
15 Price. She is our Cultural Resources lead.
16 And sitting at Lori's left is Richard
17 Reaves, Ecology and NEPA lead. In
18 addition, I should mention that NASA is
19 serving as a cooperating agency for this
20 EIS.

21 So the materials which you can review
22 here or take home with you are the fact
23 sheets and information boards. This
24 presentation, the electronic version of the
25 fact sheets, and the information boards

1 will be posted on this website,
2 www.nsf.gov/AST, sometime soon after public
3 meetings.

4 So the National Science Foundation has
5 prepared a Draft Environmental Impact
6 Statement to evaluate potential
7 environmental impacts of the proposed
8 operational changes due to funding
9 constraints for Arecibo Observatory. The
10 Draft Environmental Impact Statement was
11 noticed in the Federal Register, emailed to
12 our stakeholder list, and posted to our
13 website on October 28.

14 The purpose of this meeting is to
15 allow for public comments on the DEIS which
16 will help us put together the Final
17 Environmental Statement. It would be
18 helpful for your comments to be as specific
19 as possible; and, of course, we welcome any
20 comments on the Draft Environmental Impact
21 Statement that you may wish to provide. In
22 addition, a Section 106 consultation
23 meeting will be held tomorrow at 1:00 p.m.

24 The purpose of the proposed action is
25 to substantially reduce NSF's contribution

1 to the funding of Arecibo Observatory. NSF
2 needs to maintain a balanced research
3 portfolio with the largest scientific
4 return for the taxpayer dollar. The
5 scientific community, through reviews and
6 surveys, has indicated that the scientific
7 capability of Arecibo Observatory is lower
8 in priority than other scientific
9 capabilities that NSF funds. So I would
10 ask you to please see the Executive Summary
11 of the DEIS on Section 1 for a full
12 background and an explanation of why the
13 NSF is proposing these changes.

14 So in 2012 the National Science
15 Foundation -- the Division of Astronomical
16 Sciences Portfolio Review Committee was
17 formed as a subcommittee of the Advisory
18 Committee, the NSF director of Mathematical
19 and Physical Sciences. The Portfolio
20 Review Committee was subject to the
21 regulations pertaining to the Federal
22 Advisory Committee Act.

23 With regards to Arecibo Observatory
24 this report said that AST should reevaluate
25 its participation in Arecibo and SOAR later

1 in the decade, in light of the science
2 opportunities and budgets forecasts and
3 that time. If funding remains tight later
4 in the decade, then, the scientific need
5 for continued AST funding for Arecibo and
6 SOAR must be weighed against the needs of
7 the grants program.

8 The reevaluation discussed here began
9 with a Dear Colleague Letter on October
10 2015, which requested viable concepts for
11 the future of Arecibo Observatory,
12 specifically including strategies and goals
13 for continued operations that involve a
14 substantially reduced funding commitment
15 from NSF. In addition, in 2015 the NSF
16 Division of Atmospheric and Geospace
17 Sciences performed a portfolio review
18 committee as a subcommittee of the Advisory
19 Committee of the National Sciences
20 Foundation Directorate for Geosciences.

21 Like the Astronomical Sciences
22 Portfolio Review Committee, the Atmospheric
23 and Geospace Sciences Portfolio Review
24 Committee was subject to regulations
25 pertaining to the Federal Advisory

1 Committee Act. This Portfolio Review
2 Committee recommended the reduction of
3 atmospheric and geospace sciences annual
4 funding for Arecibo from 4.1 million per
5 year in 2016 to 1.1 million per year 2020.
6 The Atmospheric and Geospace Sciences
7 Portfolio Review was accepted by the
8 Geosciences Directorate Advisory Committee,
9 in April 2016, and is currently being
10 assessed by the National Academies
11 Committee. At this time, NSF has made no
12 determination to act upon this
13 recommendation.

14 Every 10 years the National Academies
15 has undertaken a decadal survey that
16 recommends scientifically important
17 projects that NSF, NASA, and the Department
18 of Energy should undertake in the next
19 decade. The last astronomy decadal survey
20 was published in 2010 and was called "New
21 Worlds, New Horizons in Astronomy and
22 Astrophysics."

23 Recently, the National Academies
24 formed a committee to review progress
25 toward the decadal survey vision. In

1 August 2016, this committee reported that
2 the NSF should proceed with divestment from
3 ground-based facilities that have a lower
4 scientific impact, implementing the
5 recommendations of the NSF Portfolio
6 Review, which is essential to sustaining
7 the scientific vitality of U.S.
8 Ground-based Astronomy Program as new
9 facilities come into operation.

10 One final committee report which I'll
11 mention is the Astronomy and Astrophysics
12 Advisory Committee. It's a committee
13 formed by Congress in 2002. Again, they
14 review NSF, NASA, and the Department of
15 Energy's astrophysics programs. Annually,
16 the Astronomy and Astrophysics Advisory
17 Committee sends reports on NSF, NASA, and
18 Department of Energy astronomy and
19 astrophysics programs to several
20 congressional science-related committees
21 both in the House of Representatives and
22 the Senate.

23 In their report this year the
24 Committee stated, "Strong efforts by NSF
25 for facility divestment should continue as

1 fast as is practical. Efforts to explore
2 partnerships, interagency cooperation, and
3 private resources to maintain some access
4 to facilities for the U.S. community that
5 may mitigate the loss of open access should
6 continue. Transferring the cost of
7 operating a facility outside of the NSF/AST
8 budget is preferable to complete loss of a
9 capability from the suite of capabilities
10 used by U.S. researchers."

11 As we presented during the scoping
12 period, several alternatives were
13 identified that can meet the purpose of
14 substantially reduce NSF's funding. Those
15 are following: the collaboration with
16 interested parties for continued
17 science-focused operations; the
18 collaboration with interested parties for
19 transition to education-focused operations;
20 mothballing of facilities, and note that
21 "mothballing" could mean suspension of
22 operations in a manner such that operations
23 could resume efficiently at a future date;
24 full deconstruction and site restoration;
25 partial deconstruction and site

1 restoration; and no action, which is
2 continued NSF investment for
3 science-focused operations.

4 With regards to Alternative 4,
5 "Partial Deconstruction and Site
6 Restoration" -- Alternative 4 involves the
7 deconstruction of all above-grade
8 structures, except for large, concrete
9 structures; that is the towers, tower and
10 catwalk anchors, and rim wall
11 infrastructure. All below-grade
12 foundations would be stabilized and filled
13 in.

14 NSF's preferred alternative, as
15 identified in the Draft Environmental
16 Impact Statement, is Alternative 1:
17 "Collaboration with Interested Parties for
18 Transition to Science-focused Operations."
19 This alternative will meet the purpose and
20 need of reducing the funding required for
21 NSF while allowing continued benefits to
22 the scientific and educational communities.
23 However, Alternative 1 can only be
24 implemented if new stakeholders come
25 forward to participate as collaborating

1 parties with viable proposed plans to
2 provide additional non-NSF funding in
3 support of their science-focused
4 operations.

5 Note that for each proposed
6 alternative NSF has identified which
7 buildings and infrastructure would be
8 retained, deconstructed, mothballed, or
9 safe abandoned. This level of detail is
10 helpful in ensuring the environmental
11 impact analysis and adequately addresses
12 each proposed alternative.

13 In October 2015, NSF issued a Dear
14 Colleague Letter requesting viable concepts
15 for future continued operations of Arecibo
16 Observatory. In part, NSF utilized the
17 responses received to inform which
18 buildings and infrastructure will be
19 included for study in the EIS. As I said,
20 "In part NSF utilized these responses to
21 inform which buildings and infrastructure
22 will be included." The Dear Colleague
23 Letter did not limit the responders or
24 direct the responders to a specific
25 solution but allowed the responders to

1 propose innovative and operational models
2 that may require some subset of the
3 existing buildings and infrastructure.

4 As we move forward with the EIS
5 process, it is possible that a subset of
6 the buildings and infrastructure identified
7 in the DEIS under Alternative 1 and 2 could
8 be retained, deconstructed, mothballed, or
9 safe abandoned.

10 I believe that Caroline Blanco has
11 some additional words that she wanted to
12 add to this slide.

13 MS. BLANCO: Thank you, Ralph. Good
14 evening everybody.

15 The number of structures and
16 infrastructure for Alternatives 1 and 2
17 represent the most inclusive scenarios.
18 But, as Ralph mentioned, it might be that a
19 smaller subset is ultimately selected.

20 We analyzed the most inclusive
21 scenario so that we can understand the full
22 scope of environmental impacts anticipated.
23 This way we have already analyzed the most
24 inclusive scenario of impacts and any
25 reduction in infrastructure and structures

1 would be a lesser included universe of
2 impacts analyzed.

3 This slide provides information on the
4 scoping process that occurred late last
5 spring. The meeting materials and
6 transcripts of those scoping meetings are
7 available on our website. Over 80
8 attendees participated in the two scoping
9 meetings and 240 comments were submitted to
10 NSF. The comments are addressed in
11 Section 5 of the Draft EIS.

12 The contents of the Draft EIS are the
13 following. The first part is the Executive
14 Summary, which provides a concise summary
15 of approximately 26 pages out of 272 of the
16 Draft EIS, and includes all the findings.
17 It is provided in the website in both
18 English and Spanish. The second section is
19 the Purpose and Needs Section, and that
20 provides the rationale for NSF's proposed
21 action.

22 The next section provides a full
23 description of each of the proposed
24 alternatives, including which buildings or
25 structures would remain under each

1 alternative. Then the document moves on to
2 the Affected Environment Section, which
3 provides an overview of the existing
4 physical, biological, economic, and social
5 conditions at Arecibo Observatory.

6 The next section is the Environmental
7 Consequences Section, which provides an
8 evaluation of the potential environmental
9 impacts of the proposed action under each
10 of the five alternatives; and then the
11 no-action alternative. The impacts of each
12 alternative's implementation and operations
13 are assessed. In addition, mitigation
14 measures to reduce the duration, intensity,
15 or scale of the impacts are identified.

16 The final section of the Draft EIS
17 provides information on the process thus
18 far and a summary of the consultation that
19 has occurred to inform the Draft
20 Environmental Impact Statement.

21 Under "Impact Analyses," it includes
22 impacts of ecological, aesthetic, historic,
23 cultural, economic, social, or health; and
24 also indicates whether they can be
25 beneficial or adverse. Wherever possible

1 in the Draft EIS, the type of impact,
2 direct, indirect, or cumulative; the
3 duration, whether short-term or long-term;
4 the intensity, whether negligible or minor,
5 moderate, or major; and the scale, whether
6 it's local or regional are analyzed for any
7 potential impacts.

8 Direct impacts are those caused by the
9 action and occur at the same time and
10 place. Indirect impacts are those that are
11 caused by the action and are later in time
12 or farther removed in distance but still
13 reasonably known. Cumulative impacts are
14 those that can result from individually
15 minor; but, when added to past, present,
16 and reasonable foreseeable impacts, we take
17 a look at whether those actions then become
18 major over time.

19 The resource areas that were
20 considered in the Draft EIS include the
21 following: biological resources, cultural
22 resources, geological resources;
23 groundwater, hazardous, and solid wastes;
24 health and safety; noise; socioeconomics;
25 traffic; visual resources; and

1 environmental justice issues.

2 The Draft Environmental Impact
3 Statement is available in the NSF website
4 and in local libraries. In addition, as
5 Ralph mentioned, the Executive Summary is
6 available in Spanish and can also be found
7 on our website. The copies that are at the
8 local libraries are hard copies.

9 We are now in the middle of the
10 45-day-public comment period on the Draft
11 Environmental Impact Statement. There are
12 a couple of ways to provide public comments
13 and we encourage you to do so. One is
14 through providing verbal comments at this
15 meeting. The other is by providing written
16 comments, either emailed or mailed; and
17 those will be accepted until December 12,
18 2016. The address to submit comments
19 through email or written comments by mail
20 are included at the bottom of the slide.

21 Looking forward, there are target
22 dates for the process. The first is the
23 scoping period that has already concluded.
24 There was a 30-day-comment period and
25 public meetings. That public-comment

1 period helped to inform the preparation of
2 the Draft EIS. As I mentioned, that began,
3 once it was published, a 45-day-public
4 comment period and public meetings, both
5 tonight and tomorrow morning from 10:00 to
6 12:00 in San Juan.

7 Again, the public-comment period will
8 conclude on December 12, 2016. Then we
9 will take those comments, review them,
10 consider them, and prepare the Final
11 Environmental Impact Statement. We
12 anticipate the release of the Final
13 Environmental Impact Statement sometime
14 around or on May of 2017. And then, at
15 least 30 days later, it could be longer, we
16 will prepare and issue a Record of
17 Decision. That is anticipated in the
18 summer of 2017. That decision will include
19 reasoning based on environmental impacts,
20 budget issues, science priorities, and
21 other factors.

22 And the solicitation that Ralph
23 mentioned earlier for collaboration will be
24 going on in parallel to this environmental
25 review. And also, at the bottom of the

1 slide, you will see two other environmental
2 compliance processes: the National
3 Historic Preservation Act and the
4 Endangered Species Act. And as we
5 mentioned earlier, a Section 106
6 consultation meeting under the National
7 Historic Preservation Act will take place
8 tomorrow at the Doubletree Hotel, in San
9 Juan, from 1:00 to 2:00. People who
10 expressed an interest in participating as
11 consulting parties already are aware of
12 this, and the public is also invited. As I
13 mentioned, the Record of Decision includes
14 a variety of factors that I mentioned
15 earlier.

16 And now we turn to the public-comment
17 period, oral-comments period of this
18 meeting. We would ask that we have one
19 speaker at a time that will be called up by
20 Kristen Hamilton. When your name is
21 called, Karen Pierce -- well, please stand
22 up, state your name and spell your name for
23 the court reporter, and Karen Pearce will
24 bring the microphone to you so that you can
25 provide your comment.

1 This is a good time to mention that
2 these proceedings are going to be
3 transcribed by a court reporter and, when
4 available, the transcript will be posted on
5 the website. When you do provide your
6 public comments, please direct them only
7 to -- please, understand that the NSF is
8 not going to be addressing your comments at
9 this time, but they will be addressed in
10 the Final EIS. And please direct your
11 comments and questions to the contents of
12 the DEIS.

13 Also, given the number of speakers and
14 to give everyone an opportunity to provide
15 their verbal comments, we will limit the
16 time per comment, including time for
17 translation, initially to three minutes.

18 Because it can often be difficult for
19 a speaker to know how long he or she has
20 been speaking, Kristen Hamilton will stand
21 up at the two-minute mark so that the
22 speaker will know when to begin to wrap up
23 his or her comments. If we have time left
24 over after everyone has had a chance to
25 speak, we will allow an additional

1 opportunity for additional comments. Also,
2 please remember that you still have an
3 opportunity to provide any comments up
4 until December 12 by email or by regular
5 mail.

6 Thank you very much for your
7 participation. We do value your comments
8 and do encourage you to provide them.
9 Thank you very much.

10 Now Kristen will call each speaker in
11 the order they signed up.

12 MS. HAMILTON: Thank you. And my
13 colleague Karen will help to pass the
14 microphone around.

15 First up is Francisco Córdova.

16 MR. CÓRDOVA: Thank you. I will not
17 need translation today. I have them both
18 in Spanish and English, all written
19 continuously.

20 MS. HAMILTON: Okay.

21 MR. CÓRDOVA: Thank you.

22 My name is Francisco Córdova. I'm the
23 director of the Arecibo Observatory and of
24 SRI International. This statement reflects
25 the views of SRI International and the

1 Arecibo Observatory management team,
2 composed of SRI International, University
3 Space Research Association and Universidad
4 Metropolitana.

5 The Arecibo Observatory has been a
6 critical scientific site for over 53 years,
7 performing cutting-edge research in the
8 areas of radio astronomy, space and
9 atmospheric sciences, and planetary
10 sciences. It currently plays a vital role
11 in the study of potentially hazardous
12 asteroids, studying space weather and
13 enabling discoveries that help humanity
14 better understand the universe. It is also
15 a key facility for science, technology,
16 engineering and math education, hosting
17 over 90 thousand visitors every year, the
18 majority of which are minority students
19 local to Puerto Rico.

20 It has been clearly communicated by
21 NSF that severe internal financial pressure
22 is driving the Agency to reduce funding for
23 various large facilities, Arecibo being one
24 of them. While we may disagree on the need
25 to divest in Arecibo based on the

1 uniqueness of the site and the remarkable
2 scientific and educational accomplishments,
3 we have been focused on helping NSF find
4 suitable solutions that will provide
5 long-term financial stability for the
6 Arecibo site, and today we reiterate our
7 commitment in providing that support.

8 In the published DEIS, NSF identified
9 Alternative 1, "Collaboration with
10 Interested Parties for Continued
11 Science-focused Operations," as the
12 Agency-preferred Alternative. The AMT,
13 Arecibo Management Team, is optimistic
14 about NSF wanting to continue
15 science-focused operations at the Arecibo
16 Observatory. However, we are concerned by
17 the details behind NSF's proposed
18 alternative, in particular the
19 deconstruction of over 26 buildings at the
20 site and the implied elimination of the
21 planetary radar and the space and
22 atmospheric science capabilities at
23 Arecibo.

24 The DEIS states, and I quote, that
25 "Alternative 1 would meet the purpose and

1 need of reducing the funding required from
2 NSF." However, nowhere in the document has
3 this financial analysis been presented nor
4 has it been clearly communicated why or how
5 the deconstruction of critical elements of
6 the Observatory is of financial benefit to
7 NSF. It certainly did not come from the
8 Arecibo Management Team.

9 A rationale for how and why these
10 specific buildings were selected for
11 deconstruction should also be included. A
12 thorough financial analysis outlining the
13 exact maintenance and operational costs for
14 each of the buildings also needs to be
15 performed and included in the document as
16 data.

17 It is also puzzling that while the NSF
18 wants interested parties to collaborate and
19 financially support the Arecibo
20 Observatory, NSF proposes the elimination
21 of the very elements that differentiate
22 Arecibo from other sites around the world:
23 the radar and space weather capabilities.

24 To provide an example, more than 15
25 million NSF dollars have been spent over

1 the past 10 years in the development and
2 commissioning of a heating facility in
3 support of space and atmospheric sciences.
4 Yet, under the DEIS, NSF recommends its
5 deconstruction. The heating facility was
6 explicitly requested by the scientific
7 community, has potential to become
8 revenue-generating, and was just
9 commissioned less than three weeks ago.

10 Similarly, approximately one third of
11 the current operating budget for Arecibo is
12 provided by NASA, solely for the use of the
13 planetary radar capabilities and the
14 studies of near-Earth objects. This is
15 another unique equipment which is being
16 deconstructed under Alternative 1.

17 The following quote talks about the
18 role of studying NEOs as a public health
19 resource: "This improved characterization
20 and tracking has an impact on public safety
21 only if there is a means of deflecting or
22 disrupting objects on a collision course
23 with Earth, which would be completely
24 independent of the Arecibo Observatory.
25 The U.S. Government currently does not have

1 such capability."

2 This logic is similar to saying that
3 the human race should stop studying the
4 disease of cancer because we have no way to
5 cure it or that we should stop looking for
6 other galaxies because we have no way to
7 reach them. It is the very essence of
8 research to dive into the unknown, to
9 accomplish what have never been
10 accomplished before in order to make our
11 world a better one.

12 A written statement will also be
13 provided by the Arecibo Management Team
14 outlining multiple inconsistencies found in
15 the DEIS document, which I will not discuss
16 verbally.

17 We reiterate our support for all three
18 scientific areas, planetary sciences, radio
19 astronomy, and space and atmospheric
20 sciences to continue operations at the
21 site. We believe these capabilities make
22 Arecibo more marketable and better prepared
23 for a future with reduced NSF funding.

24 We will continue to collaborate with
25 NSF as much as possible in an effort to

1 ensure the future of the Arecibo
2 Observatory and to maintain the prestige
3 and recognition this institution has held
4 for over 50 years.

5 My three minutes aren't up. Would you
6 like me to go ahead and do it in Spanish?

7 (Whereupon, Mr. Córdoba reads his
8 comments in Spanish.)

9 MS. HAMILTON: Thank you.

10 Francisco gets a free pass for being
11 the first one. But from now on I think we
12 need to keep it to three minutes with both
13 English and Spanish. The reason is that we
14 are currently delayed with the number of
15 speakers we have signed up. We're already
16 delayed to be 20 to 30 minutes passed 8:00,
17 which is when the scheduled end-time is.

18 So, if you have a letter to read, I
19 would encourage you to mention the
20 pertinent points and then submit the letter
21 as your comment. It would be considered.

22 Thank you. We appreciate your
23 understanding.

24 The next speaker is Nicholas White.

25 MR. WHITE: Thank you. I will also

1 provide translation. So we don't need the
2 translator.

3 My name is Nicholas White. I'm the
4 Universities Space Research Association
5 senior vice-president for Science. USRA is
6 a non-profit organization with a 105
7 universities granting PhDs in Space
8 Science, and we are one of the three
9 managing partners of the Observatory.

10 I'm going to focus my comments on the
11 planetary radar, which the Draft EIS
12 incorrectly summarizes the safety hazard.

13 You may have read in the newspapers
14 last month that NASA, the Federal Emergency
15 Management Agency, and other government
16 agencies engaged in a planetary protection
17 exercise of the NASA jet propulsion lab to
18 consider the potentially devastating
19 consequences of a 330-foot asteroid hitting
20 the Earth.

21 While this may seem like science
22 fiction, these events are a real
23 possibility. One just has to remember the
24 2013 Chelyabinsk impact in Russia, which
25 was caused by an object only 20 meters

1 across. Despite its small size, it caused
2 damage to 7,200 buildings and injured 1,500
3 people.

4 How is this relevant to the discussion
5 today? Well, Arecibo Observatory is the
6 world's most powerful and sensitive radar
7 system which is used to track these killer
8 objects. It is a vital part of our
9 planetary defense system. These objects
10 are found by optical telescopes that scan
11 the sky, looking for moving points of
12 light. Once an asteroid is found, Arecibo
13 Observatory is, within days, turning its
14 radar to pin-point its orbit.

15 Arecibo Observatory determines to
16 better than 1 part in 10 million the path
17 of the asteroid and whether it will or will
18 not hit the Earth at some point in the
19 future. Such is the precision Arecibo
20 Observatory can predict the asteroid orbit
21 decades, even centuries, into the future.
22 The earlier we find one of these killer
23 asteroids the more time there is to deal
24 with it.

25 Many of these asteroids may go on to

1 orbit the sun for decades before their
2 paths cross the Earth. In these cases we
3 will have time to send spacecraft to
4 deflect well ahead. Even in the worst case
5 scenario, where the asteroid is already on
6 a direct collision course, Arecibo
7 Observatory allows us to predict the time
8 and place of its impact and take action to
9 save lives.

10 The criticality of the Observatory has
11 been recognized by the National Academy of
12 Sciences. In a report in 2010, the Academy
13 recommended immediate actions required to
14 ensure the continued operation of the
15 Arecibo Observatory at a level sufficient
16 to maintain it and the staff of the
17 facility, and that is a source of the NASA
18 funding for one third of the total funding
19 of the Observatory.

20 In 2005 the United States Congress
21 passed the George E. Brown, Jr. Act that
22 directed NASA to detect, track, and
23 characterize near-Earth objects. This went
24 on to a second goal, which incorporated the
25 National Space Policy of the United States

1 of America that guides the NASA
2 administrators to pursue capabilities in
3 cooperation with other departments and
4 other agencies and commercial partners to
5 detect these asteroids.

6 Shutting down the planetary radar
7 operations of Arecibo Observatory will put
8 lives and properties at risk. NSF is the
9 federal steward for this facility, and it's
10 USRA's expectation that NSF will maintain
11 this national need to track and
12 characterize near-Earth asteroids. The
13 DEIS fails to note all these critical
14 facts, and USRA requests that it be
15 corrected.

16 I would like to end by saying that the
17 USRA, along with our partners, SRI and
18 UMET, remain committed to maintain the full
19 operation of the site. As part of this,
20 we're seeking all interested parties to
21 utilize the scientific assets or the site
22 itself to ensure that the NSF's preferred
23 option can be realized.

24 I will pass it now for the
25 translation.

1 (Whereupon, an audience member reads
2 in Spanish Mr. White's comments.)

3 MS. BLANCO: Folks, if you
4 really -- we are really going to do our
5 best to try to stay as late as we can. But
6 please, please give everybody else an
7 opportunity to speak as well.

8 We'd appreciate if you keep your
9 comments to three minutes, including the
10 translation. If you have a written
11 comment, you can provide it to the
12 translator; and as soon as you're done
13 reading it, he can translate it. In the
14 alternative, if you just provide your oral
15 comment, please provide enough breaks so
16 that he can translate.

17 Thank you.

18 MS. HAMILTON: Carlos Padín.

19 MR. CÓRDOVA: Carlos couldn't make it
20 today. We'll present his comments
21 tomorrow.

22 MS. HAMILTON: Tony Van Eyken.

23 MR. VAN EYKEN: In the interest of
24 making sure that we get out of here
25 tonight, I'll make my comments in writing.

1 MS. HAMILTON: Good point. I just
2 wanted to make the point that everybody's
3 comments, whether they are verbal or
4 written, will be considered the same, in
5 the same way.

6 José Menéndez. Oh, my apologies.
7 Edgard Rivera. If it's okay with Edgard,
8 we'll have John Kelly go next. He was next
9 in line but wasn't --

10 MR. KELLY: Thank you.

11 We do welcome the opportunity to
12 provide comments on NSF's Draft
13 Environmental Impact Statement and we
14 believe that we can provide important
15 perspectives that should be included in the
16 final version. Nevertheless, we will also
17 provide written comments within the period.

18 The first and most important point is
19 that the Draft EIS does not cover the
20 specific scenario of operational changes
21 that we describe in our response to NSF's
22 Dear Colleague Letter. That scenario, DEIS
23 notwithstanding, is the one we consider the
24 most desirable, most practical, and most
25 likely to be successful. That scenario was

1 first described to NSF four years ago. It
2 is entirely viable, addresses NSF's needs,
3 and it is well known throughout the
4 community and at NFS itself. Instead, the
5 Draft EIS considers, and NSF has adopted as
6 the Agency's preferred solution, a scenario
7 so unlikely as to render the whole result
8 not relevant.

9 The NASA requirement already mentioned
10 absolutely requires a continuation of the
11 Observatory's globally unique planetary
12 radar. Every scenario in the future
13 assumes that the NASA involvement
14 continues. Yet the Agency's preferred
15 option includes the demolition of that
16 radar's power supply without which there
17 would be no planetary radar at all, which
18 brings me to the second point.

19 The NSF has announced in a further
20 Dear Colleague Letter its intention to
21 solicit proposals for the future operation
22 of the Arecibo Observatory and to require
23 those inputs before the Final EIS is
24 published and before deciding and
25 publishing the Record of Decision. This

1 improper order of events suggests that
2 potential solicitation will require
3 proposers to bid on an unknown.

4 Formal requirements for a Record of
5 Decision require that an EIS has been
6 prepared for all considered alternatives.
7 So either there is something unsuitable
8 with the time order -- clearly there is
9 something unsuitable with the time order
10 here. Either the Record of Decision should
11 precede the solicitation to the proposal or
12 the proposal should be collected before the
13 EIS was undertaken. As it is, the only
14 scenarios considered in today's DEIS appear
15 to be qualified. And, as I have already
16 said, that specifically excludes the
17 current management teams' longstanding
18 vision.

19 Thank you.

20 (Whereupon, an audience member reads
21 in Spanish Mr. Van Eyken's comments.)

22 MS. HAMILTON: Edgard Rivera.

23 (Mr. Rivera reads his comment both in
24 English and Spanish.)

25 MR. RIVERA: "Saludos." I am Edgard

1 Rivera-Valentín. I am a staff scientist at
2 the Arecibo Observatory and a native of
3 Arecibo, Puerto Rico. The following
4 statement is my opinion and does not
5 reflect the views of my employer.

6 The Draft Environmental Impact
7 Statement, as released, suggests that
8 buildings and infrastructure specifically
9 related to planetary radar operations at
10 the Arecibo Observatory will face
11 demolition in NSF's favorite option. At
12 the same time, the mothballing option would
13 suggest that demolition of such buildings
14 is not required, as the option exists to
15 leave them as is.

16 I would like to remind the National
17 Science Foundation of the various
18 congressional and executive policies, acts
19 and mandates related to the national
20 capabilities for planetary defense. For
21 example, the NASA Authorization Act of
22 2008, which specifically calls for funding
23 Arecibo and continue its operations,
24 pending review by the National Research
25 Council, which actually released a

1 statement the following year affirming the
2 vital role Arecibo plays in planetary
3 defense.

4 The Space Act Public Law 11-314 in
5 2010 also specifically affirms the value of
6 planetary radar on Section 71104. The
7 National Space Policy of 2010, and in fact
8 the NSF Act of 1950 Public Law 81-507,
9 which sets forth the NSF mission, requests
10 to secure the national defense. There is
11 sufficient public policy on this.

12 By the NSF choosing to pursue
13 deconstruction of the planetary radar
14 capabilities of Arecibo Observatory rather
15 than considering mothballing at worse, this
16 act of choice by the NSF, which is the
17 steward of Arecibo Observatory, can be
18 construed as the NSF interfering in public
19 policy that mandates the upkeep and
20 operation of the planetary radar and the
21 national abilities to precisely track
22 asteroids.

23 I would strongly suggest the NSF to
24 reconsider its demonstrated plans in the
25 DEIS of deconstructing infrastructure

1 related to the Arecibo Observatory
2 capabilities so that it maintains rather
3 than interferes with public policy that has
4 received historically bipartisan support.

5 Thank you.

6 MS. HAMILTON: Patrick Taylor.

7 MR. TAYLOR: My name is Patrick
8 Taylor. I'm commenting on Section 4.7.1.1,
9 "Operations under Alternative 1," the
10 Agency-preferred Alternative.

11 The proposed destruction of the power
12 supply building would result on the loss of
13 at least 4 million dollars, a potential
14 support from NASA, and would be an absurd
15 action to take as part of a science-focused
16 future for the Observatory.

17 There is a fallacy that because
18 Arecibo only sees 30 percent of the sky
19 that it cannot see the majority of
20 asteroids. Asteroids are moving targets on
21 the sky and can easily move in and out of
22 Arecibo's field of view. In fact, an
23 internal NASA study suggests Arecibo would
24 see approximately 80 percent of potentially
25 hazardous asteroids more than a year before

1 impact.

2 This flawed argument is further used
3 incorrectly to claim that Arecibo is
4 unlikely to see an impact in its field of
5 view. Impacts are dismissed as having a
6 negligible effect on public safety. Yes,
7 impacts are low-probability, high-risk
8 events. Yet the NASA Planetary Defense
9 Coordination Office and the Federal
10 Emergency Management Agency, FEMA,
11 regularly carry up mock-asteroid-impact
12 scenarios to practice disaster response.
13 Similar scenarios involve the Space Mission
14 Planning Advisory Group and the
15 International Warning Network that are both
16 sanctioned by the United Nations.

17 The risk of public safety from an
18 asteroid impact is taken very seriously on
19 an international level. Only imminent
20 impacts are considered, for imminent
21 impacts radar can lengthen the warning time
22 prior to impact and significantly narrow
23 the risk corridor. On the longer term,
24 Arecibo Observatory is especially powerful
25 for constraining possible impacts years or

1 decades in the future, famously seen in the
2 case of asteroid Apophis.

3 Weighing the frequency of impacts
4 against the lifetime of an observatory is
5 completely irrelevant and only serves to
6 obtain the desired result of a negligible
7 effect on the public.

8 Finally, dismissing the threat of an
9 asteroid impact because we lack an
10 available deflection strategy is comparable
11 to choosing to not study an infectious
12 disease because we don't have yet the
13 vaccine. It's incredibly naïve and
14 short-sighted.

15 Thank you.

16 (Whereupon, an audience member reads
17 in Spanish Mr. Taylor's comments.)

18 MS. HAMILTON: Next is Brett Isham.

19 MR. ISHAM: Hello. I'm Brett Isham
20 from Interamerican University. Also, these
21 comments are my own. I wanted to comment
22 on the science justification mentioned in
23 the DEIS.

24 In regard to the 2012 Astronomy
25 Portfolio Review, it called for a science

1 reevaluation as well as a budget
2 reevaluation later in the decade. I do not
3 think a DCL is a new placement for the
4 science reevaluation for the community.
5 Besides the planetary radar -- I hope there
6 would be someone here from NANOGrav. But
7 also, in regard the 2015 AGS Portfolio
8 Review, which is -- I guess the final
9 results aren't in yet. But there were some
10 serious errors. For example, there was a
11 two-time error on the factor of two in the
12 power of the planetary radar to its
13 detriment.

14 Besides the science which speaks to
15 the intellectual merit criteria of NSF,
16 there is another criterion which NSF
17 appears to weigh just as heavily, which is
18 broader impact. I think the broader impact
19 is mostly missing from the DEIS. So what
20 better broader impact than an observatory
21 located in the United States as opposed to
22 one, for example, in the Andes.

23 In the case of Arecibo, 100 thousand
24 visitors come per year to the Visitor
25 Center, including 22 thousand students. I

1 think it might be fair, I could be wrong,
2 that the Visitor Center is the best science
3 museum in Puerto Rico, and 22 thousand
4 students experience that each year. What
5 would be the message to children and people
6 in Puerto Rico if we leave a dish as a
7 monument to science abandoned? The message
8 will be that science has abandoned Puerto
9 Rico, that science is not a valuable tool.

10 So the Arecibo Observatory has other
11 broader impact activities, such as the
12 Saturday Academy, the Space Academy,
13 teacher training, and several things like
14 that. What I would hope or wish for is
15 that rather than new science badly argue
16 for closing the Arecibo Observatory to use
17 it well as an argument for finding
18 solutions. Perhaps even within NSF some
19 sharing of funding could be founded in
20 Physics, which is spending 30 million a
21 year on LIGO to search for gravitational
22 waves, which can also be a project at
23 Arecibo.

24 THE INTERPRETER: I'm sorry. Can you
25 repeat that a little bit more clearly?

1 MR. ISHAM: I would hope that NSF put
2 its efforts in a more positive direction,
3 looking for solutions rather than trying to
4 close the Arecibo Observatory. Perhaps,
5 for example, sharing some funding with
6 Physics, which is paying 30 million a year
7 looking for gravitational waves, which
8 Arecibo also has the possibility to
9 observe.

10 One final comment, Arecibo has the
11 possibility of looking at the lower
12 atmosphere, which has been historically
13 underexploited in part because of the lack
14 of interest of the lower atmosphere vision.
15 But I believe that science is good. That's
16 another thing NSF could potentially look at
17 internally.

18 THE INTERPRETER: That it's not
19 sufficiently explored, and...?

20 MR. ISHAM: Another thing that could
21 possibly be explored within NSF.

22 MS. HAMILTON: Andre Seymour.

23 MR. SEYMOUR: Hello. My name is
24 Andrew Seymour, A-N-D-R-E-W-S-E-Y-M-O-U-R,
25 for the record. We have our own

1 translation. She's right there, so we
2 don't need -- so not to delay things
3 longer.

4 The NSF as it produced this
5 draft -- and I quote from this draft: "To
6 analyze the potential environmental impacts
7 associated with potential funding changes
8 for the Arecibo Observatory." Sections
9 3.1.5, "Threatened and Endangered Species,"
10 and 3.1.6, "Migratory Birds," of this draft
11 use the information for planning and
12 conservation, also known as the IPAC Trust
13 Report, as its sole reference to list the
14 protected species known from Arecibo. Yet
15 the IPAC Trust Report states multiple
16 times, and I quote, "This IPAC Trust Report
17 is for informational purposes only and
18 should not be used for planning or analysis
19 project-level impacts."

20 Since the IPAC Trust Report is not a
21 proper study of the site and states it
22 should not be used to analyze the impact
23 level satisfactorily under Section 7 of the
24 Endangered Species Act, all material based
25 on the IPAC Report should be stricken from

1 the Environmental Impact Statement. Along
2 with all this, sections in the Draft that
3 refer to mitigation on migratory birds and
4 threatened endangered species should be
5 reevaluated.

6 Seeing that no studies to the
7 environmental impact on threatened
8 endangered species and migratory birds have
9 been done for the site, an intensive
10 full-year study should be conducted. This
11 study should include endangered species,
12 migratory birds, seasonal plants, insects,
13 and fungi that are using in the site as a
14 refuge. Regardless, the EIS should only be
15 finalized when appropriate study of the
16 site is concluded.

17 While this is a difficult process, a
18 proper job must be done to ensure we reduce
19 the impact from any of these options and to
20 ensure that this document is correct when
21 referenced in the future.

22 Thank you.

23 MS. HAMILTON: Ryan Lynch.

24 MR. LYNCH: (To the interpreter) It's
25 okay. I'll give you my comments to read

1 when I'm done.

2 THE INTERPRETER: Okay.

3 MR. LYNCH: I'm going to read a
4 portion of my comments today and I'll read
5 a portion of them tomorrow.

6 So my name is Ryan Lynch, R-Y-A-N-L-Y-
7 C-H. I'm a member of the North American
8 Nanohertz Observatory for Gravitational
9 Waves, or NANOGrav.

10 Arecibo is absolutely critical to our
11 efforts to detect low frequency
12 gravitational waves, and we strongly
13 support its continuous science operations.
14 I would like to raise a few points,
15 specifically with regards to the Draft EIS.

16 As it's already been mentioned the
17 Portfolio Review Committee recommended, and
18 I quote, "The AST should reevaluate
19 participation in Arecibo later in the
20 decade, in light of the science
21 opportunities and budget forecasts at the
22 time." The Draft EIS did not directly
23 include a current scientific
24 impact-scenario study. So I ask the Final
25 EIS either include scientific

1 impact-scenario study or that NSF conduct a
2 separate process to address current
3 scientific impact. Otherwise, references
4 in the Portfolio Review and other studies
5 are out of date.

6 Along those lines, the Draft EIS
7 referenced decadal and mid-decadal report
8 has evidenced Arecibo lower scientific
9 priority. But this is not justified by the
10 communities and NSF's decision to award,
11 for example, NANOGrav with a Physics
12 Frontier Center grant totaling 14 and a
13 half million dollars over five years.
14 Also, a multi-messenger astronomy has been
15 highlighted as one of five big ideas to be
16 pursued by NSF foundation-wide over the
17 next several years. Gravitational-waves
18 astronomy is an example of multi-messenger
19 astronomy.

20 The assertion that Arecibo is of lower
21 scientific priority is simply not justified
22 in the current scientific environment. In
23 addition to the Physics Frontier Center
24 grant that I just mentioned -- well, NSF
25 funds the NANOGrav through. NANOGrav also

1 uses 800 hours of open sky in Arecibo,
2 valued at approximately 1.6 million dollars
3 per year. By comparison, the LIGO
4 gravitational waves detector costs
5 1 billion dollars to build and has an
6 operational budget of 30 million dollars
7 per year. The proposed LISA space
8 gravitational waves detector will also be
9 over 1 billion dollars total. I won't say
10 that these are not incredibly worthy and
11 scientifically valuable projects, but
12 NANOGrav can open a unique part of the
13 gravitational waves spectrum for a fraction
14 of this cost.

15 Also, international facilities, most
16 notably the FAST telescope under
17 construction in China, have been cited as
18 potential replacements for the unique
19 capabilities of Arecibo. If FAST operates
20 as planned, it would be a wonderful
21 scientific instrument, and I look forward
22 to that. However, it is very much an open
23 question as to whether FAST will actually
24 achieve these ambitious performance goals,
25 and right now Arecibo remains the most

1 sensitive, single-dish radio telescope in
2 the world and may very well remain so for a
3 foreseeable future.

4 I will read the rest of my comments
5 tomorrow. (To the interpreter) Now I'll
6 pass this up to you.

7 MS. HAMILTON: Gerrit Verschuur.

8 MR. VERSCHUUR: I'm going to read one
9 paragraph. It will be translated by this
10 gentleman [the interpreter], and then I'll
11 read my second paragraph.

12 All the traffic and transportation
13 statements in the DEIS include this rather
14 disingenuous claim: "Minor, adverse,
15 short-term impacts to traffic and
16 transportation would be expected during
17 deconstruction." Only someone who has
18 never driven on the local roads would claim
19 that only minor impacts would be
20 experienced. Having hundreds of
21 debris-laden trucks navigating local roads,
22 for instance taking shortcuts across to
23 Highway 10, will cause enormous damage and
24 pose traffic hazards all day, every day.
25 Will the city of Arecibo be willing to

1 repay this minor damage?

2 This EIS statement is yet another
3 example of why the present draft is
4 ill-considered and needs to be rewritten.
5 The EIS states that in a funding
6 constrained environment NSF needs to
7 maintain a balanced research portfolio with
8 largest scientific return for the taxpayer.
9 The projected shortfall in NSF's budget by
10 2023 is, in a flat budget, around 60
11 million dollars. The net worth savings
12 from divestment of Arecibo it's about 4
13 millions dollars. This is insignificant in
14 terms of the overall budget shortfall. To
15 meet its budget, NSF needs to go back to
16 draw a realistic long-term plan before it
17 does permanent damage to the U.S.
18 scientific infrastructure for virtually no
19 return.

20 MS. HAMILTON: Joan Schmelz.

21 MS. SCHMELZ: My name is Joan Schmelz.
22 I'm the deputy director of Arecibo
23 Observatory and I'm speaking today as the
24 principal investigator of two NASA grants
25 that find one third of the Observatory

1 budget.

2 According to the Space Studies Board
3 of the National Research Council 2010
4 report called "Defending Planet Earth"
5 immediate action is required to ensure the
6 continued operation of the Arecibo
7 Observatory. NASA and the NSF should
8 support a vigorous program of radar
9 observations of near-Earth objects for
10 orbital determination and the
11 characterization of physical properties.

12 The huge variation of the properties
13 of asteroids makes it impossible to develop
14 a comprehensive inventory by sending
15 spacecraft to each potentially dangerous
16 asteroid individually. The cost would be
17 astronomical. For example, the cost of
18 NASA's OSIRIS-REx mission, the first U.S.
19 spacecraft to visit an asteroid and return
20 a sample to Earth, is almost 1 billion
21 dollars. Compare that to the annual budget
22 of the Arecibo Observatory Planetary Radar
23 Program, just 4 million.

24 The Planetary Radar Program at Arecibo
25 Observatory can study orders of magnitude

1 more asteroids at orders magnitude less
2 cost than dedicated spacecraft missions.
3 In fact, NASA has stated that it will not
4 send a mission to an asteroid that had not
5 been studied first with radar.

6 The spacecraft reconnaissance mission
7 makes sense only if NASA knows with near
8 certainty that an asteroid will hit the
9 Earth. Such a mission would be feasible if
10 there was sufficient time to develop,
11 build, and launch a spacecraft that could
12 deflect the asteroid and ensure that it
13 does not collide with Earth. The vital
14 ground-based observation of Arecibo is a
15 small price to pay for the possible
16 preservation of civilization itself.

17 The misinformation in the Draft EIS
18 should be corrected to accurately describe
19 the role of the Planetary Radar Program as
20 a national priority.

21 (Whereupon, an audience member reads
22 in Spanish Ms. Schmelz comments.)

23 MS. HAMILTON: Justine González-Vélez.

24 MS. GONZÁLEZ: My name is Justine
25 González-Vélez. Good evening to all those

1 present right now. I'm a member of the
2 Arecibo Observatory Space Academy.

3 Since I started at the Arecibo
4 Observatory Academy at the age of 16 it
5 provided me with the scientific education
6 and the tools necessary to conduct a
7 successful scientific research. That's the
8 place that saw me take my first steps into
9 scientific research, and it saw me grow as
10 a student and as a person.

11 What I want to say with this is that
12 Puerto Rico does not have many places that
13 can foster scientific research by young
14 people and that can foster the interest of
15 young people in the sciences and research.
16 If the youth of Puerto Rico has these tools
17 that the Arecibo Observatory provides for
18 free, with no cost, we should take
19 advantage of it.

20 We are all gathered here with one
21 purpose and that purpose is to discuss
22 issues related to science. The future
23 generation is just coming up, and that's
24 the reason why we are here in support of
25 the Arecibo Academy and of the Arecibo

1 Observatory. And the analogy that I want
2 to make is that if I'm a bread-maker and I
3 don't have any flour, what am I going to
4 make the bread with? By the same token, if
5 I do not have the tools necessary for
6 continuing science research and I don't
7 have within my reach those things that are
8 necessary for my to continue studying
9 sciences, how am I going to have a future
10 as a professional in the sciences?

11 Therefore, we should highlight the
12 wonderful characteristics of the Arecibo
13 Observatory and prioritize those programs
14 that interest youth in the field of
15 sciences. With this, I want to wish a long
16 life to the Arecibo Observatory so that it
17 can create the future leaders that will
18 follow the path of the sciences, the arts,
19 math, and all other related fields.

20 Thank you.

21 MS. HAMILTON: Just as an update, we
22 have 10 more speakers who asked to speak,
23 and it is a little after 8:20. So I'm
24 trying to get you all in.

25 Kristen Jones.

1 MS. JONES: My name is Kristen Jones,
2 K-R-I-S-T-E-N-J-O-N-E-S. I had a speech
3 for you, but we don't have time for that,
4 so I'm just going to talk what's on my
5 mind, my personal opinion.

6 Let's talk about broader impacts. In
7 the NSF issue statement, one of the
8 priority goals that it has is -- let me
9 read: "Improve the nation's capacity in
10 data science by investing in the
11 development of human capital and
12 infrastructure."

13 In choosing the content of this goal,
14 the acknowledgement of the success of the
15 NSF and the success of science and
16 technology depends on fostering and
17 mentoring minority groups, such as people
18 of color and women in the field of science,
19 acknowledging that they are untapped but
20 expanding portion of the country's
21 potential intellectual capital. This is
22 represented throughout NSF as a concept of
23 broader impacts.

24 My concern with Draft Environmental
25 Impact Statement is that broader impacts do

1 not appear to be addressed at all. If they
2 had been addressed, the deliberate
3 connections between Arecibo Observatory and
4 minority students such as the one who just
5 spoke, sorry I didn't catch your name,
6 would have become apparent. Arecibo
7 Observatory hosts one of the longest
8 running REU programs, reaching over 400 REU
9 students who are minorities, often
10 minorities and women of science. It has
11 the AOSA Program, and I could go on and
12 list.

13 So my concern is that the DEIS does
14 not address the broader impact and how
15 Arecibo Observatory reaches out to minority
16 groups, such as students of color and
17 women, in the science field. More than
18 that, it sort of completely ignores the
19 injustice and perpetuates the problems of
20 both sexism and racism in the field in the
21 manner in which it assesses the Observatory
22 as -- um. What is the exact phrase? Of
23 lower scientific impact.

24 There are numerous references about
25 how assessing institutions that are

1 primarily minority-serving and
2 predominantly helpful towards women are
3 grounded in implicit bias. I recommend
4 Harvard's project Implicit, for example.

5 At the very least, this broader impact
6 of Arecibo on minorities and women in
7 science needs to be studied and included in
8 the EIS. This is a broader environment
9 rather than the more specific local
10 environments we've talked about. Not
11 addressing these concerns is not the act of
12 remaining neutral. Either you are fighting
13 injustice, trying to take steps to address
14 your bias, or through inaction you are
15 condoning and supporting that bias, thus
16 allowing it to continue.

17 MS. HAMILTON: Robert Minchin.

18 MR. MINCHIN: I'm Robert Minchin,
19 group lead for Radio Astronomy, speaking
20 here on a personal capacity.

21 I have read through this document and
22 it is my personal opinion it is a tapestry
23 of obfuscation, omissions, and outright
24 lies. Let me illustrate.

25 The NSF's preferred option,

1 Alternative 1, involves the demolition of
2 the Administration Building as obsolete.
3 The fact that this is the house of the
4 scientific staff is not mentioned. But we
5 must assume that this option, therefore,
6 means running the Observatory without any
7 scientific staff. This would limit the
8 available options for partners and make
9 this alternative, at least in this form,
10 nonviable.

11 Just last week, I was working with
12 some of our most experienced observers, the
13 ALFALFA Team from Cornell University,
14 troubleshooting problems with their
15 observations. It cannot be over emphasized
16 that without an onsite radio astronomy
17 staff working closely with the technical
18 staff you do not have a radio astronomy
19 program. But that is not all the
20 scientific staff do.

21 As I pointed out in the last meeting,
22 and which was apparently completely
23 ignored, the Observatory would be in the
24 top 10 universities in the U.S. by the
25 number of Hispanic physics undergraduates

1 it educates on our intern program. We also
2 run a space academy for local high school
3 students. We are working with professors
4 at Puerto Rican universities to establish
5 astronomy and space science programs, and
6 we run a biannual radio astronomy school
7 for graduate students. All of this
8 schooling to PhD pipeline relies on the
9 Observatory scientific staff, a fact the
10 Draft omits to mention.

11 Removal of the scientific staff would
12 massively set back efforts to bring Puerto
13 Ricans into astronomy and space sciences
14 and send messages to Hispanics and other
15 minorities that the NSF doesn't care. Yet
16 the Draft report makes the claim that there
17 would be no disproportionate impact on low
18 income or minority populations. That is an
19 outright lie.

20 MS. HAMILTON: Anne Virkki.

21 MS. VIRKKI: I actually had multiple
22 comments, but I'm going just with the
23 shortest one to save you all -- I have my
24 own translator.

25 I understood that the Alternative 1

1 includes all potential collaboration plans.
2 How can the reader know which impacts
3 belong to which plan? If this is the
4 recommended option, it should be also the
5 most accurately defined. Now, it's the
6 most ambiguous one.

7 In spite of the choice of the
8 collaboration plan, this will change the
9 Final Environmental Impact Statement from
10 the draft version drastically and, as such,
11 will not give the public the possibility to
12 comment on all aspects.

13 As stated in the NSF website, as a
14 public agency, NSF is responsible for
15 building and sustaining the public trust
16 through the transparency of our processes
17 and accountability of our organization.

18 MS. HAMILTON: Topasi Ghosh.

19 MS. GHOSH: Hello. My name is Topasi
20 Ghosh. I'm a scientist at the Arecibo
21 Observatory. But what I'm going to say is
22 my own opinion, and I have my own
23 translation, too. Thank you.

24 In the listed options presented by the
25 NSF at the June EIS scoping meeting,

1 reference to the demolishing of any
2 structure was included only in the last
3 option of deconstruction and site
4 restoration. However, the DEIS, as many of
5 us here have pointed out, now considers
6 various lists of entities to be destroyed,
7 even for the favored option number one,
8 "Collaboration with Interested Parties for
9 Continued Science-focused Operations."

10 I argue that with the addition of the
11 demolition of 26 vital working areas the
12 favored option is internally inconsistent
13 with it. It is presupposed a mode of
14 operation which might make collaboration
15 with interested parties limited and, hence,
16 makes the goal of the very option itself
17 difficult to achieve.

18 I also argue that the general public
19 was denied of any opportunity to provide
20 any feedback on the scientific, social, and
21 commercial impact of the stated Alternative
22 1 with partial removal of infrastructure.
23 Any comments raised now should be included
24 in a second draft and should be brought to
25 public for further comments before

1 finalizing the report.

2 Thank you.

3 (Whereupon, Ms. Ghosh reads her
4 comments in Spanish.)

5 MS. HAMILTON: Chris Salter.

6 MR. SALTER: My name is Chris Salter.

7 I'm a scientist for the Arecibo
8 Observatory. But this is a personal
9 statement; and it's a statement involving
10 the cultural environment of what the
11 Observatory represents, not only for the
12 whole of the U.S.A. but especially for its
13 impact in the local community of Puerto
14 Rico.

15 I thought tonight I'd illustrate this
16 for a field marked out of its importance by
17 the 2010 Decadal Report, mainly time domain
18 astronomy.

19 Recently, Arecibo Observatory has
20 discovered a unique source of repeating
21 radio bursts, studied their properties, and
22 is key to determining the position of the
23 source in the sky of the order of thousands
24 of a second of arc; and a second of the
25 second of arc, let me make clear, is a

1 quarter observed from Washington. As held
2 up in Europe, it's tiny.

3 We now know that this mystery source,
4 and it stays a mystery, is some three
5 billion light years away from us. It's
6 situated not in our Milky Way Galaxy but in
7 a very, very distant galaxy indeed.

8 Given this sort of discovery, is it
9 any surprise that the Observatory is a
10 unique source of pride to our local
11 community and an inspiration to our young
12 people to study and make their own
13 researches in STEM fields, where Puerto
14 Rico has been so sadly underrepresented
15 over the years? I think this aspect does
16 not come through in the Draft Environmental
17 Study.

18 Thank you.

19 MS. BLANCO: Folks, I think we have
20 five more speakers. It's almost 9:00, and
21 the folks we are renting this room from
22 will be here at 9:00. So please keep your
23 comments to three minutes. And if you have
24 your own translation, please state so at
25 the very beginning. If not, let's do one

1 sentence and then one sentence, so we don't
2 lose more time.

3 Thank you.

4 MS. HAMILTON: Luisa Zambrano.

5 MS. ZAMBRANO: My name is Luisa
6 Fernanda Zambrano-Marín, and these are my
7 own expressions and not my employer.

8 Have you read the document, Ralph?
9 Carol?

10 MS. BLANCO: Yes.

11 MS. ZAMBRANO: Okay.

12 You know Arecibo. You receive annual
13 reports of our work. You publish; you
14 know. How can you publish a document that
15 states "Minor or negligible impact to
16 public safety by ceasing operations of the
17 Radar Program"? Your office knows the
18 system's capabilities and its annual
19 asteroids detections.

20 Arecibo has participated in multiple
21 asteroid and comet missions, such as Dawn
22 Mission, NEAR-Shoemaker, EPOXI, JAXA,
23 Hayabusa, and the recently launched
24 OSIRIS-REx Mission, and helped recover the
25 SOHO satellite. It will also help future

1 deflection missions, including the ESA NASA
2 Asteroid Impact and Deflection Assessment
3 AIDA and the Asteroid Retrieval Mission.

4 Arcibo currently provides support to
5 the Lunar Reconnaissance Orbiter and
6 supports tracking of the commissioned lunar
7 satellites. The company hired to do the
8 Environmental Impact Statement should look
9 at the value implications of space
10 missions, support, and participation.

11 (Whereupon, Ms. Zambrano reads in
12 Spanish her comments.)

13 MS. HAMILTON: Ramón Lugo.

14 MR. LUGO: I'm going to submit mine in
15 written.

16 MS. HAMILTON: Okay. Thank you.

17 Jesús Lautenbach. My apologies, Jens
18 Lautenbach. Is he not here anymore?

19 We will move on to Wilbert Rupert.

20 MR. RUPERT: (To the interpreter) You
21 can translate after I finish.

22 THE INTERPRETER: I'm sorry. I will,
23 or I won't?

24 MR. RUPERT: You will.

25 THE INTERPRETER: Okay. So you have

1 it written. Okay. Go ahead.

2 MR. RUPERT: Good afternoon. My name
3 is Wilbert Rupert and today I came here to
4 present my views on the Arecibo Observatory
5 situation.

6 I am part of the Observatory's
7 Pre-college Research Academy known as AOSA.
8 We the alumni of the Academy have been
9 following this process since back to its
10 beginnings in May. We are concerned about
11 what impacts the outcomes could have on the
12 continuation of AOSA.

13 Even though AOSA is funded by the NASA
14 SERVIR Program and thus is not affected by
15 budget cuts of the NSF, it will truly be
16 affected by the deconstruction of certain
17 parts of the site which are used by the
18 students as part of their research.
19 Students use the real telescope itself and
20 even the soil and water of the flora of the
21 site in order to study it.

22 Where else could high school students
23 in Puerto Rico be mentored by specialized
24 scientist at one of Earth's most important
25 scientific facilities? It's true. You may

1 think that there are other research
2 programs in this island, but none offer the
3 technology and instruments we have in
4 Arecibo.

5 Now, considering the five alternatives
6 that the NSF has developed and published, I
7 can partially agree with them that
8 Alternative 1 should be the one to take
9 since it seems to affect less the
10 continuation of operations of the whole
11 site. However, and in accordance to what
12 I've said before, I have my reservations as
13 to the deconstruction of buildings that are
14 used for researched and other scientific
15 and technological endeavors.

16 I understand that a few might be
17 obsolete and should be acknowledged in
18 order to cut expenses and such. But let's
19 consider other options. Since these are
20 scattered around the Observatory's ground,
21 why not think of relocating all possible
22 offices of operations to centralized areas,
23 giving feasible conditions and resources.
24 This way you will be taking out a minimum
25 of the capacity and would also be saving

1 the work of dozens of employees whose
2 families depend on them.

3 I urge you to ponder upon all the
4 alternatives and ideas exposed today and to
5 be incisive in looking for partnerships
6 with other interest parties. It is
7 important to remember how essential the
8 Arecibo Observatory is to us as students,
9 to scientists, to workers, to young
10 children inspired by space and the
11 magnitude of the Observatory when they
12 visit the Visitor Center, to tourism,
13 economy, and to the cultural identity of
14 Puerto Rico. Most importantly it is
15 important to the advancement of the STEM
16 fields and our scientific knowledge and to
17 the safeguarding of our planet from the
18 asteroids and other celestial threats.

19 Thanks.

20 MS. HAMILTON: The final speaker for
21 this evening is Pablo Llarandi.

22 MR. LLARANDI: Good evening. I will
23 translate the introduction and then I will
24 ask the gentleman [the interpreter] to help
25 me with the rest.

1 Hello, everybody. My name is
2 Dr. Pablo Llarandi-Román. I am a professor
3 at the Department of Physical Sciences of
4 the University of Puerto Rico in Río
5 Piedras and a geologist. More importantly,
6 for me, I'm an Arecibeño; I'm from Arecibo.

7 I'll begin by saying that my main
8 purpose in speaking here tonight is related
9 to what the fellow who spoke before me
10 mentioned before. I'm a scientist in part
11 because the Arecibo Observatory is in my
12 town.

13 When I was a child I had the
14 opportunity to visit the Observatory on
15 multiple occasions. In my family I have an
16 uncle who was an attorney and who worked at
17 the Observatory, and that was my door of
18 entry into the Control Room. So you can
19 imagine a little kid, like me, interested
20 in everything having to do with sciences
21 and with the space listen for the first
22 time to a true-life scientist explaining
23 everything having to do with scientific
24 research.

25 So I urge the NSF to take into account

1 all of the aspects of the broader impact
2 that this has on scientific education in
3 Puerto Rico, for kids in Puerto Rico and
4 for any person interested in learning about
5 science, and also to take into account the
6 role that the Arecibo Observatory has
7 played in such a manner that has sparked
8 our interest in maintaining this facility
9 for posterity.

10 I only have a couple of more
11 commentaries and I will soon close.

12 The National Science Foundation talks
13 about national priority of closing
14 operations gradually at the Observatory.
15 But I strongly urge you to take into
16 consideration the Puerto Rican priority of
17 maintaining such a facility for the
18 interest of Puerto Rico and for the
19 international community that visits it.

20 Are there any representatives from the
21 municipality of Arecibo? Anybody? Or from
22 the Government of Puerto Rico? I would
23 like for you to consider contributing to
24 these alliances, either with funds or
25 otherwise, to the continuation of the

1 Arecibo Observatory because this is ours
2 and we cannot let it go.

3 MS. HAMILTON: We do have one more
4 comment. Can you please state your name?

5 MS. PANTOJAS: My name is Dr. Carmen
6 Pantojas. I am a professor of Physics at
7 the University of Puerto Rico and I want to
8 comment on the Alternative 1.

9 It says that NSF will reduce its
10 funding, and under Alternative 1 the future
11 stakeholders are responsible for
12 maintenance and upgrades. But that
13 alternative is not clear. What is the
14 amount that NSF will provide and for how
15 long? It is not clear in that alternative
16 either for those stakeholders -- are they
17 responsible for future deconstruction and
18 site restoration under Alternative 1? And
19 if so, it needs to address specifically how
20 much would that deconstruction and site
21 restoration cost in 2016.

22 In regard to Alternative 2, which is
23 the education alternative, it mentions
24 entities interested, or the Government of
25 Puerto Rico, or entities in Puerto Rico.

1 But what are those entities that is
2 considering, other than the Government of
3 Puerto Rico, to take the facility for
4 education and have the Observatory but
5 without the telescope? That is another
6 comment for that alternative.

7 The third, Arecibo Observatory is a
8 historic property that is included in the
9 National Register of Historic Places.
10 There is no way to minimize or avoid or
11 mitigate the adverse effects of
12 deconstruction of a historical site of
13 worldwide recognition and importance. The
14 U.S. would lose an important historical
15 place and the world will lose a historical
16 place. That needs to be addressed.

17 The other thing, the Observatory, its
18 purpose is the future generations. The
19 purpose of the NSF is the future
20 generations. This draft does not address
21 clearly how many graduate students in
22 astrophysics -- because that is the pull
23 from which we will have the future
24 scientists: the graduate students. From
25 there we'll have the pull for the future.

1 How many graduate students use Arecibo
2 versus the future instruments that are so
3 expensive that we are replacing -- because
4 if we close all the radio observatories,
5 where are the U.S. graduate students going
6 to train?

7 Arecibo will never be a small
8 telescope. It is a place for graduate
9 students to study, to train to be
10 radio-astronomers. If we close all the
11 radio telescopes, those sophisticated
12 instruments will be oversubscribed, and
13 that is not addressed either. How the
14 oversubscription will affect the graduate
15 students that come from smaller
16 universities? How will they train? Only
17 the big institutions will be able to easily
18 get access to the big facilities. So that
19 needs also to be addressed.

20 And the other point is the minorities.
21 How many minority-graduate students are
22 using Arecibo to train, and how that will
23 be affected adversely? I am a professor of
24 physics at the Department of Physics at the
25 UPR. I am the only woman in the Department

1 of Physics and I did my graduate studies at
2 the Arecibo Observatory. So I know this
3 would have an adverse effect.

4 Thank you.

5 (Whereupon, the interpreter and the
6 court reporter try to set the digital
7 recorder in order to listen to a
8 portion of the audio.)

9 MS. BLANCO: We are working on the
10 translation.

11 THE INTERPRETER: She ad-libbed most
12 of it so that's what I'm --

13 MS. PANTOJA: I can translate.

14 THE INTERPRETER: (To Ms. Blanco) I
15 mean, it's for your record. But if you
16 want it for the record, what she said, then
17 I'll have to go back, listen to the
18 recording, and I'll do it simultaneously.

19 MS. BLANCO: While we're waiting for
20 the translation, I would like to remind
21 everybody that they can still submit
22 written comments by email or by regular
23 mail through December 12.

24 We will also be having another public
25 meeting tomorrow morning from 10:00 to

1 12:00, at the Doubletree Hotel, in San
2 Juan. And as a reminder, it's open to the
3 public. The Section 106 meeting is
4 scheduled from 1:00 to 2:30, also at the
5 Doubletree Hotel tomorrow.

6 The next step after this will be
7 issuance of the Final Environmental Impact
8 Statement that will reflect the comments
9 that we've obtained during this
10 45-day-public comment period. That will
11 happen later in the spring of 2014.

12 And now for the translation.

13 THE INTERPRETER: It was not possible.

14 MS. BLANCO: Not possible. Okay.

15 (To Ms. Pantojas) Could you, please,
16 as best as possible --

17 (Whereupon, Ms. Pantojas translates
18 her comments to Spanish.)

19 MS. BLANCO: Thank you for sharing
20 that, and thank you all for providing your
21 comments. You can provide them by written.

22 We are going to end the official
23 meeting now. If you have comments, please
24 submit them by email or writing, or you can
25 come to the meeting tomorrow between 10:00

1 to 12:00, in San Juan.

2 Thank you.

3 (Whereupon, the public meeting
4 concludes at 9:25 p.m.)

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REPORTER'S CERTIFICATE

I, ALEJANDRA DOMÍNGUEZ MENÉNDEZ, E.R.

Reporter, do hereby certify that the following transcript is a full, true record transcribed by me.

I further certify that I am not interested in the outcome of the case named in said caption.

ALEJANDRA DOMÍNGUEZ MENÉNDEZ

PUBLIC MEETING ON THE DRAFT
ENVIRONMENTAL IMPACT STATEMENT
IN SAN JUAN, PUERTO RICO

held on Thursday, November 17, 2016, at the Doubletree
Hotel, 105 De Diego Avenue, San Juan, Puerto Rico,
00914, beginning at 10:15 a.m.

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IN SAN JUAN, PUERTO RICO
THURSDAY 17, 2016
PROCEEDINGS

MR. GAUME: Please, take your seats,
and we'll get started here.

Good morning. Thank you for coming to
our public meeting on the Arecibo Draft
Environmental Impact Statement. If you are
at the wrong meeting, now it's your time to
head to the exit.

So this is what we are planning to do
today. First, I'll introduce the team
members. We'll talk about the materials
and the transcript of this proceeding.
We'll talk about the purpose of the
meeting. We'll talk about the Draft
Environmental Impact Statement and
summarize that. Then it will be your turn
to provide public comments. If you haven't
already -- if you would like to speak and
haven't already signed up, please sign up.

First, the introductions. My name is
Ralph Gaume and I'm the Arecibo Observatory
Program Director for NSF. This is Caroline

1 Blanco. She's our Assistant General
2 Counsel for NSF. In a few minutes, when
3 I'm done with my portion of the
4 presentation, Kristen Hamilton will be
5 talking. She is the Environmental
6 Compliance officer for the National Science
7 Foundation. Also from the NSF we have
8 Karen Pearce, who is our senior Legislative
9 Affairs specialist; also, Ivy Kupec, our
10 Public Affairs specialist.

11 NSF has worked with CH2M Hill, who is
12 providing contractor support to us in
13 preparation of the DEIS. From CH2M Hill we
14 have Lori Price, who is our Cultural
15 Resources lead. Over here we have Richard
16 Reaves, who is our Ecology and National
17 Environmental Policy Act lead.

18 The materials we have for today are
19 the fact sheets and the information boards
20 which we have here. Feel free to take this
21 fact sheets home with you. I think we want
22 to somehow fit the information boards on an
23 airplane. This presentation and electronic
24 versions of the fact sheets and information
25 boards will be soon posted at this website

1 (showing in the slide).

2 So the purpose of this meeting is that
3 a Draft Environmental Impact Statement has
4 been prepared by the National Science
5 Foundation to evaluate potential
6 environmental impacts of the proposed
7 operational changes to the Arecibo
8 Observatory due to funding constraints.

9 The Notice of Availability, NOA, for the
10 Draft EIS has been published in the federal
11 register, emailed to our entire stakeholder
12 list, and posted on our website on October
13 28. And the purpose of this meeting is to
14 allow for public comments on the Draft EIS,
15 which will help inform the Final EIS.

16 It would be helpful for your comments
17 to be as specific as possible. We, of
18 course, welcome any comments on the Draft
19 EIS. A Section 106 consultation meeting
20 will be held immediately after this. We're
21 changing rooms. We will be changing rooms.
22 It's here, from 1:00 to 2:30, in the hotel,
23 but in a different room.

24 So the purpose of this proposed action
25 is to substantially reduce NSF's

1 contribution to the funding of Arecibo
2 Observatory. The need for the proposed
3 action is that NSF needs to maintain a
4 balanced research portfolio with the
5 largest scientific return for the taxpayer
6 dollar. The scientific community, through
7 reviews and surveys, has indicated that the
8 scientific capability of Arecibo
9 Observatory is lower in priority than other
10 scientific capabilities at NSF funds.

11 Please, see the Executive Summary of
12 the DEIS, Section 1 of the Draft EIS, for a
13 full background and explanation of why NSF
14 is proposing these changes. For the next
15 few slides, I wanted to review what the
16 scientific community is telling us.

17 In 2012 the National Science
18 Foundation, the Division of Astronomical
19 Sciences Portfolio Review Committee was
20 formed as a subcommittee of the Advisory
21 Committee of the National Science
22 Foundation director of Mathematical and
23 Physical Sciences. The Portfolio Review
24 Committee was subject to regulations
25 pertaining to the Federal Advisory

1 Committee Act.

2 What that committee said was that AST
3 should reevaluate its participation in
4 Arecibo and SOAR later in the decade, in
5 light of the science opportunities and
6 budget forecasts at that time. If funding
7 remains tight later in the decade, then,
8 the scientific need for continued AST
9 funding for Arecibo and SOAR must be
10 weighed against the needs of the grants
11 program.

12 This reevaluation of Arecibo began
13 with a Dear Colleague Letter that NSF
14 published on October 2015, which requested
15 viable concepts for the future of Arecibo
16 Observatory, specifically including
17 strategies and goals for continued
18 operations that involve a substantially
19 reduced funding commitment from NSF. In
20 addition, in 2015, the NSF Division of
21 Atmospheric and Geospace Sciences performed
22 a portfolio review as a subcommittee of the
23 Advisory Committee of the NSF Directorate
24 for Geosciences.

25 Like the Astronomical Sciences

1 Portfolio Review Committee, the Atmospheric
2 and Geospace Sciences Portfolio Review
3 Committee was subject to regulations
4 pertaining to the Federal Advisory
5 Committee Act. This Portfolio Review
6 Committee recommended the reduction of
7 atmospheric and geospace sciences annual
8 funding for Arecibo from 4.1 million per
9 year, in 2016, to 1.1 million per year by
10 2020. The Atmospheric and Geospace
11 Sciences Portfolio Review was accepted by
12 the Geosciences Directorate Advisory
13 Committee, in April 2016, and is currently
14 being assessed by the National Academies
15 Committee. At this time NSF has made no
16 determination to act upon this
17 recommendation.

18 Every 10 years the National Academies
19 has undertaken a decadal survey which
20 recommends scientific important projects
21 that NSF, NASA, and the Department of
22 Energy should undertake in the next decade.
23 The last astronomy decadal survey was
24 published in 2010 and was called "New
25 Worlds, New Horizons in Astronomy and

1 Astrophysics." Recently, the National
2 Academies formed a committee to review
3 progress toward the decadal survey vision.
4 Last August, this committee reported that
5 the NSF should proceed with divestment from
6 ground-based facilities that have a lower
7 scientific impact, implementing the
8 recommendations of the NSF Portfolio
9 Review, which is essential to sustaining
10 the scientific vitality of the U.S.
11 Ground-based Astronomy Program as new
12 facilities come into operation.

13 The final scientific committee report
14 which I will mention today is the Astronomy
15 and Astrophysics Advisory Committee, which
16 is a committee formed by Congress in 2002.
17 It reviews NSF, NASA, and the Department of
18 Energy, Astronomy and Astrophysics Program.
19 Annually the Astronomy and Astrophysics
20 Advisory Committee sends reports on NSF,
21 NASA, and Department of Energy, Astronomy
22 and Astrophysics Program to several
23 congressional science-related committees,
24 both in the House of Representatives and
25 the Senate.

1 This year the Committee reported,
2 "Strong efforts by NSF for facility
3 divestment should continue as fast as is
4 practical. Efforts to explore
5 partnerships, interagency cooperation, and
6 private resources to maintain some access
7 to facilities for the U.S. community that
8 may mitigate the loss of open access should
9 continue. Transferring the cost of
10 operating a facility outside of the NSF
11 budget is preferable to complete loss of a
12 capability from the suite of capabilities
13 used by U.S. researchers."

14 I should have mentioned earlier that,
15 in addition, NASA is serving as a
16 cooperating agency for this Environmental
17 Impact Statement.

18 With regards to Arecibo, NASA is the
19 federal government agency that has the
20 responsibility and the funding for
21 detecting and tracking asteroids. As I
22 mentioned, they are a cooperating agency in
23 this EIS. But the responsibility for
24 asteroids falls to NASA, not the National
25 Science Foundation.

1 So let's take a look at the
2 alternatives. The first alternative is the
3 collaboration with interested parties for
4 continued science-focused operations. As
5 we presented during the scoping meeting,
6 all six of these alternatives were
7 identified in that they could meet the
8 purpose of substantially reduce NSF
9 funding.

10 The second alternative is the
11 collaboration with interested parties for
12 transition to education-focused operations.

13 Number three is the mothballing of
14 facilities. And please note that
15 "mothballing" means "suspension of
16 operations in a manner such that operations
17 could resume efficiently at a future date."

18 Alternative 4 is a partial
19 deconstruction and site restoration. And
20 please note that Alternative 4 involves
21 deconstruction of all above-grade
22 structures, except for the large concrete
23 structures; that is the towers, tower and
24 catwalk anchors, and rim wall
25 infrastructure. In Alternative 4 all

1 below-grade foundations would be stabilized
2 and filled in.

3 NSF's preferred alternative, as
4 identified in the Draft EIS, is
5 Alternative 1. This alternative would meet
6 the purpose and need of reducing the
7 funding required for NSF while allowing
8 continued benefits to the scientific and
9 educational communities. However,
10 Alternative 1 can only be implemented if
11 new stakeholders come forward to
12 participate as collaborating parties with
13 viable proposed plans to provide additional
14 non-NSF funding in support of their
15 science-focused operations.

16 Finally, in my last chart -- let me
17 mention a little bit about Alternative 1.
18 Note that for each proposed alternative,
19 including Alternative 1, NSF has identified
20 which buildings and infrastructure would be
21 retained, deconstructed, mothballed, or
22 safe abandoned. This level of detail is
23 absolutely necessary for ensuring that the
24 environmental impact analysis adequately
25 addresses each proposed alternative. Now,

1 you might ask how these listed
2 buildings -- how was the list of buildings
3 selected.

4 In October 2015, NSF issued a Dear
5 Colleague Letter requesting viable concepts
6 for future continued operations of Arecibo
7 Observatory. In part, NSF utilized the
8 responses that were received to inform and
9 determined which buildings and
10 infrastructure would be included for study
11 in the EIS. The Dear Colleague Letter did
12 not limit the responders or direct the
13 responders to a specific solution.
14 Instead, it allowed the responders to
15 propose innovative and operational models
16 that may require a subset of the existing
17 buildings and infrastructure.

18 It is possible that a subset of the
19 buildings and infrastructure identified
20 currently under proposed Alternatives 1 and
21 2 could be retained, deconstructed,
22 mothballed, or safe abandoned as the EIS
23 process moves forward.

24 Now I turn this over to Kristen
25 Hamilton. I think Kristen has a couple of

1 more words on this slide that she wanted to
2 say.

3 MS. HAMILTON: Thank you, Ralph. Good
4 morning. Again, I'm Kristen Hamilton. I
5 will be walking through the environmental
6 review process today.

7 As for what Ralph was just saying, I
8 just want to reemphasize that the number of
9 buildings identified for deconstruction,
10 for example in Alternatives 1 and 2, are
11 the most inclusive scenario. But a smaller
12 subset may or may not be selected.

13 This slide provides information on the
14 scoping process that occurred last spring.
15 Meeting materials are available on our
16 website and the transcript from those
17 meetings is attached to the DEIS as an
18 appendix. Over 80 attendees participated
19 in the two scoping meetings and 240
20 comments were submitted to NSF. The
21 comments are addressed in Section 5 of
22 DEIS.

23 The Draft Environmental Impact
24 Statement contains an executive summary
25 which provides a concise overview of the

1 DEIS. So it's only 26 pages, but we really
2 tried to make it capture all of the main
3 findings of the document. It's provided on
4 our website in both English and Spanish.

5 The Purpose and Needs Section provides
6 the rationale for NSF's proposed action.
7 The next section provides a full
8 description of each of the proposed
9 alternatives. The Affected Environment
10 Section provides an overview of the
11 existing physical, biological, economic,
12 and social conditions at Arecibo
13 Observatory. The Environmental
14 Consequences Section provides an evaluation
15 of the potential environmental impacts of
16 the proposed action under the five
17 alternatives. And the no action
18 alternative.

19 The impacts of each alternative's
20 implementation and operations phase are
21 assessed. In addition, mitigation measures
22 to reduce the duration, intensity, or scale
23 of the impacts are identified. And lastly,
24 the final sections of the DEIS provide
25 information on the process thus far and a

1 summary of the consultation that has
2 occurred that informed the DEIS.

3 So let's talk about impacts. Impacts
4 can include ecological, aesthetic,
5 historic, cultural, economic, social, or
6 health, and can be beneficial or adverse.
7 Wherever possible in the Draft EIS, the
8 type, duration, intensity, and scale for
9 any potential impact are identified.

10 This slide lists the resource areas
11 that we evaluated in the Draft
12 Environmental Impact Statement. I'll let
13 you read them, but you can see they cover a
14 diverse range of aspects of the
15 environment.

16 The DEIS and full appendixes, as well
17 as the Executive Summary in both languages,
18 may be found at our website and hardcopies
19 have been provided to these two libraries
20 as well (showing in the slide). We also
21 have a hardcopy right there on that table,
22 if anybody wants to look through it after
23 the meeting.

24 There are several ways to provide
25 comments on the EIS. Verbal comments can

1 be provided today at this meeting, and note
2 that all comments are being fully
3 transcribed today. Written comments,
4 either emailed or mailed, will be accepted
5 through December 12, 2016. The email
6 address and mailing address are up here
7 (showing in the slide). We can put this
8 information back up at the end.

9 I want to talk now about target dates.
10 We conducted our public scoping last May,
11 which, as I said, included a 30-day-comment
12 period. We considered those comments and
13 developed the Draft Environmental Impact
14 Statement, which was published on October
15 28. We are currently in the middle of a
16 45-day-comment period on that DEIS. We
17 will again be closely considering those
18 comments and revising the -- or preparing
19 the Final Environmental Impact Statement.
20 And we are targeting spring, hopefully May
21 of 2017 for that. There will be at least a
22 30-day-period after that, prior to making a
23 final agency decision, which we'll be
24 targeted for summer of 2017.

25 I also want to mention that our

1 compliance with two other acts, the
2 National Historic Preservation Act and the
3 Endangered Species Act, are going on in
4 parallel to the DEIS process and they are
5 also informing that process. So the same
6 information appears on both processes. And
7 we do have a meeting for Section 106 of the
8 National Historic Preservation Act, after
9 this meeting, in the same hotel, in a
10 different room, at 1:00. That is open to
11 anyone who wants to attend.

12 The Record of Decisions states the
13 Agency's chosen path, identifying all
14 alternatives considered and discussing
15 preferences based on relevant factors,
16 including science priorities, feasibility,
17 environmental considerations and
18 mitigations, and budget factors.

19 Before we turn to your comments, I
20 just want to remind you that comments can
21 be emailed, mailed, or written here and
22 left with us today. Again, we are
23 accepting comments through December 12.

24 As we enter the "your comment" phase
25 of the meeting, please remember to state

1 your name for our transcriber. We also ask
2 that you direct your comments to the
3 contents of the Draft Environmental Impact
4 Statement so that we can better hear you.
5 NSF will not address comments at this time.
6 We will be addressing those comments in the
7 Final Environmental Impact Statement.

8 We were just discussing the number of
9 people who signed up to speak. It looks
10 like we have about 11, and we have about an
11 hour. So if you can try to keep your
12 comments to five minutes or so -- five
13 minutes, trying to include the translation
14 portion. We hate to do it, but...

15 We can begin with Francisco Córdoba.

16 MR. CÓRDOBA: Thank you.

17 My name is Francisco Córdoba. I won't
18 need translation. I'll be able to say my
19 speech in English and then in Spanish. So
20 no worries.

21 THE INTERPRETER: Okay.

22 MR. CÓRDOVA: My name is Francisco
23 Córdoba. I'm the director of the Arecibo
24 Observatory and a member of SRI
25 International. This statement reflects the

1 views of SRI International and the Arecibo
2 Observatory management team, composed of
3 SRI International, University Space
4 Research Association and Universidad
5 Metropolitana.

6 The Arecibo Observatory has been a
7 critical scientific site for over 53 years,
8 performing cutting-edge research in the
9 areas of radio astronomy, space and
10 atmospheric sciences, and planetary
11 sciences. It currently plays a vital role
12 in the study of potentially hazardous
13 asteroids, studying space weather and
14 enabling discoveries that help humanity
15 better understand the Universe. It is also
16 a key facility for science, technology,
17 engineering, and mathematics education,
18 hosting over 90 thousand visitors every
19 year, the majority of which are minority
20 students local to Puerto Rico.

21 It has been clearly communicated by
22 NSF that severe internal financial pressure
23 is driving the Agency to reduce funding for
24 various large facilities, Arecibo being one
25 of them. While we may disagree on the need

1 to divest in Arecibo based on the
2 uniqueness of the site and the remarkable
3 scientific and educational accomplishments,
4 we have been focused on helping NSF find
5 suitable solutions that will provide
6 long-term financial stability for the
7 Arecibo site, and today we reiterate our
8 commitment in providing that support.

9 In the published DEIS, NSF identified
10 Alternative 1, "Collaboration with
11 Interested Parties for Continued
12 Science-focused Operations," as the
13 Agency-preferred Alternative. The Arecibo
14 Management Team is optimistic about NSF
15 wanting to continue science-focused
16 operations at the Arecibo Observatory.
17 However, we are concerned by the details
18 behind NSF's proposed alternative, in
19 particular the deconstruction of over 26
20 buildings at the site and the implied
21 elimination of the planetary radar and the
22 space and atmospheric science capabilities
23 at Arecibo.

24 The DEIS states, and I quote, that
25 "Alternative 1 would meet the purpose and

1 need of reducing the funding required from
2 NSF." However, nowhere in the document has
3 this financial analysis been presented nor
4 has it been clearly communicated why or how
5 the deconstruction of critical elements of
6 the Observatory is of financial benefit to
7 NSF. It certainly did not come from the
8 Arecibo Management Team.

9 A rationale for how and why these
10 specific buildings were selected for
11 deconstruction should also be included. A
12 thorough financial analysis outlining the
13 exact maintenance and operational costs for
14 each of the buildings also needs to be
15 performed and included in the document as
16 data.

17 It is puzzling that, while the NSF
18 wants interested parties to collaborate and
19 financially support the Arecibo
20 Observatory, NSF proposes the elimination
21 of the very elements that differentiate
22 Arecibo from other sites around the world:
23 the radar and space weather capabilities.

24 To provide an example, more than 15
25 million NSF dollars have been spent over

1 the past 10 years in the development and
2 commissioning of a heating facility in
3 support of space and atmospheric sciences.
4 Yet, under the DEIS, NSF recommends its
5 deconstruction. The heating facility was
6 explicitly requested by the scientific
7 community, has potential to become
8 revenue-generating, and was just
9 commissioned less than three weeks ago.

10 Similarly, approximately one third of
11 the current operating budget for Arecibo is
12 provided by NASA solely for the use of the
13 planetary radar capabilities and the
14 studies of near-Earth objects. This is a
15 unique equipment which is being
16 deconstructed under Alternative 1.

17 The following quote talks about the
18 role of studying NEOs as a public health
19 resource: "This improved characterization
20 and tracking has an impact on public safety
21 only if there is a means of deflecting or
22 disrupting objects on a collision course
23 with Earth, which would be completely
24 independent of the Arecibo Observatory.
25 The U.S. Government currently does not have

1 currently such a capability."

2 This logic is similar to saying that
3 the human race should stop studying the
4 disease of cancer because we have no way to
5 cure it or that we should stop looking for
6 other galaxies because we have no way to
7 reach them. It is the very essence of
8 research to dive into the unknown, to
9 accomplish what have never been
10 accomplished before in order to make our
11 world a better one.

12 A written statement will also be
13 provided by the Arecibo Management Team
14 outlining multiple inconsistencies found in
15 the DEIS document, which I will not discuss
16 verbally.

17 We reiterate our support for all three
18 scientific areas, planetary sciences, radio
19 astronomy, and space and atmospheric
20 sciences to continue operations at the
21 site. We believe these capabilities make
22 Arecibo more marketable and better prepared
23 for a future with reduced NSF funding.

24 We will continue to collaborate with
25 NSF as much as possible in an effort to

1 ensure the future of the Arecibo
2 Observatory and to maintain the prestige
3 and recognition this institution has held
4 for over 50 years.

5 (Whereupon, Mr. Córdoba reads in
6 Spanish his comments.)

7 MS. HAMILTON: Thank you.

8 One thing I should have mentioned is
9 that we love to hear your verbal comments
10 at these meetings, but ultimately verbal
11 and written comments will be considered
12 equally.

13 MS. HAMILTON: We now have Nick White
14 and Carlos Padín.

15 MS. WHITE: Okay. I think we are
16 doing them separately and will also provide
17 our own translation.

18 My name is Nicholas White. I'm from
19 the Universities Space Research
20 Association, USRA, and I am the senior
21 vice-president for Science at the
22 organization.

23 USRA is a non-profit organization with
24 a 105 member universities, all granting
25 PhDs in the space sciences. USRA is one of

1 the three partners managing the Arecibo
2 Observatory and is primarily responsible
3 for the astronomy and the planetary radar
4 science of the Observatory.

5 I'll focus my comments on the
6 planetary radar of to the Observatory,
7 where we find errors in the Draft EIS, in
8 particular summarizing the safety hazard.

9 You may have read in the newspapers
10 last month that NASA, the Federal Emergency
11 Management Agency or FEMA, and other
12 government agencies engaged in a planetary
13 protection exercise of the NASA Jet
14 Propulsion Lab. They did this to consider
15 the potentially devastating consequences of
16 a 330-foot asteroid hitting the planet
17 Earth.

18 This may seem like science fiction,
19 but these events are a real possibility.
20 One just has to remember the 2013
21 Chelyabinsk impact in Russia, which was
22 caused by an object only 20 meters across.
23 Despite its relatively small size, it
24 caused damage to 7,200 buildings and 1,500
25 people were injured.

1 How is this relevant to the discussion
2 today? Well, Arecibo Observatory is the
3 world's most powerful and sensitive radar
4 system which is used to track these killer
5 objects. It is a vital part of our
6 planetary defense system. These hazardous
7 objects are found by optical telescopes
8 that scan the sky, looking for moving
9 points of light. Once an asteroid is
10 found, Arecibo Observatory, within days,
11 turns its radar to pin-point its orbit.

12 Arecibo Observatory determines to
13 better than one part in 10 million the path
14 of the asteroid and whether or not it will
15 hit the Earth at some point in the future.
16 Such is the precision Arecibo Observatory
17 can predict the asteroid orbit for decades,
18 even centuries in the future so we would
19 have time to prepare a response.

20 The criticality of the Observatory has
21 been recognized by the National Academy of
22 Sciences. In a report in 2010, the Academy
23 recommended immediate actions required to
24 ensure the continued operation of the
25 Arecibo Observatory at a level sufficient

1 to maintain and staff the radar facility.
2 This recommendation has resulted in NASA
3 providing 3.7 million a year through USRA
4 to enable capability. And this is for the
5 one third of the funding at the
6 Observatory.

7 Furthermore, in 2005, the United
8 States Congress passed the George E. Brown,
9 Jr. Act that directed NASA to detect,
10 track, and characterize near-Earth objects
11 larger than 140 meters in diameter. In
12 2010, the goals of that act were
13 incorporated into the National Space Policy
14 of the United States of America that guides
15 the NASA administrators to pursue
16 capabilities in cooperation with other
17 departments, agencies, and commercial
18 partners; and I stress "other agencies," to
19 detect, track, catalogue and characterize
20 near-Earth objects to reduce the risk of
21 harm to humans from unexpected impact on
22 our planet. Shutting down the planetary
23 radar operations of Arecibo Observatory
24 will put lives and properties at risk.

25 NSF is the federal steward for this

1 facility, and it's USRA's expectation that
2 NSF will maintain the national need to
3 track and characterize near-Earth
4 asteroids. The DEIS fails to note all
5 these critical facts, and USRA requests
6 that it be corrected.

7 We, in addition, suggest that an
8 option be included: the continuous
9 operation of the facility with the prime
10 purpose to support the NASA funded
11 planetary radar.

12 I would like to end by saying that the
13 USRA, along with our partners, SRI and
14 UMET, remain committed to maintain the full
15 operation of the site. As part of this, we
16 are seeking all interested parties who can
17 bring funding to utilize the scientific
18 assets or even the site itself to ensure
19 that we can implement the NSF preferred
20 option when that can be realized.

21 (Whereupon, an audience member reads
22 in Spanish Mr. White's comments.)

23 MS. HAMILTON: Carlos Padín. After
24 him, it will be John Kelly.

25 MS. BLANCO: If I could just interject

1 for one moment. We have at least nine
2 speakers more to go, and it is already
3 almost 11:30. So, in order to give
4 everybody an opportunity to speak -- we do
5 have another meeting right after this. So
6 if you could please limit your comments to
7 four minutes, including translation, it
8 will be greatly appreciated.

9 MR. PADÍN: Okay. Let's go quickly
10 here.

11 My name is Carlos M. Padín Bibiloni.
12 I am the chancellor of Universidad
13 Metropolitana and a member of the
14 management team of the Arecibo Observatory.
15 This statement reflects the view of
16 Universidad Metropolitana and the Ana G.
17 Méndez University System of Puerto Rico
18 regarding the Educational and Public
19 Outreach Program of the Arecibo Observatory
20 and the socioeconomic impact of the
21 Agency-preferred Alternative, Alternative
22 1.

23 It is our understanding that the role
24 of Arecibo Observatory in Puerto Rico and
25 its impact on our educational efforts and

1 socioeconomic situation was not adequately
2 reflected nor considered in the Declaration
3 of Environmental Impact Statement Draft
4 Statement published by the National Science
5 Foundation, in October 2016.

6 First, the five alternatives presented
7 in said document underestimate the impact
8 of the Education and Public Outreach
9 Program of the Arecibo Observatory in
10 Puerto Rico. Second, the Draft's statement
11 does not recognize the significant role of
12 the Arecibo Observatory on the economic
13 development of the Island.

14 For over 53 years, the Arecibo
15 Observatory has established a significant
16 track record of scientific accomplishments
17 in astronomy, planetary science, and space
18 atmospheric science. Its world renowned
19 scientists have served as mentors to many
20 young scientists throughout the STEM
21 pipeline in the United States. Here in
22 Puerto Rico, in contrast with many
23 scientific research facilities in other
24 locations and particularly during this past
25 five years, the Arecibo Observatory and its

1 surrounding society have established a
2 close and significant partnership.

3 The Government of Puerto Rico has
4 invested more than 600 thousand dollars in
5 training teachers in the use of the Arecibo
6 Observatory in the classroom teachings.
7 The Ángel Ramos Foundation and the Ana
8 G. Méndez University System have invested
9 2.1 million to revamp the Science and
10 Visitors Centers because both partners are
11 certain of the educational contribution of
12 this cutting-edge research facility and its
13 potential to positively impact the STEM
14 pipeline in Puerto Rico. The Puerto Rico
15 Infrastructure Financing Authority also
16 provided 800 thousand dollars for
17 infrastructure improvement at the Arecibo
18 Observatory.

19 These actions all point out to a real
20 commitment of the people of Puerto Rico to
21 the Arecibo Observatory. Another key
22 aspect of the Arecibo Observatory is the
23 role in the economic landscape of the
24 Island, specifically in the impact on the
25 tourism industry, the development of our

1 Aerospace Cluster, and its broader impact
2 on the development of a STEM workforce on
3 the Island. The Aerospace Cluster is part
4 of the economic recovery strategy of the
5 Government of Puerto Rico, aimed at
6 integrating aerospace manufactures,
7 providers, and related institutions to
8 develop strategies and foster synergies
9 that will enhance the business environment
10 in the areas where cluster members conduct
11 their operations.

12 Virtually overnight, Puerto Rico has
13 become a magnet for some of the world's
14 leading aviation and aerospace companies.
15 With a long history of manufacturing
16 expertise and a strong pipeline of
17 engineering talent, the Island has
18 attracted multimillion-dollar investments
19 by these and other major firms during
20 recent years. The Arecibo Observatory is
21 part of Puerto Rico, part of these
22 strategies, and a key asset for the
23 development of this aerospace cluster.

24 The many activities implemented by the
25 Education and Public Outreach component of

1 the Arecibo Observatory evidence the
2 broader impact of this research facility,
3 which meets the goals of the Agency to
4 broaden the participation of
5 underrepresented groups in STEM
6 initiatives.

7 Since October 2, 2011, the Ángel Ramos
8 Foundation Science and Visitor Center has
9 hosted more than 450 thousand visitors,
10 approximately 30 percent of these are
11 school children. In addition, the
12 activities hosted have included the
13 Saturday Academy for high school students,
14 REU, observations nights, research
15 opportunities as part of the undergraduate
16 capstone/practicum courses from various
17 local higher education institutions, and
18 mentoring for theses in master and PhD
19 levels.

20 In addition, the creation of the
21 Arecibo Observatory Council of Chancellors
22 and Stakeholders has enabled different
23 universities to come together to use,
24 promote, and create, innovate programs to
25 broaden opportunities for students across

1 the Island to become part of a national
2 recognized research institution. These
3 opportunities create the real, meaningful
4 pathways that increase the STEM workforce.

5 The Agency-preferred Alternative
6 includes the deconstruction of over 26
7 buildings at the site. This implies the
8 elimination of the planetary radar and the
9 space and atmospheric science capabilities
10 at the Arecibo Observatory. These actions
11 will negatively impact the promotion of the
12 aerospace cluster and will limit the
13 possibilities of the Arecibo Observatory
14 Management Team to pursue other sources of
15 income for the financial stability of
16 this outstanding research facility.

17 This alternative will also limit the
18 educational research opportunities for
19 undergraduate and graduate students, the
20 space academy, and all active and current
21 educational activities. Furthermore,
22 eliminating most of the housing at the site
23 will reduce the opportunities to host
24 scientists, teachers, and students who
25 avail themselves of these options due to

1 the geographical and logistic challenges
2 related to the location of the site.

3 We feel it is imperative that the DEIS
4 explain in more detail the impact of the
5 alternatives on the EPO component of the
6 Arecibo Observatory, the local economy, and
7 the science that only occurs at Arecibo.
8 The Agency-preferred Alternative will most
9 likely negatively impact the possibilities
10 of obtaining funds from the private sector
11 and from other federal agencies, such as
12 NASA.

13 UMET, as well as the Puerto Rico
14 Council of Chancellors and Stakeholders of
15 the Arecibo Observatory, strongly believes
16 that the option for a sustainable and
17 productive future for the Arecibo
18 Observatory is to maintain the site with
19 multiple capabilities. Our vision of the
20 Arecibo Observatory is one that will
21 continue supporting the STEM pipeline in
22 Puerto Rico and the economic development of
23 the Island.

24 MR. GAUME: Here's what we are going
25 to do. We have 45 minutes left. I went

1 out and checked with the hotel management,
2 and we have a hard cut-off at 12:30.

3 We really want to hear from everybody.
4 So if you spoke last night and you're
5 giving the exact, same comments today's,
6 your comments are in the official record
7 and will be considered. I'd really like
8 you to consider giving your time to other
9 people that didn't speak last night. But
10 that's totally up to you.

11 What we will be doing is at
12 12:30 -- once we get to 12:30, we will cut
13 off the meeting because we have to get out
14 of this room. So speakers that we don't
15 get to by 12:30, we will ask you to submit
16 your comments through email or regular
17 mail. As Kristen mentioned before,
18 comments that are submitted by email or
19 through mail and oral comments have equal
20 weight in the process.

21 MS. HAMILTON: John Kelly is next, and
22 Ryan Lynch is on deck.

23 MR. KELLY: All right. I'll be quick.

24 My name is John Kelly. I'm with SRI
25 International, and I'm the Arecibo

1 Observatory Principle Investigator.

2 We do welcome the opportunity to
3 provide comments on NSF's Draft
4 Environmental Impact Statement, and we
5 believe that we can provide important
6 perspectives that should be included in the
7 final version. We will, of course, provide
8 written comments within the period.

9 The first and most important point is
10 that the Draft EIS does not cover the
11 specific scenario of operational changes
12 that we describe in our response to the
13 NSF's Dear Colleague Letter. That scenario
14 is one that we consider the most desirable,
15 the most practical, and the most likely to
16 be successful. That's the scenario we
17 first described to NSF four years ago.
18 It's entirely viable; it addresses NSF's
19 needs; it is well known throughout the
20 community and at NSF. Instead, the Draft
21 EIS considers, and NSF has adopted as the
22 Agency-preferred Alternative, a scenario so
23 unlikely as to render the whole result
24 irrelevant.

25 You already heard about the NASA

1 issue. The NASA requirement I already
2 mentioned absolutely requires the
3 continuation of the Observatory's globally
4 unique planetary radar. Every scenario
5 should be submitted and should be
6 considered for the future assumes that the
7 NASA involvement continues. Yet the
8 Agency-preferred Option includes the
9 demolition of that radar's power supply,
10 without which there would be no planetary
11 radar, which brings me to the second point.

12 The NSF has announced in a further
13 Dear Colleague Letter its intention to
14 solicit proposals for the future operation
15 of the Arecibo Observatory and to require
16 those inputs before the Final EIS is
17 published and before deciding and
18 publishing its Record of Decisions. This
19 improper order of events suggests that
20 potential solicitation will require
21 proposers to bid on an unknown.

22 Formal requirements for a record of
23 decision require that an EIS has been
24 prepared for all considered alternatives.
25 So clearly there is something unsuitable

1 with the time order here. Either the
2 Record of Decision should precede the
3 solicitation so that proposers know what
4 they are proposing for or the proposal
5 should have been collected before the EIS
6 was undertaken. As it is, only the
7 scenarios in today's EIS appear to be
8 qualified. And, as we've already said,
9 that specifically excludes the current
10 management's vision.

11 MS. HAMILTON: Ryan Lynch, followed by
12 Brett Isham.

13 MR. LYNCH: (To the interpreter) I'll
14 also give you my comments to read
15 afterwards, if that's okay.

16 So my name is Ryan Lynch. I'm a
17 member of the North American Nanohertz
18 Observatory for Gravitational Waves. I
19 have some additional comments to read after
20 what I already said last night.

21 Sections 3.2 and 3.9 of the Draft EIS
22 define the reach of influence for cultural,
23 employment, economic and income impacts too
24 narrowly. Astronomer across the U.S. and
25 the world depend on open skies access to

1 Arecibo for their research careers. Any
2 scenario that reduces the amount of time
3 available for scientific research
4 negatively impacts the incoming employment
5 of this user group and diminishes the
6 scientific and cultural landscape of the
7 U.S. as a whole. So I ask that this be
8 considered in the Final EIS.

9 Also, Sections 3.9.3 and 4.9 reference
10 students and researchers at colleges and
11 universities when assessing educational
12 impacts. The assumptions that this group
13 would not be negatively impacted under
14 Scenario 1 are erroneous. Any reduction in
15 open-sky time will impact students who use
16 the telescope for research, unless they can
17 come with their own funding. So I also ask
18 that this be considered.

19 I would also like to echo the call to
20 include broader impacts in the Final EIS.
21 Arecibo is an incredible resource for
22 underrepresented students, particularly
23 Hispanic students. An example of this is
24 the Arecibo Remote Command Center, which
25 was started at the University of Texas

1 Brownsville, and it's now expanding
2 nationwide. NSF rightly requires the use
3 of funds to address the broader impacts of
4 their work and the EIS should do the same.

5 Finally, I would like to say that we
6 understand the challenges that NSF faces
7 with its budget and NANOGrav wants to
8 support Arecibo as much as they can. But
9 finding a long-term funding stream takes
10 time and potential donors would grow
11 uncertainty regarding the capabilities and
12 the resources that are available.
13 Expecting a multimillion-dollar committee
14 when systems like the radar and the
15 administration buildings are slated for
16 removal, even if it is only a preliminary
17 proposal, is still an official document in
18 the public record.

19 Expecting donors to come forth in this
20 situation is unrealistic, and I ask that
21 the deadline for proposals per new
22 operations be delayed until after the EIS
23 is finalized. This solicitation should
24 also make clear that these buildings may
25 not ultimately be removed.

1 Thank you.

2 MS. HAMILTON: So that the math works
3 out, when you hear the chimes we're going
4 then move to translation of whatever has
5 been said. So we will have chimes going
6 off at two minutes. Thank you.

7 Brett Isham, and Dr. Daniel Altschuler
8 will be next.

9 MR. ISHAM: I'm Brett Isham from Inter
10 American University. My comments are my
11 own.

12 I'm disappointed that NSF did not plan
13 this meeting better. It started 25 minutes
14 late and now you're pressuring people to
15 hurry up their comments and cutting off
16 people who probably still would want to
17 comment. And I think this is --

18 THE INTERPRETER: You don't have it
19 written down?

20 MR. ISHAM: Not very well. I can
21 hardly read my own notes.

22 THE INTERPRETER: Okay. Then, we
23 would have to go back and forth with this.

24 MR. ISHAM: And I think this is
25 representative of the entire process. It

1 seems to me to be so much wrong in the
2 Draft EIS. I echo the comment from last
3 night that if you read it yourself -- it's
4 hardly a first draft. And it can even be
5 interpreted as a deliberate attempt to
6 sabotage the Arecibo Observatory.

7 NSF is cherry-picking comments from
8 the various reports that is citing. It's
9 ignoring the recommendation of the 2012
10 Astronomy Portfolio Review to reevaluate
11 the science later in the decade. And how
12 can it include the science from the 2015
13 AGS review when that's not finished yet?

14 There have been many comments about
15 astronomy, including NANOGrav, the
16 planetary radar, and I can't go into
17 details. But the atmosphere radar is by
18 100 times the most sensitive in the world.
19 Anyone who has visited similar atmosphere
20 radars around the world knows first-hand
21 that the radar at Arecibo is the most
22 flexible and hands-on atmosphere radar
23 laboratory in the world.

24 NSF appears to be ignoring its own
25 guidelines to consider equally intellectual

1 merit and broader impact.

2 One thing I said last night is that
3 what better, broader impact than an
4 observatory in the United States,
5 especially when there is 22 thousand
6 students visiting every year, 99 percent of
7 whom are Hispanic. NSF wants to promote
8 the study of science.

9 It is a disappointment to me that all
10 these types of comments must be in the
11 context of an environmental impact
12 statement. In summary, it is my feeling
13 that all of this has little do with
14 scientific merit or broader impact but has
15 to do with politics inside the NSF.

16 MS. HAMILTON: Daniel Altschuler, and
17 after that José Castro.

18 MR. GAUME: Let me interrupt just for
19 a second.

20 This is the last thing I'm going to
21 say on the subject. This is your meeting;
22 this is your opportunity to get the
23 comments into the public record.

24 The overwhelming majority of comments
25 that I have heard today so far are already

1 in the public record, which robs the
2 subsequent people that didn't talk last
3 night from getting their comments into the
4 public record. I would encourage you, if
5 you're repeating comments from last night,
6 that you give your time to people that
7 didn't talk last night.

8 Thank you.

9 MR. ALTSCHULER: I didn't talk last
10 night.

11 I am Daniel Altschuler. I am the
12 former director of the Arecibo Observatory.
13 I have a statement which is co-signed by my
14 colleagues Dr. Mayra Lebrón, former
15 research associate at the Arecibo
16 Observatory; Dr. Carmen A. Pantoja, who is
17 here, former REU coordinator for the
18 Arecibo Observatory. We all three are now
19 faculty members of the University of Puerto
20 Rico in Río Piedras. This is a brief
21 statement that I wish to enter into the
22 record.

23 The future of the Arecibo Observatory
24 in Puerto Rico is, again, a matter of
25 public discussion. We would like to add

1 with these short comments to that public
2 discussion and clarify a few issues which
3 have confused the public.

4 Our long time association with the
5 Observatory allows us to make the following
6 comments. Although it recently celebrated
7 its 50th anniversary, it continues to serve
8 scientific research in several areas, and
9 in some of them it is a unique instrument.
10 In a 2006 headline, the journal "Nature"
11 declared that Arecibo might be no longer
12 the dish of the day; but, then, it never
13 was. It has always been something of a
14 gourmet dish and definitely something very
15 special. In particular, its radar
16 capabilities are unique and allow important
17 investigations in the areas of atmospheric
18 science and planetary radar.

19 We begin by expressing our
20 disagreement with statements that seem to
21 imply that because it is no longer the
22 largest dish on our planet, being surpassed
23 by the recently inaugurated FAST telescope,
24 the Five-hundred-meter Aperture Spherical
25 Telescope, in China, it has therefore

1 become obsolete. It is still the second
2 largest single dish in the world, mainly
3 serving the U.S. scientific community, and
4 FAST is in China.

5 It is also not true that the SKA, the
6 Square Kilometer Array, being constructed
7 in South Africa and in Australia, makes the
8 Arecibo Observatory obsolete. The SKA is
9 under construction and, at any rate, does
10 not and will not have certain capabilities
11 which Arecibo does have.

12 In particular we wish to point out
13 that even if all that Arecibo could do was
14 planetary radar, this capability is well
15 worth the relatively small budget needed to
16 maintain the Arecibo Observatory open. It
17 is needed to establish the precise orbit of
18 a near-Earth asteroid, which could
19 represent a threat to a region of the Earth
20 in the event of an impact which, although
21 of low probability, is not impossible.
22 Arecibo represents a first line of defense
23 to verify such a threat. An insurance
24 premium of 12 million a year is a real
25 bargain. I remind you that the total NSF

1 budget is about 4.7 billion.

2 Furthermore, it is not just another
3 telescope. It is an international
4 scientific icon and has been designated by
5 the Institute of Electrical and Electronic
6 Engineers, the IEEE, as an important
7 historical milestone of electrical
8 engineering. The American Society of
9 Mechanical Engineers, ASME, declared it a
10 monument of mechanical engineering, both
11 events happening in 2001. It was
12 registered in the National Registry of
13 Historic Places by the U.S. Department of
14 the Interior National Park Service in 2008.

15 Closing or decommissioning have
16 therefore implications which go beyond
17 strictly scientific matters, since
18 attention must also be given to Section 106
19 of the federal code for the protection of
20 historical sites. Many of our colleagues
21 agree that closing the Arecibo Observatory
22 is a bad move. Changes in its operations
23 will also have significant consequences
24 beyond the issues mentioned above,
25 including a negative effect on the already

1 gloomy economic situation of Puerto Rico.

2 We think that the preferred option by
3 NSF of finding partners for funding the
4 Observatory must be looked upon with some
5 concern, especially if the idea is to offer
6 the Observatory to the local government,
7 likely through the University of Puerto
8 Rico. The alternative of transforming the
9 Observatory into an educational institution
10 is also not a good one and just another way
11 to find local money for a federal facility
12 mostly used by U.S. scientists. The
13 telescope is not an adjunct to the
14 educational activities; it is exactly the
15 opposite.

16 Furthermore, aside from its scientific
17 value, the Arecibo Observatory has served
18 as inspiration and training ground for many
19 Puerto Rican students who have very limited
20 local opportunities to do so. Some of them
21 went on to obtain their doctoral degrees in
22 science. If NSF wants to further the
23 participation in STEM by minorities and
24 women, closing the Observatory or limiting
25 the operation is, again, a bad idea.

1 Thank you very much.

2 MS. HAMILTON: Next is José Castro,
3 followed by Joan Schmelz.

4 MR. CASTRO: Good morning. My name is
5 José Castro. I'm the business innovation
6 officer for the Puerto Rico Industrial
7 Development Company, which is a government
8 agency. Today, on behalf of Ms. Ortiz, who
9 is our executive director, we'll enter some
10 comments.

11 First of all, I wish to point out that
12 the Puerto Rico Industrial Development
13 Company Business Developing Program was
14 very successful in attracting companies,
15 mostly benefited by the Arecibo
16 Observatory. Closing this research
17 institution will not serve the interest of
18 the people of Puerto Rico and it would be a
19 setback in establishing this sector as a
20 main contributor in the economic
21 development of the Island.

22 For many years the Arecibo Observatory
23 stood proud but somewhat isolated from the
24 economic development of the Island. But in
25 2007 the stakeholders began to incorporate

1 the research capability of the institution
2 to attract innovation-driven companies,
3 mostly in aerospace. In 10 years the
4 industry grew from less than one thousand
5 employees to five thousand employees. This
6 doesn't include indirect jobs.

7 Today, it is anticipated that this
8 sector will double the number employees in
9 a five-year period. Companies in the space
10 subsectors will contribute the most and are
11 the ones that require support to receive
12 communications from the satellites as well
13 as space weather data and analytics to
14 assist in their missions. The Arecibo
15 Observatory has the capability and the
16 talent to assist in this new breed of
17 companies looking at space for
18 commercialization.

19 We certainly understand the National
20 Science Foundation's financial concerns in
21 keeping the facility open for research and
22 education. But the center has been both a
23 symbol and a driver for innovation to many
24 Puerto Rican students in their pursue of
25 science and engineering knowledge.

1 Therefore, it is important to reinvent
2 the business model of the center to meet
3 the challenges of the scientist community
4 and to become active participants of the
5 business-innovation community. Closing is
6 not the answer. Changes must be
7 instituted. New services and educational
8 activities must be incorporated. PRIDCO
9 supports Alternative 1. With a new and
10 sustainable operation of the Arecibo
11 Observatory, in a manner consistent with
12 the principle of the National Science
13 Foundation, in a short period of time the
14 center will flourish and will continue to
15 be an economic development tool for the
16 betterment of Puerto Rico and human kind.

17 (Whereupon, Mr. Castro reads his
18 comments in Spanish.)

19 MS. HAMILTON: Joan Schmelz, followed
20 by Kevin Shocket.

21 MS. SCHMELZ: My name is Joan Schmelz.
22 I'm the deputy director of Arecibo
23 Observatory. Today I speak to you as the
24 former chair of the Broadening
25 Participation Working Group at the Math and

1 Physical Sciences Directorate at NSF.

2 Unconscious bias permeates our culture
3 and our science. We all undervalue the
4 scientific contributions of women. Over
5 the past five years almost 50 percent of
6 the Arecibo astronomy telescope time went
7 to women principal investigators. May I
8 suggest that Arecibo science is
9 underappreciated because these
10 contributions from women are undervalued?

11 The Draft EIS does not consider the
12 socioeconomic impact of this pervasive
13 bias. A study needs to be conducted to
14 evaluate the impact of this bias.

15 (Whereupon, an audience member reads
16 in Spanish Ms. Schmelz' comments.)

17 MS. HAMILTON: Kevin Shocket.

18 MR. SHOCKET: Good afternoon.

19 The Arecibo Observatory is a Puerto
20 Rican national treasure and every
21 possibility that could save it should be
22 explored.

23 While it may have been surpassed by
24 newer facilities and more efficient
25 facilities, its unique capabilities and

1 location make the telescope worthy of
2 preserving. Every measure should,
3 regardless of the outcome, be taken to save
4 the facility and can continue to be a
5 source of important scientific and cultural
6 significance and inspiration.

7 Let us not see the telescope fall into
8 the same state of Puerto Rico's 360 degree
9 lighthouse system, which was built during
10 the late 1800s. This system protected the
11 maritime traffic in and around Puerto Rico.
12 And now, with the Arecibo telescope
13 protecting the planet from asteroids, let's
14 not let history repeat itself. Many of
15 these lighthouses are now abandoned and in
16 disrepair. Don't let the same happen to
17 our national treasure.

18 Thank you.

19 MS. HAMILTON: Thank you.

20 I'm very happy to say that everybody
21 who signed up to speak did get a chance to
22 speak today. Thank you for your
23 understanding.

24 We need to close the meeting now, but
25 this was a draft environmental impact

1 statement. We will now consider your
2 comments and improve the Draft
3 Environmental Statement. And, again, any
4 comments, including these or in addition to
5 these can be submitted via this email
6 address (showing on the slide) or via mail
7 through December 12.

8 Thank you so much. We really
9 appreciate your participation.

10 (Whereupon, the public meeting
11 concludes at 12:31 p.m.)

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REPORTER'S CERTIFICATE

I, ALEJANDRA DOMÍNGUEZ MENÉNDEZ, E.R.

Reporter, do hereby certify that the following transcript is a full, true record transcribed by me.

I further certify that I am not interested in the outcome of the case named in said caption.

ALEJANDRA DOMÍNGUEZ MENÉNDEZ

SECTION 106
OF THE NATIONAL HISTORIC PRESERVATION ACT
CONSULTING PARTIES MEETING
IN SAN JUAN, PUERTO RICO

held on Thursday, November 17, 2016, at the Doubletree
Hotel, 105 De Diego Avenue, San Juan, Puerto Rico,
00914, beginning at 1:10 p.m.

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IN SAN JUAN, PUERTO RICO
THURSDAY, NOVEMBER 17, 2016
PROCEEDINGS

MS. BLANCO: Is anybody here that would like to have the translator interpret in Spanish -- translate in Spanish?

(No response)

MS. BLANCO: No? Is everybody comfortable with English?

(General nodding)

MS. BLANCO: I think that we are okay to proceed in English.

THE INTERPRETER: Okay. I'll stay just in case, in the event that -- no? Am I excused?

MS. BLANCO: I think you get to go. But thank you.

THE INTERPRETER: Well, thank you all. I hope that you have a great meeting.

MS. BLANCO: (To the interpreter) Thank you so much.

(The interpreter exits the conference room.)

1 MS. BLANCO: So, folks, I think we
2 will start out our meeting today.

3 First of all I thank you very much for
4 coming. This is a consultation meeting
5 under Section 106 of the National Historic
6 Preservation Act, and we'll go into a
7 little bit more detail about what the
8 purpose of the meeting is.

9 First, let's start with the
10 introductions. My name is Caroline Blanco.
11 I'm the assistant general counsel at the
12 National Science Foundation that oversees
13 environmental matters, and I'm the historic
14 preservation officer at NSF.

15 Kristen?

16 MS. HAMILTON: Hello and good
17 afternoon. I'm Kristen Hamilton. I'm an
18 environmental compliance officer at the
19 National Science Foundation.

20 MR. GAUME: Hello. My name is Ralph
21 Gaume. I'm the Arecibo program officer for
22 the National Science Foundation.

23 MS. PRICE: Hi. I'm Lori Price. I'm
24 the senior cultural resources specialist
25 for CH2M, and I'm a contractor to NSF.

1 MS. SUEIRO: Good afternoon. My name
2 is Berenice Sueiro. I work at the State
3 Historic Preservation Office. I'm the
4 Historic Preservation manager.

5 MR. SHOCKEY: Hello. I'm Kevin
6 Schockey. I am a concerned citizen.

7 MS. LARSON: Monica Larson, another
8 concerned citizen.

9 MS. KUPEC: Ivy Kupec. I work at the
10 Public Affairs Office with the National
11 Science Foundation.

12 MS. PEARCE: I'm Karen Pearce and I'm
13 with the Commercial Affairs Office at the
14 National Science Foundation.

15 MR. KELLY: I'm John Kelly for SRI
16 International. I'm the Arecibo PI.

17 MR. BABILONIA: I'm Miguel Babilonia.
18 I'm with FIEKP, that's F-I-E-K-P. We are
19 speleologists that work the area.

20 MS. ISHAM: Brett Isham. I'm an
21 electrical engineer and professor at the
22 Inter American University in Bayamón.

23 MR. WHITE: I'm Nick White from USRA,
24 senior vice-president for Science.

25 MR. VAN EYKEN: I'm Tony Van Eyken

1 from SRI International.

2 MR. GAGO: Jaime Gago from the Arecibo
3 Observatory.

4 MS. CAISEDA: Carmen Caiseda,
5 mathematics professor at Inter American
6 University.

7 MS. BLANCO: Thank you. Again,
8 welcome to everybody. I'm so glad you're
9 taking your time out of your busy day and
10 sharing that with us. We really appreciate
11 your input.

12 I'll start with a brief overview of
13 the National Historic Preservation Act and
14 Section 106, because perhaps some of you
15 may have not been exposed to it before.
16 This is different than the meeting we just
17 had and it's under a different federal
18 statute.

19 So Section 106 of the National
20 Historic Preservation Act concerns itself
21 with nationally significant historic
22 properties. Before a federal
23 agency -- and the National Science
24 Foundation is a federal agency. Before we
25 can make any decisions, we need to consider

1 the potential impact of our decision on
2 nationally significant historic properties.

3 (New people come into the conference
4 room.)

5 MS. BLANCO: Welcome. We just got
6 started. Perhaps if you could introduce
7 yourselves -- (to Ms. Hamilton) or should
8 we wait until the next flow of folks comes
9 in?

10 Please, come on in. Have a seat. If
11 you could please identify yourselves that
12 would be great. Thank you.

13 MS. PANTOJA: Dr. Carmen Pantoja from
14 the University of Puerto Rico, Department
15 of Physics.

16 MR. ALTSCHULER: Dr. Daniel Altschuler
17 from the Department of Physics, University
18 of Puerto Rico in Río Piedras, former
19 director of the Arecibo Observatory.

20 MS. SCHMELZ: Joan Schmelz, deputy
21 director of the Arecibo Observatory.

22 MS. ZAMBRANO: Luisa Fernández
23 Zambrano, PhD candidate, University of
24 Granada in Arecibo Observatory Planetary
25 Radar Group.

1 MS. RIVERA: Luzmari Rivera. I'm an
2 AOSA alumnus.

3 MS. BLANCO: Great. Thank you again.
4 I'm Caroline Blanco from the National
5 Science Foundation. My colleague Kristen
6 Hamilton is here and Dr. Ralph Gaume, who
7 is going to help in this process. This is
8 Lori Price from CH2, our contractor that is
9 assisting us with analysis of impacts and
10 the processes of all of the statutes that
11 we are looking at.

12 So we just started talking about
13 Section 106 of the National Historic
14 Preservation Act. Because the National
15 Science Foundation is a federal agency and
16 because there are federal funds associated
17 with this proposed action, we are required
18 by federal law to comply with Section 106
19 of the National Historic Preservation Act,
20 which requires us to take a look at
21 potential impacts on nationally significant
22 historic properties. That includes
23 archeological, historic, and cultural
24 resources as well.

25 This act, contrary to the National

1 Environmental Policy Act, focuses on a
2 discreet universe of resources. Those are
3 resources that are eligible or listed on
4 the National Register of Historic Places.
5 So that's what we are concerned with, those
6 types of resources. Of course, the Arecibo
7 Observatory is listed on the National
8 Register. So right away we knew we would
9 need to go forward with compliance with
10 this act and we are looking forward to your
11 participation in it.

12 There are several points in the
13 process, several steps that we need to
14 follow. What we need to do, first of all,
15 is ask ourselves if there's an undertaking.
16 That's the buzz word under the Act. And,
17 yes, because we are a federal agency, as I
18 mentioned, and we are issuing federal funds
19 for this proposed action, there is an
20 undertaking.

21 So then we took a look at the Area of
22 Potential Effects. We have consulted with
23 the State Historic Preservation Office here
24 in Puerto Rico. We've been in contact
25 since the spring, I think, and started

1 talking about the process and the potential
2 impacts and how we'd go forward in trying
3 to comply with Section 106.

4 So Lori will go through and talk about
5 the Area of Potential Effects. I think
6 some of you who had -- and I can see some
7 folks who had signed on to be consulting
8 parties in the process. And I assume by
9 email you received the Draft Cultural
10 Resources Report. Okay. That document
11 will be accessible to all of you.

12 Hopefully you all signed in when you
13 first came into the room. If you have not,
14 please do so before you leave the meeting.
15 We'll be here until 2:30. So we'll go
16 forward on that.

17 In any event, we determine an Area of
18 Potential Effects. That's the geographical
19 area that concerns itself with -- that
20 might be potentially impacted by the
21 various alternatives that we are
22 considering. Then, from that point, what
23 we do is we take a look at whether there
24 are historic properties. And that term,
25 again, is a catchall phrase. Historic

1 properties can include archeological,
2 historic, and cultural. So I'll use that
3 term because that's what the Act uses. But
4 please be aware that it does cover all
5 three of those resources.

6 So we take a look at historic
7 properties that may be included within the
8 Area of Potential Effects. We call it the
9 APE. We'll take a look at what historic
10 properties are within the APE and how we've
11 defined the APE. Then we take a look at
12 the various alternatives and whether those
13 alternatives will have an effect on those
14 historic properties; and if so, is the
15 effect adverse.

16 If there are adverse effects, then,
17 what we take a look at is ways to -- we
18 would discuss together as consulting
19 parties, as the interested parties in the
20 process, and we take a look at ways to
21 avoid impacts, minimize, or mitigate those
22 impacts. The ultimate resolution of that
23 process will be in either the form of a
24 Memorandum of Agreement or perhaps in this
25 circumstance, because we have -- we are

1 anticipating a solicitation going out. We
2 really truly do not know the outcome of
3 this process. No decision has been made.
4 We really do not have any idea of how this
5 will come out.

6 I know there has been some confusion
7 about that and there were some questions
8 about that. I heard some comments in the
9 last meeting. But truly no decision has
10 been made. We're going to have to see how
11 this process turns out.

12 We have, as you know, defined,
13 identified a preferred alternative. Ralph
14 will go through the different alternatives
15 that we are evaluating. But, unless a
16 viable collaboration of interested parties
17 comes forward, it may not be possible.

18 In this circumstance, within the
19 context of Section 106 compliance, there
20 may be a need for some ongoing
21 consultation, in which case what we do is
22 not look at a very formulated Memorandum of
23 Agreement. But we may look at another
24 document, which gives us a little more
25 flexibility and allows us to consult

1 further. That's called a "Programmatic
2 Agreement," or a PA for shorthand.

3 I've thrown a whole, you know,
4 graduate school course at you in two
5 minutes or longer. But if anybody has
6 questions so far, I think it might be a
7 good time to stop and ask.

8 No questions?

9 MR. SHOCKEY: (Inaudible) and I know
10 that an application was made or there
11 are --

12 MS. BLANCO: It is listed on the
13 National Register, yes. So this one, as
14 far as this federal processes go, the first
15 couple of steps are pretty easy because we
16 already know the Area of Potential Effects
17 is the area of the Observatory, and Lori
18 has already gone through that. And we know
19 that these resources are listed already.
20 So absolutely, yes.

21 Ralph?

22 MR. GAUME: There are two things:
23 historic landmark and the National Register
24 of Historic Places. Recently there
25 was -- last year there was an application.

1 Maybe that's what he --

2 MS. BLANCO: Maybe.

3 MR. GAUME: So if you can clarify
4 that.

5 MS. BLANCO: Thank you. That's a
6 really good point. Thanks for bringing
7 that up.

8 It is not listed yet as a national
9 landmark. It is, though, on the National
10 Register of Historic Places.

11 MS. SUEIRO: At the national level.

12 MS. BLANCO: Yes, at the national
13 level. Thank you. That's through the
14 Department of the Interior. They hold the
15 key for the National Register and that
16 looks at nationally significant historic
17 properties for the United States. And so
18 it is on the National Register.

19 MS. SCHMELZ: Do we know the status of
20 the application, for the application as
21 landmark?

22 MS. BLANCO: What the status is right
23 now of that application? I do not.
24 Berenice, do you know?

25 MS. SUEIRO: Remember we wrote to your

1 agency and we still need an answer from the
2 National Science Foundation, because the
3 process is -- in our case, the Office for
4 National Park Service would start the
5 nomination. But we wanted to be sure that
6 the federal agency was in agreement,
7 because there is a lot of effort when you
8 nominate a landmark. It goes through a
9 very different process than the National
10 Register. It goes to two committees. It
11 could take a year, a year and a half to
12 nominate as a landmark. So we really
13 wanted to have NSF's approval before.

14 We have let National Park
15 Service -- we have informed them that we
16 wanted to nominate it. In fact, National
17 Park Service, in the 70s, had prepared a
18 historic context of astronomy and had
19 recommended that the Arecibo Observatory be
20 included as a landmark many, many, many
21 years ago. But for the purpose of Section
22 106 and the whole process that you all are
23 going through today it's good enough.

24 Even if it was not listed as a
25 National Register property, it would be

1 eligible, and that's good enough at this
2 time. So we are one step ahead. So when
3 you guys are ready to nominate it as
4 landmark, we are ready because we have it
5 ready. It's almost done.

6 MS. BLANCO: I do recall that process,
7 and I think the reason why at the time we
8 decided -- we didn't have a position on it
9 one way or the other just because of where
10 we're at in this process. It may be down
11 the line that we could go ahead and support
12 that. But we want to see how things happen
13 in this process.

14 Yes?

15 MS. SUEIRO: Let me just add
16 something. Just for you all to know, the
17 National Register Nomination, the way it
18 was written is good enough, almost, half
19 the document that would be included in the
20 Landmark's. So it would not really need a
21 lot of -- you know, it would need an update
22 but not a lot of effort to make a document
23 that could really go into the Landmark
24 Program.

25 But they have two committees. They

1 meet in the fall and in the spring, and
2 it's quite a complicated group. So we have
3 to wait until the president nominates
4 someone for the Department of the Interior,
5 that you guys are ready, and start the
6 process again.

7 MS. BLANCO: The president of the
8 United States.

9 MR. ISHAM: What's the difference
10 between the National Register of Historic
11 Places and the National Landmark?

12 MS. BLANCO: Berenice, would you like
13 to address that?

14 MS. SUEIRO: Those programs work under
15 the National Park Service, the federal
16 agency. The National Register is -- you
17 can have three levels. It could be either
18 municipal, state, or national. The process
19 is very streamlined. The owner can propose
20 it; our office can propose it; anyone can
21 propose a National Register nomination.

22 It has a 30-day review by our office.
23 It goes through a board. Then we send it
24 to the keeper of the National Register,
25 which is in Washington D.C. They have 45

1 days to give us an answer. Both processes
2 go through the Federal Register. It's
3 published, and the owner has the right to
4 object. When it's a federal agency, it is
5 the federal agency that proposes the
6 nomination. Our office reviews it, and
7 then it goes to the keeper.

8 In the case of the Landmark Program,
9 it's only properties that are nationally
10 significant, and usually it is the National
11 Park Service Office which writes the
12 nomination. Our office can also propose a
13 landmark nomination. We have worked in
14 joint cooperation with National Parks
15 Service.

16 In the case of NSF, Park Service, in
17 the 70s, proposed that the property could
18 be a landmark, many years ago. In fact,
19 the National Register has a requirement
20 that you have to have 50 years, to be
21 included.

22 But there are exceptions. In the case
23 of this wonderful property, it entered the
24 National Register before being 50. In the
25 case of landmarks, you have to have the 50

1 years. It's only national, and the process
2 is very different.

3 Once the nomination is prepared, it
4 goes through a committee in National Park
5 Service in Washington. After that a
6 committee views it. It goes through
7 another committee. Then they have the
8 final "yes" or "no" to that nomination.
9 Then the secretary of the Department of the
10 Interior is the person that signs the
11 nomination; contrary to the National
12 Register, which is the keeper that signs
13 the nomination.

14 They are both in Washington D.C. But
15 the advantage is that when you're a
16 landmark or you're listed in the National
17 Register at national level, those are the
18 first properties that can receive funding,
19 federal funding, to maintain, keep,
20 restore, and rehabilitate it.

21 Any questions? Or did I go too fast?

22 MS. ZAMBRANA: Where is your office?

23 MS. SUEIRO: Our office is at the
24 Cuartel de Ballajá, the third floor. It's
25 the State Historic Preservation Office.

1 Each state and each territory has an office
2 like this, and it's also in the law that
3 Ms. Blanco just mentioned. Every state and
4 territory is supposed to have a
5 preservation officer. It is appointed by
6 the governor and it has a review board for
7 National Register nominations. The review
8 board does not look at the landmarks
9 nominations. It is a different process in
10 that sense.

11 MR. VAN EYKEN: As I understand it,
12 this is to say that the delay is that you
13 are waiting for an answer from NSF.

14 MS. SUEIRO: Yes. But it's their
15 decision. You know, it has to come from
16 the federal agency. But it's not really a
17 delay. It was proposed in the 70s.

18 MS. ZAMBRANA: A 50-year delay?

19 MS. SUEIRO: Well, not really.
20 National Park Service would not accept it
21 if it is not 50 years. So basically we
22 went ahead and nominated it to the National
23 Register because it allows us that it would
24 go through exceptions.

25 There was a criterion -- the Arcibo

1 Observatory is listed for Criterion A and
2 Criterion C. "A" is events, basically.
3 I'm just summing up. And Criterion C is a
4 work of engineering. But when you don't
5 have the 50 years, there is a criterion of
6 exception, which is "G": properties that
7 are nationally significant for their
8 design. That was the case of the
9 Observatory. The Landmark Program doesn't
10 have those exceptions.

11 I'm not saying they're late. It's
12 just the process. It was recommended. We
13 are in good timing, but...

14 MR. CÓRDOVA: You mentioned that in
15 order to become a landmark the National
16 Park Service writes the nomination.

17 MS. SUEIRO: It could be. But usually
18 is the agency that prepares them. But our
19 office can prepare them too, or in
20 conjunction.

21 MR. CÓRDOVA: So what would prevent
22 you from initiating a nomination right now?

23 MS. SUEIRO: We need their approval.

24 MR. CÓRDOVA: You need their approval.

25 MS. SUEIRO: Yes. And if it's not

1 Ms. Blanco's or his decision, it's at a
2 higher level.

3 MR. CORDOVA: (Inaudible comment)

4 MS. SUEIRO: But you don't have to be
5 a landmark to stop this process. For the
6 National Historic Preservation Act you only
7 have to be eligible. You are as protected
8 as if you were a landmark.

9 MR. CORDOVA: How do you become
10 eligible?

11 MS. SUEIRO: You have to comply with
12 three minimum things, meet one of the four
13 National Register criteria. "A" is for
14 properties related to important historic
15 events; "B," important persons; "C,"
16 construction of architect or engineering
17 work; and "D," properties that gives us
18 information about our history or
19 prehistory.

20 It is in our website, www.oech.pr.gov,
21 and you can also put "National Register" in
22 the Internet and it will bring everything
23 down. Our number is 787.721.3737. My
24 extension is 2002. My email is
25 bsueiro@prchpo.pr.gov.

1 MS. ZAMBRANA: I think your
2 information was on one of this -- (to Ms.
3 Blanco) you sent her information by email?

4 MS. BLANCO: I think it is --

5 MS. ZAMBRANA: It's in --

6 MS. BLANCO: She's a Consulting Party
7 so she -- yes.

8 MS. SUEIRO: It is a process; it is a
9 consulting process. So the Advisory
10 Council also is the federal agency that
11 regulates this process. So if you have any
12 question, they can assist you when you are
13 a Consulting Party.

14 MS. BLANCO: As Berenice mentioned,
15 the Advisory Council on Historic
16 Preservation is an independent federal
17 agency located in Washington D.C. They are
18 the ones who promulgated the regulations to
19 implement the National Historic
20 Preservation Act. Their website is very
21 good. It does provide the people who have
22 not been familiar with the Act before the
23 process a pretty good guidance to how it
24 works. That is www.achp.gov.

25 One more historical point, it

1 was -- Arecibo Observatory was originally
2 nominated for listing on the National
3 Register. It was and it had an improper
4 designation of the land owner. It had
5 Cornell University as the owner. So this
6 came to our attention, I would say, about a
7 year ago or so. So it was requested to
8 have us delist it and then recommend to
9 have it relisted with the correct land
10 owner. And we did that.

11 So we have already -- I see how some
12 of the minds are working. Again, there is
13 no decision that has been made. There's no
14 decision that says that we are going to
15 tear it down. None of that has been made
16 at all. And we have already, in the
17 designation -- in the request for the
18 correction in the nomination, we
19 acknowledge that it is historically
20 significant. It's not something that we
21 would try to hide from anyone.

22 It is historically significant. So
23 that is out there. You can take a look at
24 that. And if you have questions, you can
25 contact us. We want us to be a very

1 iterative process.

2 MS. COLÓN: I'm glad that you
3 corrected that information because that was
4 something brought up to our office by the
5 previous director of the office,
6 Ms. López --

7 MS. BLANCO: Yes, Diana López.

8 MS. COLÓN: So we were working up to a
9 point, and then I directed that information
10 to Ralph.

11 MS. BLANCO: Yes.

12 MS. COLÓN: That's the correction that
13 was made. Thanks for the correction. It
14 was listed as a Cornell property, instead
15 of NSF's.

16 MS. BLANCO: Yes.

17 MS. SUEIRO: In the process of
18 nominating to the National Register, we
19 worked with owners and we worked with
20 applicants, and that was the information
21 that was given to us when we nominated it.

22 We wrote -- just for the rest of the
23 crowd. We wrote and we have the letter.
24 And Cornell had written back saying, "Yes,
25 we'd love this nomination." So we had no

1 reason to think Cornell was not the owner.

2 It was a small process. It was
3 delisted and relisted the same day. But
4 the nomination, the original nomination has
5 not been altered.

6 Again, if you need anything, just give
7 us a call or send an email.

8 MR. GAUME: If I could -- just to
9 clarify, because I'm really confused. To
10 follow up on what John Kelly said, if
11 Arecibo Observatory were listed today as a
12 national landmark, would that afford any
13 additional protection beyond what it
14 currently has to prevent deconstruction?

15 MS. SUEIRO: Not really. If you're
16 eligible you do not have to be listed in
17 either registers. If you were only
18 eligible, you have the same protection and
19 the process would be exactly the same.

20 We would love to have it as a landmark
21 because it is an honor. Puerto Rico only
22 has six landmarks: Fortaleza; Caguana;
23 Caparra; Concha Meléndez, who is a writer,
24 a woman, in Condado; Antonio López; and Old
25 San Juan. So it would be wonderful to have

1 the Observatory listed.

2 MS. PRICE: Just as a point of
3 clarification, when you go through Section
4 106 process, if you are a national historic
5 landmark, there are a few extra steps that
6 you take that involve the Advisory Council
7 and the Secretary of the Interior. It's
8 not protected any differently, but there
9 are some extra steps of notification that
10 you have to do if you're designated as a
11 NHL. But the protection that you receive
12 is not any different.

13 MS. SCHMELZ: I'm Joan Schmelz. I
14 have a question for Caroline about -- I'm
15 having trouble with these two points. It
16 seems to me that NSF could possibly be
17 simultaneously considering approving or
18 nominating the Arecibo Observatory as a
19 national landmark and also considering
20 demolition of the buildings that are on the
21 National Register. Am I understanding that
22 correctly?

23 MS. BLANCO: We have put on hold
24 consideration of consenting to the national
25 landmark status until this process is

1 completed. Does that help to answer your
2 question?

3 MS. SHMELZ: Technically, I suppose,
4 yes. However, it just -- it does seem a
5 bit mind boggling that any site that could
6 potentially be as important as a national
7 landmark could be considered by NSF for
8 demolition.

9 MALE VOICE: I second that.

10 MS. BLANCO: I understand. I do also
11 want to mention one thing about the process
12 that I didn't emphasize or really
13 clarified, and that is that the rule of the
14 SHPO's office is critical in our Section
15 106 process.

16 We consulted the SHPO's office and we
17 did reach out early on. We find tremendous
18 benefits from that early connection in
19 trying to understand the process and their
20 perspective, and we will be working very
21 closely with the SHPO's office and
22 consulting parties in trying to
23 find -- trying, first of all, to reach an
24 agreement on the Area of Potential Effects,
25 any effects to the historic properties

1 within the APE from the various
2 alternatives, and then looking at ways to
3 address adverse effects through
4 minimization, mitigation, and avoidance.
5 So we would play a critical role with the
6 SHPO.

7 We also have reached out to the
8 Advisory Council on Historic Preservation
9 several times. We even invited them to
10 participate. Thus far we have not heard
11 back from them saying "yes" or "no." I
12 mean -- but at this point they have told us
13 to pretty much proceed. But we will keep
14 them informed. We did give them the
15 Cultural Resources Report and so forth. So
16 that is the background on the process so
17 far.

18 At this point in the meeting, I would
19 like to turn this to Lori Price, just to
20 let you know where I'm headed. We'll take
21 questions, but -- what I wanted her to do
22 was to go forward and explain what's in the
23 Cultural Resources Report and to talk about
24 the Area of Potential Effects, the historic
25 properties identified, and anticipated

1 effects from the proposed alternatives.

2 Those would be the next steps.

3 Perhaps that will answer some of the
4 questions that some of you may have had.

5 But if not -- I saw three hands at the same
6 time.

7 MR. BABILONIA: I'm Miguel Babilonia
8 from FIEKP. I just wanted to know if there
9 is a difference in funding between those
10 two, being registered or -- it seems to me
11 that you would have more funding if you are
12 a national landmark, no?

13 MS. SUEIRO: The decision of funding
14 comes from the president of the United
15 States and Congress when they decide to
16 assign funding. For example, we had a
17 program called Save America's Treasures.
18 Landmarks and National Registered
19 properties nominated at a national level
20 would be the first to be considered. So
21 landmarks -- in this case, the Observatory
22 has a national designation within the
23 National Register.

24 But usually, when you are a federal
25 agency, you cannot receive double funding.

1 So the money goes basically to private
2 owners, in those cases, because you cannot
3 receive double funding. You know, you
4 cannot have money from National Park
5 Service and another federal agency. So
6 usually, yes, landmarks are first with
7 National Register at a national level
8 designation.

9 MR. CÓRDOVA: I guess the question is,
10 you mentioned there are certain types of
11 protection for these types of landmarks.
12 What is the protection? This is the
13 protection?

14 MS. SUEIRO: It was Lori that
15 mentioned that when you are a landmark
16 there are other steps that you would have
17 to take. That would be that the Advisory
18 Council, National Park Service, and the
19 Secretary of the Department of the Interior
20 would need to be involved in the process.

21 MS. BLANCO: And it may be also worth
22 saying right now that both the National
23 Environmental Policy Act, which is the act
24 that governs the EIS process, and Section
25 106 of the National Historic Preservation

1 Act are both procedural statutes. These
2 are processes that federal agencies must
3 follow. They don't, however, have results.
4 They're not results oriented or in
5 statutes.

6 So you can follow the process and
7 still have an outcome where a very
8 significant historic property is
9 demolished. That has happened in the past.
10 I'm not saying that this is happening here.
11 But just so you understand and that
12 everybody understands the nature of these
13 types of statutes. They're procedural in
14 nature; they don't mandate particular
15 results.

16 But that being said, your input is
17 very, very critical; and we do want to hear
18 what you have to say.

19 I think you had a question, sir.

20 MR. SCHOCKEY: What are those
21 protections?

22 MS. BLANCO: It's the steps in the
23 process, yes. The national landmark status
24 would require some additional steps. But
25 it's still a procedure that goes forward.

1 MR. SCHOCKEY: Omission of those steps
2 to prevent such a --

3 MS. BLANCO: They're not necessarily
4 to prevent or to protect. As I said, it
5 doesn't mandate particular results. But
6 there are procedural steps that inform the
7 decision, and that information is really
8 very important to us, sincerely, very
9 important to us.

10 Any concerns about moving forward to
11 the next step, to have Lori talk about the
12 APE and the rest of the steps?

13 Okay, Lori.

14 MS. PRICE: Thank you.

15 Okay. Let's see. So what you have
16 upon the screen -- those of you who had
17 registered earlier as consulting parties
18 might have received this, but we have many
19 people in the room today who did not
20 receive that report. So I just thought I
21 put it up there so we can all take a look
22 at it.

23 Part of the Section 106 process that
24 we're talking about is, as Caroline
25 explained earlier -- you have to go out and

1 look at what the area that you're affecting
2 would be, whether it could be historic
3 properties -- that is those things that are
4 eligible for or listed in the National
5 Register. They might have some of those
6 resources in the project area and they
7 might be affected. So we figure out what
8 that APE is.

9 We identify those historic properties
10 that are within that APE and then we
11 analyze what the effects of the proposed
12 project might be on those historic
13 properties that are within the APE. If the
14 project is going to affect them -- the
15 terminology is "adverse." So if there's
16 going to be an adverse effect on those
17 historic properties.

18 Then we go further in our consultation
19 with the SHPO and our other consulting
20 parties and we consult about how we would
21 address those effects: is there something
22 we could do to avoid those effects; can we
23 minimize those effects. If we can't, we
24 move on to how we would mitigate for those
25 adverse effects.

1 At the end, we come up with a legally
2 binding agreement document that stipulates
3 specifically what we're going to do, how
4 we're going to minimize or mitigate those
5 effects. Then we sign that document. When
6 it's signed, it goes to the Advisory
7 Council, where it is permanently placed on
8 file for the permanent record. And that is
9 basically sort of the conclusion of that
10 Section 106 process.

11 So to answer your earlier question, it
12 is a process where we evaluate; we consult;
13 we go back and forth; we compromise; we
14 work to get to an ending result where we
15 have successfully followed all of those
16 steps that are prescribed as part of that
17 process.

18 So that's kind of where we are. We
19 are in that consultation part or the phase,
20 and we have prepared the report, the draft
21 report which has gone to the SHPO. They
22 review it and they are going to give us
23 some comments.

24 And I'd like to kind of go over it
25 briefly with you, and then you can also

1 provide us some comments as well.

2 MS. BLANCO: Along those lines with
3 the comments, what would be really helpful
4 is if you could provide those comments on
5 or before December 12, when the NEPA
6 comments are due. Because we can take
7 those comments and incorporate them and
8 make them applicable to the Cultural
9 Resources Section of our Draft EIS, so we
10 can respond to them under that statutory
11 frame as well, as under Section 106. It
12 would serve two purposes, in other words.

13 MS. PRICE: Thank you. That's
14 actually true.

15 I know that we spent most of the time
16 this morning going over the proposed
17 alternatives. Ralph is here, and we can
18 speak to the -- Hilda is shaking her head.
19 Is there anyone that would like for us to
20 go over the proposed alternatives again?
21 We could do a brief summary. What we can
22 do is a summary.

23 AUDIENCE: No.

24 MS. PRICE: No. Okay. I just wanted
25 to make sure. So we'll skip this section.

1 That's the same stuff you've already seen.

2 So we talked about the Area of
3 Potential Effects. In this case, since the
4 Arecibo Observatory was already listed in
5 the National Register -- is listed
6 as -- you should know this, and I don't
7 think we clarified this earlier. It is
8 listed as a historic district. So it is
9 actually 118 acres that is listed as a
10 historic district. Since we sort of
11 already had the district, it was fairly
12 easy to draw our APE and we just went ahead
13 and included the entire historic district
14 in the boundaries of the APE. Then we
15 submitted that to SHPO also.

16 Just very briefly, under Section 106,
17 it allows you to have -- allows a federal
18 agency to have three different findings.
19 You can have a finding of no historic
20 properties affected, which would be, for
21 instance, that there are no historic
22 properties, if the Observatory was not a
23 historic property, or if you were doing
24 something where you wouldn't be affecting
25 any historic properties.

1 The second finding is what we call "no
2 adverse effect," which is where you have a
3 historic property and you're doing some
4 things but not anything that is going to
5 negatively impact those historic
6 properties. So you have a historic
7 property in your -- you're going to do some
8 renovations, but they are all positive
9 things and beneficial and wouldn't have an
10 adverse effect to the property. But it
11 would still affect it, obviously.

12 And then the final finding is an
13 adverse effect, which is where you have a
14 historic property and you're doing
15 something that would affect it in a
16 negative way, usually fairly significantly.
17 So if you have a demolition or you're going
18 to transfer out of federal ownership or
19 you're going to -- if you have a house, a
20 small historic house, and you build a very
21 large addition on to it and that makes the
22 original house no longer look the same. So
23 those kinds of things would be considered
24 adverse effects.

25 Those are the only three findings that

1 are allowed under Section 106.

2 (Showing in the slide) The blue line
3 is the APE boundary. This is just showing
4 it on the USGS map; and the big grey
5 circle, of course, the dish.

6 We did go out and do a survey of the
7 property and we had the nomination with us
8 that was already written by the SHPO's
9 office. It identified the properties that
10 are -- would be called "contributing" to
11 the historic district. So those are the
12 properties in that giant 118 acres that are
13 considered to be important components that
14 contribute to the history of the district
15 in a significant way.

16 There are also several pieces in this
17 very large district that are not
18 contributing. We call those
19 "non-contributive" elements, things that
20 are not architecturally significant, or not
21 significant from an engineering stand
22 point, or they didn't contribute to the
23 association with historic events that the
24 Observatory district was listed for.

25 So on this one -- (to Ms. Hamilton) if

1 you scroll a little more, there's a key at
2 the bottom. (Showing in the slide) There's
3 the dish. So you see the color code there.
4 Each of the buildings is numbered and shown
5 on the map. The darker green ones are the
6 non-contributing elements and the lighter
7 green ones are the contributing elements.

8 In the report, which is available for
9 you, there is actually an appendix on the
10 back which has a table, and it lists every
11 property and whether it is contributing or
12 non-contributing. And then you can take
13 that table and go reference this map and
14 see where all the pieces are.

15 MS. ZAMBRANA: Does the company that
16 is doing the Environmental Impact Statement
17 have access to this report too?

18 MS. PRICE: We are the same company,
19 so yes.

20 MS. ZAMBRANA: I need to process that.

21 MS. PRICE: We are a company that does
22 environmental compliance. My role in that
23 company is -- I'm the Cultural Resources
24 specialist. I specialize in Section 106
25 compliance and other laws that apply to

1 Cultural Resources. So I am part of that
2 company and this is what I specialize in.

3 MS. ZAMBRANA: It seems that --

4 MS. PRICE: I do all the cultural
5 resources stuff.

6 MS. ZAMBRANA: It seems that some of
7 the -- when you get the list of buildings
8 that are contributing or non-contributing,
9 there's quite a few buildings that are
10 contributing that are still listed on
11 possible -- under Alternative 1, where
12 worst case scenario came to be and they
13 need to be demolished.

14 So I guess it's kind of going back to
15 John's question. It's like a catch 22:
16 I'm doing an environmental impact
17 assessment on a site that could be
18 historic, but it's not a landmark, that
19 part, yet. An outcome of that study could
20 be what happens if I demolish it.

21 MS. BLANCO: We consider the
22 significance of the structures before
23 making a decision, whether it's to keep
24 them or not to keep them. So the analysis
25 just looks at the effects. And going

1 through this process we are looking at what
2 would the effect of Alternative 1 be with
3 those 26 buildings. If we just take that
4 as an example, then when we go through the
5 process when we say whether those are
6 adverse effects.

7 Of course, if they are going to be
8 demolished, those are adverse effects on
9 some of the contributing properties. So,
10 then, what do we do? We work as a group
11 here and consult on ways to avoid,
12 minimize, or mitigate those adverse
13 effects.

14 And also, again, keep in mind that the
15 ultimate decision -- if, for example, a
16 solicitation came -- a response to the
17 solicitation came through and there was an
18 entity that said, "We are willing to take
19 over operations and NSF may have a piece of
20 it," we are not quite sure how that works.

21 But let's say it still remains under
22 federal ownership and they say, "We want to
23 keep all of those building." That's a
24 possibility. Nobody says that it has to be
25 all 26 buildings wiped out at all.

1 MS. ZAMBRANA: But it's also a
2 possibility that you're not.

3 MS. BLANCO: It is. And the reason
4 why that --

5 MS. ZAMBRANA: Is it equally weighed?

6 MS. BLANCO: Right now we just don't
7 know. It's too early in the process to be
8 able to answer that. We just don't know.
9 Nobody has come forward and said, "We are
10 willing to take this over," and so forth.
11 So it's still very early in the process.

12 The reason why -- I tried to explain
13 this at the last meeting. The reason why
14 we analyze such a large number of
15 properties to be demolished is because we
16 want to have done the maximum environmental
17 review, because, for example -- and I
18 explained this to some of you after the
19 meeting. If, for example, you had a
20 solicitation that came in and said -- let's
21 say that we only analyzed only 10
22 buildings, to go along with Alternative 1,
23 and then an entity says, "We want to take
24 it over," and it's a viable entity and we
25 thought this is going to be a good thing

1 and we would go for it, but they say they
2 really want to take down 14 buildings to
3 make it work, we'd have to do additional
4 environmental compliance to cover those
5 extra four buildings.

6 This way, if we looked at the maximum,
7 then we've already covered the analysis and
8 we can choose a lesser included number or
9 no number, but the analysis has already
10 been done. So it doesn't mean for certain
11 if we choose Alternative 1 or going with 26
12 buildings. That's not the case. It's the
13 coverage of the analysis.

14 MS. PRICE: The other thing to keep in
15 mind is that the district was listed in
16 2008, and that's when they decided and
17 agreed that the district was eligible and
18 would be listed in the National Register
19 and that these were the contributing
20 buildings and the contributing elements to
21 that district. So that was done back in
22 2008.

23 Now, with this proposed action, which
24 is much later in time, we take what we had
25 already decided was historic in 2008 and

1 had all agreed on that, and then look at
2 that in light of what the current project
3 is. So that helps to make it a little bit
4 more clear.

5 MR. ISHAM: Brett Isham. I don't know
6 if this is an appropriate comment at this
7 time, but on that map there, the large
8 green building at the top left is in the
9 wrong location. That is not its actual
10 location. It's farther up, more or less,
11 to the north. I don't know why it's there
12 on the map. That's the newest visiting
13 scientist quarters.

14 Also, I don't know why or why not the
15 L-shaped, upside-down (coughing,
16 unintelligible) building. That's the
17 original Visiting Scientist Quarters
18 Building. So I don't know if that would
19 make it historic or not, but it is the
20 original.

21 And then there's two little green ones
22 sort of to the right, at the large -- those
23 are two of the second group of visiting
24 scientist quarters, like two family groups.
25 One of those was where Jodi Foster was in

1 the "Contact" movie, as a point of
2 interest; I mean, if that's historical.

3 MS. PRICE: Thank you for those
4 clarifications. I know that this map has a
5 few things that aren't in exactly
6 the -- it's not the "perfectly-to-scale
7 map." I think that we were trying to show
8 things that they could get all in one page.

9 MS. SUEIRO: Just a brief comment.
10 The National Register Nomination is in our
11 website when you open our page. It's
12 triple "W" and then "oech.pr.gov." There
13 is a map, an interactive map, and you press
14 on "Arecibo" and "Observatory." You can
15 download the original nomination and you
16 can send us comments, and we will be glad
17 to correct something or let everybody know
18 if we have something wrong.

19 When we nominated the property at that
20 time, the director of the Observatory -- we
21 sent it to them, and they commented. But
22 new information is good to have. So please
23 write to us, send it to us. We'll work
24 with you guys to fix it.

25 MS. BLANCO: And it sounds like an

1 appendix to this report.

2 MS. SUEIRO: Anyhow, they can download
3 it.

4 MR. BABILONIA: In terms of the dish
5 itself and the receiver and the towers,
6 wouldn't that be as important as the
7 buildings themselves?

8 MS. BLANCO: Absolutely. It is
9 buildings and structures. (Showing in the
10 slide) There you see this.

11 MS. PRICE: It's hard to see on this.
12 But if you have the report, you look at the
13 table and then you can flip back to the
14 map. That makes it a little bit easier to
15 read.

16 MR. BABILONIA: It's "contributing"
17 what is in the light green, not the --

18 MS. PRICE: The light is the
19 "contributing."

20 MS PANTOJA: I have a question. Under
21 this Section 106 there is a cultural
22 aspect, and now you're getting comments
23 here. But the Observatory is important for
24 the people of Puerto Rico. How is their
25 opinion and their love for the telescope

1 and the cultural importance that it is for
2 them -- how are they going to communicate
3 that aspect? How does Section 106 attend
4 to that? I still don't understand.

5 MS. PRICE: What we were saying
6 earlier was that Section 106 is a very
7 prescribed law. It only applies to those
8 things that are listed and/or eligible
9 before the National Register of Historic
10 Places. And this district is listed in
11 the --

12 MS. PANTOJA: But if you want to
13 listen to what the people --

14 MS. PRICE: And this is why we have
15 the greater NEPA process.

16 MS. PANTOJA: Yes. But to who --

17 MS. PRICE: Anyone can send in
18 comments. But the NEPA process looks at
19 those types of bigger picture issues. This
20 is really just on the historic property
21 part.

22 MS. BLANCO: I think that what you
23 mentioned is a really important comment. I
24 think this is something that if we were to
25 ultimately reach an agreement -- I could

1 see that comment being in what we call the
2 "whereas clause," at the beginning:
3 "whereas the people of Puerto Rico
4 recognize the cultural importance of this
5 facility." So it will be reflected on
6 that. I think it is important for us to
7 hear that it's culturally important.

8 MS. PANTOJAS: It's very important.

9 MS. BLANCO: If you want to, as I
10 said, send in comments before December 12.
11 You may want to say in your comments that
12 these are both comments that are in
13 response to the Technical Report under
14 Section 106 and in response to the Cultural
15 Resources Section of Draft EIS. That would
16 be helpful. Then we could respond to that
17 important comment and others in the
18 documents, in the Final EIS under NEPA.

19 Then, as we move forward and start to
20 talk about whether it is a problematic
21 agreement or whatever document we use to
22 resolve adverse effects we can certainly
23 have that reflected in there. Thank you.

24 I think Ralph --

25 MR. GAUME: I had a question. I can

1 always ask you questions later. But this
2 question may be of interest to everybody,
3 and I don't know the answer. So I'd
4 appreciate your comments.

5 In astronomy this is an observatory,
6 and technology is always moving forward
7 with our telescopes. Under Alternative 1,
8 if the Observatory continues to operate and
9 upgrades to the technology would be desired
10 down the road, as they must certainly would
11 be, and those upgrades would result in some
12 significant changes to the configuration of
13 the instrumentation, or the structure, or
14 the feed, or something that was considered
15 historically significant, what sort of
16 process do we have to go through to do
17 those upgrades under Alternative 1?

18 MS. BLANCO: I think that part of the
19 answer to that question is whether it
20 remains in federal ownership. If it's
21 federal ownership, NSF would still have a
22 role and we would go to a Section 106
23 process for that. So we would have to
24 consult on that and go through the same
25 steps: determine the Area of Potential

1 Effects; look at historic properties within
2 the Area of Potential Effects; whether
3 there are effects; if there are, are they
4 adverse. If so, we work through with the
5 SHPO and consulting parties ways to avoid,
6 minimize, or mitigate those effects. So
7 that is definitely the case.

8 If, for example, we look at
9 transferring the property out of federal
10 ownership to an entity to operate it, that
11 may be something this group would want to
12 talk about: whether it should be in a
13 programmatic agreement to say, "We'll
14 address this once that fact becomes known,"
15 if it does become known, so we could look
16 at some ways. You know, maybe it could be
17 a contingency that a new operator would
18 consult with the SHPO before going ahead.

19 I mean, there are a lot of ways we can
20 deal with that. But, if it remains in
21 federal ownership, we still have a Section
22 106 obligation.

23 MS. SUEIRO: If it goes out of federal
24 jurisdiction, the process -- that would be
25 an adverse effect. And we would really and

1 strongly support a preservation covenant
2 that guarantees perpetuity. We have
3 several -- our office is located at Cuartel
4 de Ballajá. That area in front of El
5 Morro, from the parking up to El Morro,
6 Casablanca, Institute of Puerto Rican
7 Culture, all that area, the Hospital, those
8 buildings have preservation covenants.

9 That's usually signed between the
10 federal agency that is transferring the
11 property to the other entity, and there are
12 stipulations that guarantee the
13 conservation and preservation of the
14 historic property. You know, because we
15 mentioned it the other day, if it goes
16 totally out of federal ownership, we would
17 support very strongly a preservation
18 covenant at perpetuity to whoever receives
19 the property.

20 The Advisory Council on Historic
21 Preservation can also be contacted by the
22 community, because they want to hear what
23 the community has to say. So any
24 Consulting Party can send them a letter.
25 They are the other federal agency by law,

1 by the National Historic Preservation Act
2 that is responsible of receiving the views
3 of the public and other interested
4 consulting parties. So you can contact
5 them. They want to know what everybody out
6 there wants to say. We don't have that
7 role because we are not regulatory, but
8 they do.

9 MR. VAN EYKEN: I just want to go back
10 to something that Ralph said. He commented
11 that he did not know the answer to the
12 question of what would be the impact of
13 maintaining large-scale upgrades.

14 There should be written input from the
15 scoping exercise of Environmental Impact
16 Statement suggesting exactly what we
17 consider, the increases in the number of
18 tourists or increases on the operation of
19 the Observatory. I think it's pretty
20 strange for us to come along now, for NSF
21 to say, "Oh, we don't have an analysis of
22 those things," when we actually suggested
23 in that scoping, precisely, (inaudible) the
24 whole process.

25 MS. BLANCO: I'm not sure I'm really

1 understanding your comment. Could you
2 please repeat that?

3 MR. VAN EYKEN: Yes. This goes back
4 to the process of the scoping exercise for
5 the Environmental Impact Statement, and by
6 extension to this, that we asked for things
7 to be considered in that process that were
8 involved with upgrades to the facility;
9 that were involved with increases in the
10 future, not just decreases, or closing, or
11 such things.

12 None of that was chosen to be part of
13 the Environmental Impact Statement. And I
14 think it's quite strange for NSF now to
15 stand up on this meeting and say, "We don't
16 know the results of expanding something.
17 Why wasn't that considered?" And it seems
18 to me that it just casts doubt on the basis
19 of this whole process.

20 Okay. You hold a scoping meeting; you
21 listen to everything everybody says. Then
22 you ignore the lot, and you do the thing
23 you want to do. You come to this meeting,
24 and listen to everything that people say,
25 and you ignore the lot. It just looks so

1 terribly bad.

2 MS. BLANCO: I really appreciate that
3 comment. I think it's really important for
4 us to understand how you view things.

5 First of all, perhaps one reason there
6 may be some -- if someone could draw that
7 conclusion it's because of how the NEPA
8 process works and how 106 works. They are
9 two different processes.

10 I looked at Ralph's question as "What
11 if we were presented in the future with
12 proposed upgrades? Under a new operator,
13 how would we handle that?" So I answered
14 the question with regard to that. And it's
15 a speculative thing because there is
16 nothing that's been proposed at the moment.
17 So that's how that works.

18 With regards to the scoping comment, I
19 don't recall your precise scoping comment
20 at the moment. But we need to be very,
21 very careful in maintaining the integrity
22 of the administrative process under NEPA.
23 I can't address specific comments that were
24 raised there. It will be in the documents
25 themselves. But what I can say is, in

1 general, if there is a comment made during
2 a scoping meeting or during this public
3 scoping process and it is something -- I'd
4 have to look at exactly what the comment
5 was or what the nature of the comment was.

6 If it says, "Consider potential
7 upgrades" -- I mean, part of it is -- it
8 becomes very difficult for purposes of
9 conducting an environmental analysis to
10 consider all possibilities out there. So
11 what we would take a look at, for example,
12 under Alternative 1 here is -- if a
13 response came to a solicitation and the
14 contours of that response were such that
15 there needed to be some additional analysis
16 done because it wasn't covered under the
17 DEIS process, we would have to do that.

18 Our hope is to keep things as broad
19 enough as they can be and more generalities
20 so that it provides the broadest coverage
21 in terms of environmental review that would
22 then allow the flexibility for any
23 possibility to come up. But we can perhaps
24 talk more off line on that.

25 MR. ALTSCHULER: Just a general

1 comment, which I think points to me to a
2 sort of disconnection between our
3 discussion this morning and the one here,
4 just as disconnected as the rooms were.

5 It doesn't make any sense to me. We
6 are talking about a national monument or
7 whatever you want. To me is a monument to
8 human curiosity. But it's a very different
9 thing. And you can have a monument, a
10 statue, an old bridge, an obelisk
11 somewhere, and you can preserve it. Fine.
12 But this is not the case.

13 You cannot have this as a monument
14 without its operation. You cannot have
15 this as a monument and just say it looks
16 nice, because it wouldn't work. The first
17 thing you would have is some very tragic
18 accident at some point down the line if you
19 left it as an alternative that is
20 ridiculous, actually, and which you
21 suggest: mothballing. As if we didn't
22 have enough mothballing in the universe.
23 It's stupid.

24 How can you mothball something of this
25 size in this climate? All you're going to

1 ask is for the federal government to be
2 liable for some kid who slipped after he
3 climbed the tower and fell down to the
4 ground. So that's a useless, stupid
5 consideration. I'm sorry to use those
6 words, but whoever thought of that deserves
7 them.

8 But, anyway, I think it's not a matter
9 of preserving a monument as if it were an
10 obelisk or some statue. Either you have an
11 operation, and it is a monument, certainly,
12 or you have nothing. You cannot have one
13 thing and not the other.

14 This morning I said that the cheapest
15 and best thing you can do at the NSF is
16 figure out your own problems, pay the 12
17 million a year, and continue, because there
18 is a lot of science to be done, a lot of
19 unique science to be done.

20 Yes, it is a monument that you're only
21 going to turn into trouble whichever
22 solution you want. And if you expect,
23 after all this, in the 20 years of
24 "open or close," "open or close" that
25 somebody from outside is going to come and

1 say, "Oh, we are going to give you a lot of
2 money," for us to use it, again, you're off
3 base. I think the cheapest -- it's
4 peanuts. Twelve million dollars is nothing
5 for the National Science Foundation. I
6 think it would take someone inside the
7 National Science Foundation to convince
8 either the Division of Physical Sciences or
9 the National Sciences director that for 12
10 million dollars you're getting a bargain
11 and that you're getting out of a problem
12 that is now 20 years old.

13 I remember when we suffered the
14 considerations of "Do we keep it up? "Do
15 we don't keep it up?" And I think that for
16 20 years a lot of people and a lot of
17 scientists and a lot of administrators,
18 including myself, had to suffer all this
19 mistreatment by the National Science
20 Foundation, who didn't seem to know, and
21 doesn't seem to know, what it is that they
22 really wanted to do. And it demoralized
23 the staff. People were saying, "Oh, they
24 are going to close. They are going to fire
25 me. We won't have the money to do what we

1 want to do." In the end NSF lost; the
2 scientific world lost; and we are still
3 here, 20 years later, still discussing the
4 same thing, only a bit worse.

5 So I think it really is an exercise in
6 futility. Is it a national monument or
7 not? Of course it is, and it's very
8 important to Puerto Rico, as we already
9 mentioned, and it's important to science.
10 Just because somebody has a bigger one
11 doesn't make any difference. It's 12
12 million dollars out of a budget of 7.5
13 billion in the National Science Foundation.
14 I think somebody at the National Science
15 Foundation should be able to resolve the
16 problem without all this hoopla.

17 MS. BLANCO: Thank you.

18 I think there was another comment
19 here.

20 MR. SHOCKEY: I just want to clarify
21 what I think the gentleman on the back was
22 trying to say.

23 When I read these documents -- and,
24 again, it was very brief. It doesn't
25 present that there's an alternative that

1 things could get better, that the incoming
2 partner would want to do more things right.
3 In fact, if you look at all the options,
4 the only option that doesn't really say
5 that most likely there's going to be
6 deconstruction is "No action." All the
7 other options say there is going to be
8 deconstruction.

9 And Dr. Isham, in his comment this
10 morning -- so when someone reads that, they
11 come away with the interpretation that "Oh,
12 it's already sort of been decided that
13 deconstruction is going to happen because
14 NSF is not going to fund it at previous
15 levels." Then, if you take it to the next
16 logical step, by definition of what we've
17 already gone through, there is an adverse
18 effect.

19 So it does seem to be -- if it's not
20 results oriented, what is this process
21 leading us to? If we already know those
22 are the options on the table and all of
23 them present adverse actions, what is this
24 process really doing?

25 MS. BLANCO: I think that one of the

1 things that we have learned -- and we heard
2 about this even before coming out to Puerto
3 Rico that there was confusion about 26
4 buildings set in stone. We are taking
5 those comments back and we'll address them
6 in the Final EIS. So hopefully there will
7 be better clarification.

8 MR. CORDOVA: You mentioned that you
9 are trying to be as inclusive as possible
10 when you selected those buildings.
11 Wouldn't we need to be inclusive as well
12 for other ideas regarding the upgrade that
13 Tony mentioned earlier? For example, if I
14 were to suggest to double the size of the
15 dish -- no, no. I'm not joking. If I were
16 to double the size of the dish to make it
17 the largest, single radio telescope dish in
18 the world once again, wouldn't that need to
19 be -- that would have to admit the
20 environmental impact of its surroundings.
21 How do you make the decision of what is the
22 most inclusive option?

23 MS. BLANCO: Well, I think, with
24 regards to the example you gave -- I mean,
25 what agencies look at in identifying a

1 range of reasonable alternatives -- if you
2 take a look at what is a viable
3 alternative, a proposal such as increasing
4 the size of the facility -- and I'm going
5 to speak in generalities. So I'm not
6 commenting on the Draft.

7 If that is something that has been
8 proposed and an agency views it as being a
9 viable option, it could be part of what is
10 analyzed in the NEPA process, in the Draft
11 EIS. But if it's not been presented as a
12 viable option -- you know, these endeavors,
13 these analyses are very time consuming,
14 very expensive, very thoughtful, and are
15 difficult for everybody, very difficult for
16 everybody. There's a lot of effort that is
17 being expended in these processes.

18 So that's one reason why we look at a
19 viable range of alternatives, a reasonable
20 range. So that's what we would look at.
21 That's not to say that down the line
22 something could be proposed at a facility
23 that might extend it. And if you have
24 something that is realistic, that is
25 presented to an agency and an agency

1 considers it, then, you would follow that
2 up with appropriate environmental reviews.

3 MR. GAUME: Let me make another
4 comment, partly in answer to the National
5 Science Foundation from the
6 programmatic -- from my level. It is
7 responsive to the community, and the
8 astronomy community puts together these
9 decadal reviews. And I'm not trying to
10 undermine what your personal science is,
11 but the personal science of the entire
12 astronomy and astrophysics community is
13 supposed to come together. They're
14 supposed to come together under the
15 auspices of the National Academy to put
16 together these decadal reviews. Okay?

17 We did the decadal review in 2010.
18 We're gearing up to do a decadal review in
19 2020 -- or the National Academy is gearing
20 up to do that. Just to use that example,
21 making the world's largest radio telescope
22 here in Puerto Rico, or anywhere, didn't
23 appear anywhere in the last decadal report.
24 If it appears in the next decadal report,
25 then, that's something that NSF will have

1 to --

2 MR. CORDOVA: Yes. But demolishing 26
3 buildings, was that on the decadal report?

4 MR. GAUME: No. The decadal --

5 MR. CORDOVA: That's my point.

6 MR. GAUME: The purpose of the decadal
7 report is to advise NASA, the National
8 Science Foundation, and the Department of
9 Energy on what major projects in astronomy
10 to undertake in next decade. The last
11 decadal report emphasized LSST, and the
12 previous decadal reports emphasized ALMA
13 and the whole bunch of NASA missions and
14 (unintelligible) missions to the extent
15 that our budgets allowed. NSF has tried to
16 address those.

17 That's how the process works in the
18 larger astronomy, regardless of -- you
19 know, if my personal science -- and I used
20 to be a scientist. If it depended upon
21 Arecibo Observatory, that's the most
22 important observatory to me. But somehow
23 the needs of my science get blended in
24 these decadal reports.

25 MS. BLANCO: I'm going to turn to

1 Joan. She's been waiting quite a while.

2 MS. SCHMELZ: I really want to return
3 to Carmen's question because I don't think
4 it really got the attention that it
5 deserved. It has to do with the cultural
6 part of this process and how important the
7 Arecibo Observatory is to culture of Puerto
8 Rico.

9 I think of it as Puerto Rico's
10 telescope. So my question is, how do you
11 get input from the people of Puerto Rico as
12 opposed to just, let's say, the 20 people
13 in this room, to say to you how important
14 this is as part of Puerto Rican culture?

15 MS. BLANCO: You raise a really good
16 point.

17 One of the biggest challenges that all
18 agencies have in these processes is trying
19 to do appropriate outreach and to let
20 people know about these different processes
21 that are under way. So we end up
22 publishing in the Federal Register, which
23 is a standard way of doing things.

24 But we also have looked at a variety
25 of ways of trying to reach out through

1 newspapers, local newspapers both
2 Spanish-speaking and English-speaking, the
3 major newspapers that are out.

4 MS. PANTOJAS: But those were the
5 printed ones.

6 MS. BLANCO: The printed ones, but we
7 also -- and Ivy is here right now, our
8 Public Affairs person. We posted on our
9 NSF websites; we have tweeted; we have
10 looked at all of the astronomical
11 societies, from my understanding. We've
12 looked at -- I don't even know how big our
13 list of stakeholders is, but it is
14 substantial. And we've reached out to SRI
15 to ask them for a list of stakeholders.

16 So we tried to be as inclusive as we
17 possibly can and to get the word out as
18 much as we can. No doubt we are not going
19 to reach everybody. We certainly make a
20 tremendous effort. If you know of other
21 efforts you'd like to suggest, by all
22 means, please do.

23 MR. ALTSHCULER: I suggest you publish
24 it in the main newspaper of Puerto Rico, El
25 Nuevo Día.

1 MS. BLANCO: I think we did.

2 MS. PANTOJAS: But not the electronic.
3 People don't buy the paper anymore, the
4 printed version.

5 MS. BLANCO: I think it appeared in
6 both. Did it not?

7 (Voices overlapping.)

8 MS. PANTOJAS: Nobody buys the printed
9 newspaper.

10 MR. ALTSHCULER: Nowhere in the news
11 in Puerto Rico has appeared that this is
12 going on.

13 MS. PANTOJAS: Even today the only
14 thing that appears is the meeting that you
15 had in June or July.

16 MS. BLANCO: So we'll take that
17 comment back and see if it is -- if we
18 can -- Kristen, do you want to --

19 MS. HAMILTON: No, just wanted to
20 say -- but it can...

21 MS. BLANCO: We can take a look at
22 that. But I think the intent was certainly
23 to put it in widespread documents.

24 Just as a note, this meeting is
25 scheduled to go until 2:30. We're trying

1 to see if we can stay until 3:00. Yes, I
2 think we have permission to stay until
3 3:00.

4 MS. COLÓN: I appreciate all these
5 efforts and I do appreciate Dr. Carmen
6 Pantoja's question and Joan's support.

7 On our side, we have to say, of
8 course, that this is the only place in
9 Puerto Rico that we are doing at the same
10 time science and telling about it to the
11 whole public. This is the only place in
12 which we can do this. Any other place we
13 are either teaching but not telling the
14 whole public. Any other place we don't
15 receive visitors; we don't receive 100
16 thousand persons coming to it every year,
17 even with the difficulties that it takes.
18 We don't get this kind of opportunity
19 anywhere else.

20 I know that it sounded like a joke
21 when I said at a meeting of one of our
22 committees that I was in charge one day and
23 one of the old ladies turned around and she
24 asked me, "Do you work at the Observatory?"
25 I said, "Yes, I do. I have a part in it."

1 Then she says, "You're not closing it,
2 please. Please, don't tell me." She was
3 an old lady and she was worried about it
4 when she said it, because this is who we
5 are. And I want my grandchildren to visit
6 and to be proud of it.

7 I know that this is not scientific,
8 but it's cultural. It's who we are. It's
9 part of really being Puerto Ricans
10 interested in science and being a part of
11 the world, both the scientific world and
12 also the cultural world that we are
13 representing this way. And it needs to be
14 represented in English and in Spanish, and
15 it needs to be represented in the way that
16 our children understand. It needs to be
17 kept because it's the only best way that
18 I've seen, and I was at the University of
19 Puerto Rico for 33 years, we can really
20 tell and inform about science right in the
21 middle of it.

22 So please take this into
23 consideration. I know that there is no way
24 that we can do a survey or send out
25 questionnaires. But let me tell you, this

1 is a feeling that the whole country carries
2 with it.

3 Sorry I'm sounding too emotional, but
4 it's because I am.

5 MS. SCHMELZ: I just wanted to say
6 that I've heard Hilda tell the story
7 before, and I have to give the extra added
8 pieces that she didn't described.

9 She asked the priest at her church to
10 please be able to speak to the
11 congregation. And I know that I asked her,
12 "Hilda, did you preach from the pulpit?"
13 and she said, "No, no, no. I couldn't
14 possibly do that." She was too
15 intimidated. But I told Ralph at the time
16 that Hilda has spoken to God. She spoke to
17 her congregation and to God, and everybody
18 agrees that the Observatory has to remain.

19 MS. RIVERA: You said that you posted
20 it on the webpage and all that. But what
21 about the educational sites? Why don't you
22 do reunions and school meetings at
23 institutes, because at least in my school
24 we haven't learned about the things that
25 happen in the Observatory.

1 So I personally think it would be good
2 for you to inform not only -- particularly
3 to the students, it has a very important
4 meaning to us.

5 MS. BLANCO: Perhaps, maybe if you
6 know of a part of the school that would be
7 a good part to contact and put them in our
8 contact list. It's a good way of reaching
9 out students. Some of it is -- there are a
10 lot of good recommendations like that. And
11 if we have a name or contact, we could
12 reach out.

13 MR. BABILONIA: In terms of social
14 media, I wrote or read about the
15 Observatory; and, basically, as a citizen,
16 I wrote them in Facebook and Twitter.
17 Similar to what I have done, I think that's
18 something that you can do as well, with a
19 higher scope, of course, and reaching a
20 larger audience.

21 MS. BLANCO: We do have a Twitter
22 account and we have tweated these public
23 meetings, I think, on the NSF Twitter
24 account. Or maybe is the Mathematics and
25 Sciences Account? I think it's on that.

1 Also, I think we have tweated it on another
2 account, maybe the Division of -- so we
3 have reached out and used social media.

4 If Ivy were in the room she could
5 explain more. But maybe Daniel -- thank
6 you.

7 MS. PANTOJA: I knew, for example, of
8 the two meetings. Those were on the
9 register announcement. But I didn't know
10 of this meeting in the afternoon. I've
11 learned about that in Arecibo.

12 MS. BLANCO: It's on the announcement.

13 MS. PANTOJA: The other thing -- for
14 that reason I'm not prepared for this
15 meeting, to have the comments. I can only
16 tell you anecdotally, like her (pointing at
17 Ms. Colón).

18 I teach the descriptive astronomy
19 course at the University of Puerto Rico,
20 and I make an effort to take those students
21 to the Observatory each time I teach this.
22 These are students that will be the future
23 professionals. They are the students that
24 are going to be in science. This is the
25 course for everybody. I do this effort to

1 teach them the importance of connect it
2 with the class, which is astronomy. And I
3 expanded it so that they can invite
4 everyone.

5 The first time I did that, to my
6 surprise, they bring their parents; they
7 bring their siblings. And this is
8 anecdotic; this is something that doesn't
9 appear in the reports. But that is being
10 done. The grandmother goes to this, and
11 you have college level students taking
12 their parents and their grandmothers; and
13 they are asking questions, very good
14 questions, by the way, that make the event
15 all very significant, because the students
16 see the importance, the family sees the
17 importance.

18 That's another dimension of outreach
19 that is not reported but happens. And if
20 we don't have the telescope, if it's not
21 working for research, that's gone.

22 MS. BLANCO: Well, that would be
23 something I'd ask -- if you wouldn't mind
24 submitting that as a comment as well.

25 I mean, I understand the bringing of

1 children. I once had a family vacation
2 here in 2008 and I brought my entire family
3 to the Arecibo Observatory. So, yes, we
4 are aware of that.

5 If you can comment on that, it would
6 be helpful, by December 12, so we can have
7 it again and count for both.

8 I just wanted to take a
9 moment -- here's Ivy Kupec from our Public
10 Affairs Office at NSF. She can explain
11 what social media efforts and outreach
12 efforts were made.

13 MS. KUPEC: So the social media
14 efforts that we've done from NSF -- we've
15 promoted the meeting and the comment period
16 on the Twitter feeds for the Mathematical
17 and Physical Sciences Directorate as well
18 as the Geosciences Directorate.

19 Our main Twitter feed and our Facebook
20 pages are devoted specifically for more
21 consumer-friendly things that are just
22 talking about, like, feature stories, about
23 science specifically, not the inner
24 workings of the Agency. So that's not
25 where we place the notices about the

1 meetings.

2 Additionally, we have fact sheets that
3 have been put on our website.

4 MS. PANTOJA: Do you have a hashtag to
5 send?

6 MS. KUPEC: Oh, no. That's a good
7 idea. That could be something we'd work on
8 together with the Arecibo Observatory.

9 Ricardo and I have talked. It was
10 nice I've got to finally meet him here so
11 we can work together better. And we've
12 actually talked about ways -- since we
13 didn't have any traditional media
14 attendance meeting, it concerns me as much
15 as him because it doesn't do anybody any
16 service to not have media come to this
17 things.

18 They need to be able to be informed so
19 they know all the information about what's
20 going on. It doesn't help anyone when
21 they're not informed. We just saw this in
22 the elections and all this information has
23 become the big story now, right?

24 I've tried to think about
25 ways -- we've talked about ways that -- we

1 talked about potential blogs and coopting
2 some websites for the guest bloggers and
3 things like that in the future we can get
4 more information out together. It is
5 really important to me.

6 I'm from a small town. This is not a
7 big city. Even though this is the capital
8 of Puerto Rico, to me, this seems like a
9 small community, just like the one I grew
10 up in. I'm from a town where the paper mill
11 closed and it really affected the local
12 economy. So I have vested interest in
13 trying to help as much as I can, although I
14 am from the NSF. I have to maintain
15 objectivity. Caroline reminds me of this.

16 We often are debating on wordings
17 because there's a legal language that I'm
18 saying, "Oh, it doesn't sound human
19 enough." But, yes, I want you to realize
20 that the people who are working on this are
21 very much devoted to trying to do the right
22 thing. I don't feel like there's anything
23 duplicitous here.

24 I love the people who I work with. I
25 think they are doing a very good job, and

1 we are really trying to do the best thing
2 for the Observatory, although I'm probably
3 not allowed to say that. But it is really,
4 really difficult for us at NSF as well. I
5 hope you realize that.

6 MS. BLANCO: Thanks, Ivy.

7 And also, again, these processes are
8 not perfect. To the extent that -- again,
9 if you do have ideas about outreach, please
10 let us know. We can continue to move
11 forward on that.

12 I would like to just give -- in the
13 interest of time, if you wouldn't mind if
14 we could just talk about the next item on
15 the agenda, which is "Anticipated Effects
16 From the Proposed Alternatives," just to
17 move forward. Then we'll try to get to you
18 in a moment. I just want to be sure we get
19 at least some of these really important
20 components in this process, before we
21 conclude.

22 MS. PRICE: Just to go back to where
23 we were earlier, this is the table that
24 shows all of the contributing resources
25 currently identified as contributing to the

1 historic district, which the Observatory
2 District. So that's just a table that
3 shows them all. You can reference that
4 back to the map, the one we were talking
5 about earlier.

6 Once we had that all identified, we
7 looked at the alternatives that are
8 presented, as part of this post-project, to
9 see how they might affect those identified
10 historic properties.

11 The first one is, of course,
12 Alternative 1, "Collaboration with
13 Interested Parties for the Science-focused
14 Operations," and as we've discussed a lot
15 for the last two days, part of that
16 alternative contemplates sort of a -- I
17 don't want to use the words "worst case
18 scenario," but trying to encompass what
19 would happen if there were contributing
20 resources that had to be removed in order
21 to -- for this partnership for the
22 continued science space operations to work.
23 So we looked at that scenario.

24 If there were contributing elements
25 that would have to be removed in order to

1 make that partnership work, as we discussed
2 earlier, that would be an adverse effect on
3 the historic property -- on the historic
4 district because we would be removing
5 contributing elements to that district in
6 that particular scenario, in order to make
7 that partnership -- for it to be effective.
8 So that was the case.

9 This is the scenario that's presented,
10 of course, in the DEIS: three historic
11 properties -- and this is not all the
12 resources. This is three contributing
13 elements in the district that would be
14 contemplated for removal under this
15 scenario: Building 2, Building 17, and
16 Building 66 and 68. And then the other
17 historic properties would remain. So that
18 would be an adverse effect if some of these
19 historic, contributing elements were
20 removed.

21 We also looked at what would happen,
22 as part of the operations, if the selected
23 facilities were removed and then it
24 continued to operate. We would still have
25 a historic district. There would be

1 historic properties remaining and still
2 operating and performing a science
3 function. So just from an operational
4 stand point, as things go forward, at this
5 point we would anticipate that there
6 wouldn't be adverse effects to historic
7 properties.

8 Now, that doesn't contemplate some of
9 the things that have been brought up here:
10 that if someone -- that a partner came out
11 and said, "We want to do this, but we want
12 to make tremendous changes to the
13 telescope, tremendous changes to the
14 campus." Then we would have to reconsider
15 that under Section 106 consultation, if
16 that is what was brought to the table. But
17 right now that's not on the table so to
18 speak.

19 As currently contemplated, if we had a
20 new partner that continue to operate it in
21 science-based function, that would not be
22 an adverse effect. Probably the district
23 would remain and it would still function.

24 Alternative 2 is basically the same.
25 It's basically identical, except that there

1 would be different buildings being
2 deconstructed and this additional building
3 contemplated under this current
4 alternative. So basically the findings for
5 Alternative 1 and Alternative 2 are
6 essentially the same.

7 Alternative 3 is the mothballing of
8 the facilities. Because your comment made
9 me laugh earlier, there is
10 actually -- although we use that term.
11 There is guidance that has been published
12 by the National Park Service which
13 addresses how you mothball historic
14 properties, and we talked about this with
15 Berenice. We actually took that
16 preservation brief and used that when we
17 were considering what this alternative
18 might be.

19 So there are very specific things that
20 you do to ensure the continued lifespan of
21 the historic property for a limited amount
22 of time, until such time, as it could be
23 put back into use. This is true for
24 buildings, structures, bridges, all
25 different kinds of things. And that has

1 very prescribed steps that you take to do
2 that mothballing process. I won't read
3 them all to you, you know.

4 So there's the "National Parks Service
5 Presentation Brief 31: Mothballing Historic
6 Buildings." That's the reference. That's
7 also available online, and you can just
8 google that if you go to the National Park
9 Service website. They have a whole list of
10 other preservation briefs and you can just
11 pull them up at the PDF and read them if
12 you really want to see all the details.

13 There are several things that they
14 require: that you document all the
15 buildings before you ceased using them;
16 that you secure them so they can't be
17 broken into or vandalized; that you make
18 sure that there is proper air flow in the
19 building so that they don't get mold and
20 deterioration; that they are secured so you
21 can't climb the fence and fall to near
22 death. Things of that nature.

23 So there are specific steps that would
24 be incorporated as part of that
25 mothballing. And because the buildings

1 will essentially be protected and kept for
2 future use, that also would qualify as a
3 no-adverse effect finding. That's what
4 we've proposed. So in two years, let's
5 say, you could reestablish the buildings
6 and reopen them and the historic district
7 will remain intact. We are not removing
8 any pieces of the historic district. It
9 would remain just as it was and be able to
10 be put back into use.

11 Alternatives 4 and 5 -- since we're
12 running out of time, I'll try to wrap that
13 up. They are also very similar.
14 Alternative 4, of course, is deconstruction
15 of the buildings, and we would keep the
16 foundations. Under Alternative 5, those
17 would not be retained and there would be
18 complete deconstruction of the site.

19 Obviously, both of those alternatives
20 will result in an adverse effect to
21 historic properties because the historic
22 properties will be removed whether almost
23 completely or completely, depending on the
24 alternative. And obviously, if there are
25 no historic structures left, there is no

1 historic district and demolition is almost
2 always an adverse effect under Section 106.
3 So there is that.

4 I think we also have -- so if you want
5 to look at this report, there are a few
6 appendices. One of them is photos, some
7 results from the survey. We did go out and
8 looked and we photographed every structure
9 that's out there for the record. That's an
10 appendix that shows all of these. There's
11 also the National Register Nomination as
12 well.

13 So our next step in this process, as
14 we continue our consultation, would
15 be -- like we talked to Berenice earlier
16 this week, it's to kind of move forward
17 with our resolution of what those effects
18 might be. So, for instance, if we want to
19 have a programmatic agreement, that would
20 give us a little more leeway. It would
21 look at different scenarios and help us
22 decide how we are going to minimize or
23 mitigate, how we're going to address what
24 might be these scenarios that are presented
25 as part of the proposed project.

1 If you do an MOA -- which in this case
2 might be challenging for us because an MOA
3 really addresses one specific undertaking
4 and you know what you're going to do: "We
5 know we are going to do 'X' and here is how
6 we're going to -- and that's an adverse
7 effect; and here is how we are going to
8 minimize and mitigate it." We don't have
9 that scenario in this case because we don't
10 know what we are going to do.

11 So a programmatic agreement allows you
12 to contemplate a wide range of possible
13 outcomes, essentially, and then decide. It
14 gives you a process. So it helps you
15 decide, "Well, if this is what we end up
16 doing, then, we would have to have this
17 process and we would decide on mitigation
18 in this way. If we are going to do this
19 one, then, we would mitigate it this way
20 and maybe we would have this process." So
21 it gives you a framework within which to
22 operate and have a procedure to moves you
23 forward as you go through the process. So
24 I think that's the next thing we'll be
25 talking about.

1 And we will have some additional
2 consulting-party meetings and we'll have
3 opportunities for more input under Section
4 106. So this is just sort of the beginning
5 of the process. It is not the end of the
6 story. So it is, as Caroline said earlier,
7 a vital part of Section 106, this input of
8 our consulting parties and also the public.
9 So this process doesn't work very well if
10 it's just me; it doesn't work at all.

11 I have to have my consulting parties'
12 input for this to be a valid process.
13 That's why we go to all the trouble and
14 have these meetings, because it's not a
15 process if we're not consulting. So I
16 really do appreciate everybody's time.

17 I know this is one of those sort of
18 arcane federal laws that you just got
19 to -- Caroline set the graduate level
20 course in five minutes. So I really
21 appreciate your taking the time to kind of
22 work through this and learn about it and
23 work with us on it. I really do appreciate
24 it.

25 Any questions?

1 MS. BLANCO: Nick, you had a question
2 to make before. I want to make sure you
3 had a chance.

4 MR. WHITE: This might be kind of a
5 dumb question. I don't know.

6 Puerto Rico is sort of self-governing
7 in many ways. It's not a traditional
8 United States state. It has a governor and
9 a way of governance. I am just wondering
10 what the NSF has done in terms of
11 contacting the governor and looking for
12 ways to engage the government here in terms
13 of (inaudible).

14 MS. BLANCO: I'm going to turn over
15 that question to Karen Pearce, who is our
16 Legislative Affairs specialist. She has
17 been in contact during the scoping process.

18 MS. PEARCE: Thanks, Caroline.

19 During the scoping process and this
20 process I've contacted the governor's
21 office, spoke with his staff, contacted the
22 representative Pedro Pierluisi's office,
23 and have had two meetings in person with
24 his staff and with the resident
25 commissioner himself. I spoke to his staff

1 as recently as yesterday.

2 So I have been in close contact with
3 his staff and I have been in continual
4 contact with the governor's office as well
5 to provide them with information as well as
6 take any questions I had.

7 MR. WHITE: Have you also reached the
8 incoming governor and the incoming resident
9 commissioner?

10 MR. PEARCE: No, because at the time
11 of the release of the DEIS the elections
12 had not taken place yet. And they are
13 still in office until -- well. But I
14 absolutely will continue that, yes, that
15 dialogue.

16 MS. BLANCO: I think Tony has a
17 follow-up question.

18 MR. VAN EYKEN: What's their feedback?

19 MS. PEARCE: They were interested in
20 the process. The first time I met with
21 Pedro Pierluisi's office, we met with staff
22 who's no longer there. But he was very
23 interested, on behalf of the congressman,
24 very interested in the process, in the EIS
25 process. We provided PowerPoint

1 presentations, explanations. We answered
2 all questions.

3 We then went back several months
4 later. We discussed this with the
5 congressman himself and additional staff,
6 his chief of staff, among others; we
7 reviewed the process again with our senior
8 folks at NSF, our division director for
9 Astronomy and our assistant director for
10 the Physical Sciences Directorate. They
11 listened to us. They asked questions. We
12 answered.

13 They have not really been in contact
14 with me to get any additional information.
15 Yesterday, I did get one call and provided
16 that information. And we have a friendly
17 communication. We have a friendly
18 relationship, as well as with the
19 governor's office, and I will continue
20 that.

21 MS. BLANCO: I think Tony Van Eyken
22 came before. I think he had -- I'm sorry.

23 MR. WHITE: It's all right.

24 I just wanted to very quickly go back
25 to the matter of the mothballs in the

1 universe. I don't know how many there are.
2 But I think it kind of illuminates the
3 disconnection between the reports, their
4 options and reality.

5 So the mothballing option, and
6 incidentally option two, includes the
7 removal of the main cables and the
8 Gregorian, leaving, of course, the platform
9 hanging in mid-air, on no cables. There is
10 absolutely no way back from doing that.
11 Those options, two and three, are
12 destruction.

13 That just illuminates the
14 disconnection between -- what you have is
15 your options and the reality on the ground.

16 MS. BLANCO: Those are the comments I
17 suggest you put in response to the Draft
18 EIS during the comment period, if they're
19 not there already.

20 MR. ALTSCHULER: I would like to just
21 give you a general take-home message,
22 perhaps, for the people who are thinking
23 about this. And it is to get out of their
24 minds that this is just another telescope
25 in their portfolio.

1 And as you have heard from here and
2 perhaps from others, the Arecibo
3 Observatory is much more than just another
4 telescope. It is an institution, which is
5 educational, inspirational. A lot of our
6 current professors at the university who
7 teach astronomy started their first steps
8 by visiting Arecibo Observatory. It's the
9 only fully scientific operation that has a
10 characteristic in the island of Puerto
11 Rico.

12 These are 3.5 million U.S. citizens
13 who are basically otherwise disenfranchised
14 from one of the missions of the National
15 Science Foundation, which I understand, at
16 least, is to increase the participation of
17 minorities and women in science. This is
18 the best effort of achieving that. And
19 just because of that, I think it can be a
20 matter of 12 million dollars.

21 NSF can get that money somewhere else
22 if needed; and NASA, as a matter of fact,
23 provides for a million, anyway. So it's
24 not a question of money. I am sure it is
25 not.

1 Mothballing -- I was joking about the
2 mothballs. But it's useless because five
3 years from now you can't go back and
4 "unmothball" it. But also in
5 deconstruction -- I don't know if you know,
6 but when last I looked, 10 years, 20 years
7 ago, when we were looking at this already,
8 deconstruction amounts to about 10 years of
9 operation in terms of cost. So it's not an
10 option. What's the option? Paying 120
11 million dollars to deconstruct, or just
12 keep it running with its benefit?

13 So somebody has to come back and think
14 a little bit about all the implications,
15 about the closing the Arecibo Observatory.
16 It's not just another telescope. Please,
17 take that home.

18 MR. ISHAM: I just wanted to second a
19 couple of things Daniel said. First, about
20 the mothball, it is completely unrealistic
21 to think that you could set that thing
22 there out in the jungle.

23 Somebody mentioned two years. I think
24 it's ridiculous. Mothball for two years?
25 And if it's longer, it's going to be gone.

1 There is no way it's going to be safe or is
2 going to be retained. Go out in Puerto
3 Rico and look at anything that's been
4 sitting there in the jungle for a couple of
5 years. It is completely unrealistic. It
6 has happened with other instruments, not
7 such a big one; but I've seen it with
8 others in Puerto Rico.

9 What was the second thing? Anyway, I
10 can't remember what else I was going to
11 say. But I agree with what Daniel said. I
12 think that what he said is right on.

13 Thanks.

14 MS. BLANCO: We really appreciate all
15 of the active conversation. It is the
16 best. I agree with Lori. Meetings like
17 this, when there is no public input, really
18 aren't productive and not helpful. This is
19 very helpful to us.

20 One of the things -- before we close,
21 I just wanted to -- it seems we've been
22 working with a couple of assumptions but I
23 just didn't want to presume. So I wanted
24 to make sure that this group was
25 comfortable with this.

1 I know that we met earlier with
2 Berenice and the SHPO to talk about these
3 issues, and we talked about the APE, the
4 Area of Potential Effects as being 118
5 acres. I just wanted to be sure that
6 everybody looks at that in the same way.
7 And that would be a starting point.

8 I'm seeing heads nodding. Is there
9 anybody that would disagree that that would
10 be a reasonable area to take a look at, the
11 Area of Potential Effects?

12 And I think that we all agree that the
13 area of historic properties -- there are
14 historic properties within the Area of
15 Potential Effects. I think we all
16 acknowledge that they are nationally
17 significant. They are listed on the
18 National Register.

19 I just wanted to make sure that
20 everybody was in agreement with those two
21 things before we move forward in the next
22 stage of this process. Are we all in
23 agreement on that? Does anybody disagree?
24 I see no hands. I'm going to presume
25 agreement on those two things.

1 MS. SCHMELZ: What are we disagreeing
2 with?

3 MS. BLANCO: That the Area of
4 Potential Effects that we were talking
5 about earlier is the area of the
6 Observatory, the 118 acres, and that there
7 are definitely historic properties within
8 that area. It is maybe sort of obvious,
9 but I just wanted to be sure and make sure
10 everybody was comfortable with that.

11 MR. ISHAM: Again, some details about
12 the map. There is this little section on
13 the upper right that seems to be different
14 in one of the other maps I saw, this little
15 sliver that's outlined differently. I
16 don't know if that makes a different.

17 And the second thing is that area in
18 the upper left, that thing is not in this
19 generally big rectangle. It is outside the
20 rectangle. I don't know if anybody
21 realizes that. But it's not there. It's
22 farther out.

23 MS. PRICE: As I said earlier, it's
24 not to scale. And I think they included
25 that, so they could have it -- to show up.

1 Otherwise, it would be over there. So they
2 just wanted it to appear on the map; you
3 know, that it's there. We can maybe put a
4 note or something if that makes you feel
5 better.

6 MS. BLANCO: The next step I think
7 would be --

8 MR. CORDOBA: That's in addition to
9 the 118 acres? Yes. That would be outside
10 of the area.

11 MS. KUPEC: Is it included in the 118
12 acres, is that what they're asking.

13 MS. BLANCO: I think so. But I would
14 have to go back and check.

15 The other think I would ask is that if
16 you do have comments on the technical
17 report with regard to the effects that are
18 identified, please provide them to us by
19 December 12 so that we can take a look at
20 those. Then the next step in the process
21 would be to go ahead and work with you.

22 Please, please, again, make sure that
23 if you want to serve as a Consulting Party
24 and be part of this process your name is on
25 the signing sheet with an email address.

1 We'll correspond by email and we'll look at
2 different ways to connect. Our travel
3 budgets are sort of tight, but that doesn't
4 mean we can't find ways to connect with one
5 another. We will do our best to do that
6 and provide notice of another consultation
7 meeting to discuss this further.

8 Tony?

9 MR. VAN EYKEN: You said multiple
10 times that verbal comments and written
11 comments are identical. But you said a
12 couple of times to me, here, in this
13 meeting: "Please, put that in the report."
14 So that means that what I said here is
15 irrelevant and I have to write it?

16 MS. BLANCO: I wouldn't say it's
17 irrelevant. Meeting notes are being taken
18 here but it's not a direct transcription.
19 I think that -- the NEPA process is
20 different, the NEPA process that we had.
21 Those meetings are formal. There was a
22 court reporter present. They did put down
23 those comments in the transcript. That
24 transcript is provided to us. We do take a
25 look at the transcript to identify the

1 verbal comments that were presented, and
2 those comments are treated equally to
3 written comments, yes.

4 For this meeting, I think we have
5 general ideas about things. But if there
6 are certain things you would like us to
7 consider -- again, there are some things
8 that we were provided here that were very
9 helpful and to some extent some were
10 different comments that what were presented
11 in the NEPA public meetings. So to make
12 sure that your thoughts are captured for
13 both processes, I would recommend that you
14 submit them in writing, so they can count
15 toward both processes.

16 Thank you everybody, very, very much.
17 (Whereupon, the public meeting
18 concludes at 3:05 p.m.)

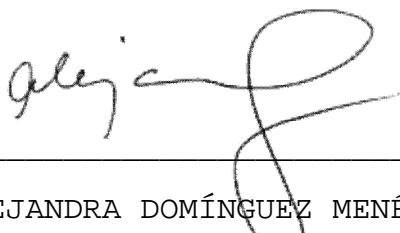
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REPORTER'S CERTIFICATE

I, ALEJANDRA DOMÍNGUEZ-MENÉNDEZ, E.R.

Reporter, do hereby certify that the following transcript is a full, true record transcribed by me.

I further certify that I am not interested in the outcome of the case named in said caption.




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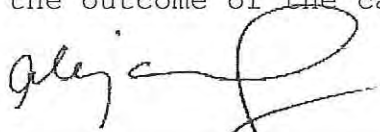


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ALEJANDRA DOMÍNGUEZ MENÉNDEZ

5-H-DEIS Materials



Environmental Impact Statement and Section 106 Consultation for Proposed Changes to Arecibo Observatory Operations

Arecibo, Puerto Rico

Overview:

The National Environmental Policy Act requires federal agencies to conduct an environmental review to assess the potential environmental impacts of federal actions that could significantly affect the environment.

Section 106 of the National Historic Preservation Act requires federal agencies to consult with interested parties and the State Historic Preservation Officer regarding potential effects of their proposed actions on significant historic properties, such as the Arecibo Observatory.

The purpose of this public meeting is to obtain comments on the Draft Environmental Impact Statement (DEIS).

Project Timeline Schedule for Public Involvement:

- **Scoping Comment Period:**
May 24-June 23, 2016
- **Draft EIS target:** November 2016
- **Comment Period on Draft EIS:**
45-Day Comment Period ends
December 12, 2016
- **Public meetings on Draft EIS:**
Arecibo CIAPR - November 16, 2016
from 6:00 pm to 8:00 pm
San Juan Doubletree by Hilton
Hotel - November 17, 2016
from 10:00 am to 12:00 pm.
- **Final EIS target:** Spring 2017
- **Record of Decision target:**
Summer 2017

Submit Comments:

You may submit comments by either of the following methods:

Email to: envcomp-AST@nsf.gov,
with subject line
"Arecibo Observatory"

Mail to: Ms. Elizabeth Pentecost,
RE: Arecibo Observatory
National Science Foundation,
Suite 1045 4201 Wilson Blvd
Arlington, VA 22230

Project information will be posted,
throughout the EIS process, at
www.nsf.gov/AST.



National Science
Foundation

Environmental Impact Statement and Section 106 Consultation for Proposed Changes to Arecibo Observatory Operations

Arecibo, Puerto Rico

Alternatives evaluated in the draft EIS include the following:

- Continued NSF investment for science-focused operations (No-Action Alternative)
- Collaboration with interested parties for continued science-focused operations (Preferred Alternative)
- Collaboration with interested parties for transition to education-focused operations
- Mothballing of facilities (suspension of operations in a manner such that operations could resume efficiently at some future date)
- Partial deconstruction and site restoration
- Full deconstruction and site restoration

Potential Resources considered:

An impact is a change or consequence that results from a proposed activity; it can be positive, negative or both. It may be mitigated to lessen or remove the impact. At present, NSF has identified the following resource areas for analysis of potential impacts:

solid waste generation

geological resources

cultural resources

biological resources

health and safety

traffic

groundwater resources

socioeconomics

Section 106 Process for the Arecibo Observatory:

In coordination with the draft EIS, NSF is consulting with the State Historic Preservation Officer and other consulting parties on potential effects to historic properties located within the Area of Potential Effects (APE).

- NSF proposes that the APE encompass the full Arecibo Observatory property.
- Arecibo Observatory (as the "National Astronomy and Ionosphere Center") is listed in the National Register of Historic Places as a historic district that is significant in the areas of science, engineering, and education.
- Consultation is focused on identifying potential effects and any measures to avoid, minimize, and/or mitigate adverse effects; in the case of adverse effects, a Memorandum of Agreement may be used to formalize such measures.



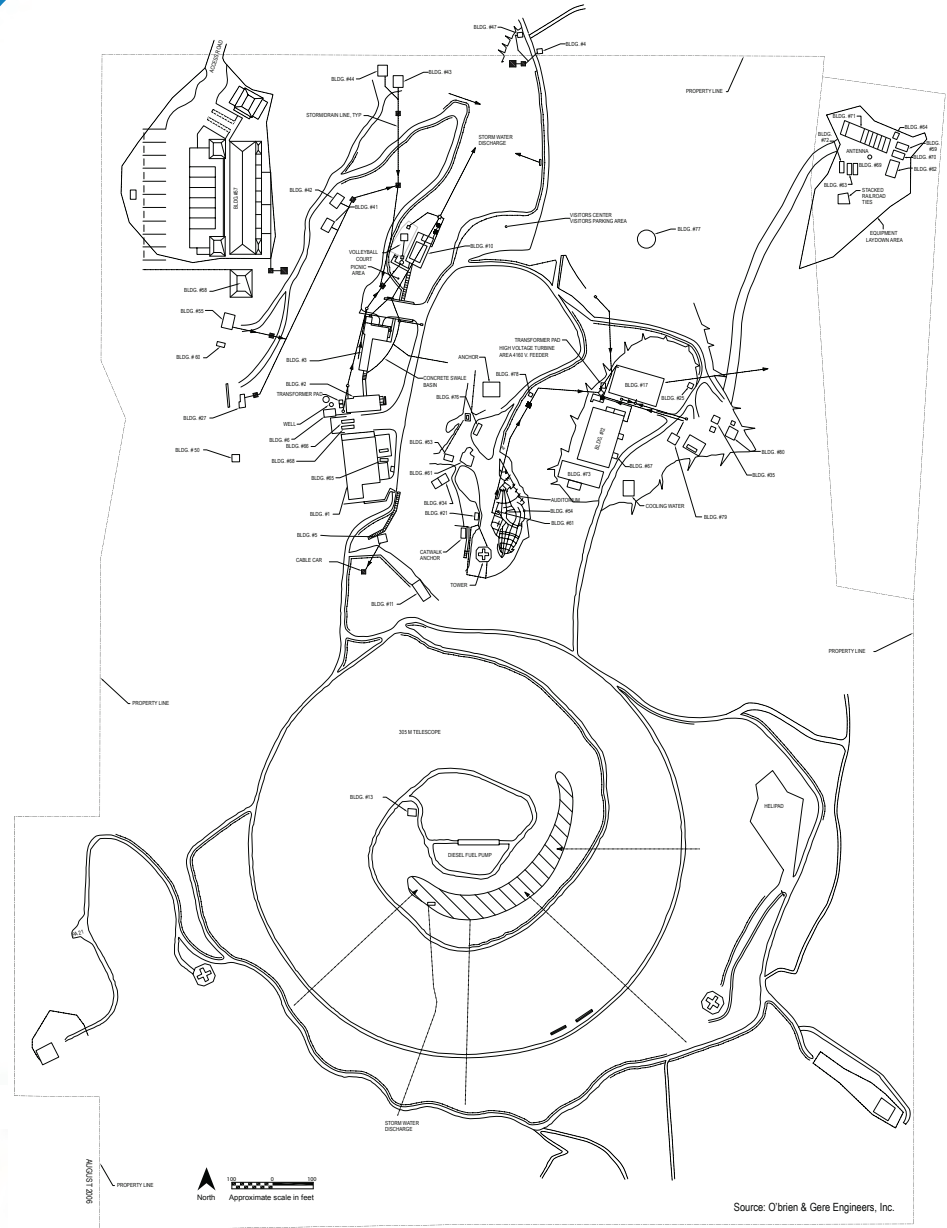
Environmental Impact Statement and Section 106 Consultation for Proposed Changes to Arecibo Observatory Operations



Site Plan

Arecibo, Puerto Rico

Arecibo is a municipality on the northern coast of Puerto Rico, on the shores of the Atlantic Ocean, located north of Utuado and Ciales; east of Hatillo; and west of Barceloneta and Florida. It is about 50 miles west of San Juan, the capital city.



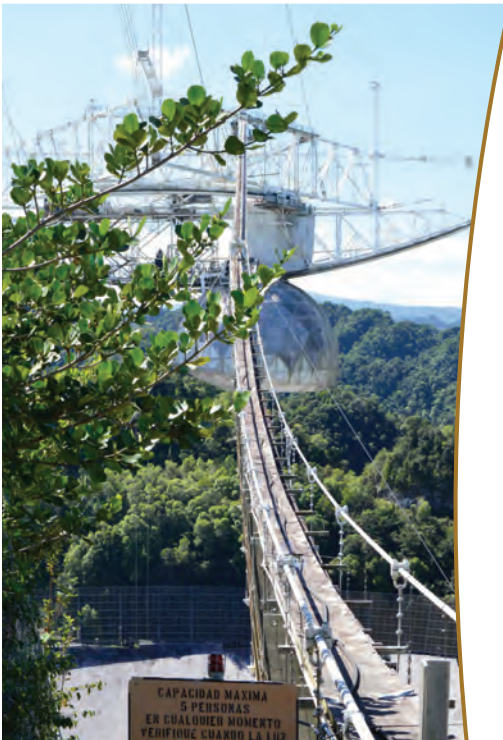
Source: O'brien & Gere Engineers, Inc.

BUILDING NO. DESCRIPTION

- | | | | |
|---|--|---------------------------------------|--|
| 1. OPERATIONS BUILDING | 34. HIGH VOLTAGE POWER SUPPLY BLDG. | 69. VISITOR CENTER TRAILER | 76. INFIRMARY FOR SCIENCE TRAILER |
| 2. ADMIN. TRAINING BUILDING | 35. CUMMINGS GENERATOR CONTROL BLDG. | 70. ANT. REECE TESTING BLDG. | 77. PHASE REFERENCE ANTENNA (SMA) |
| 3. VISITOR CENTER QUARTERS AND CATERING | 36. VISITOR CENTER QUARTERS AND CATERING | 71. LEARNING CENTER | 78. COFFEY HSE |
| 4. WEST HILL V.S.Q. BACHELOR UNIT NO. 1 | 37. WEST HILL V.S.Q. BACHELOR UNIT NO. 2 | 72. HPF STORAGE TRAILER | 79. ENGINEERING OFFICE BUILDING |
| 5. ENTRANCE GUARD HOUSE | 38. CABLE CAR HOUSE | 73. ELECTRONIC TRAILER | 80. CUMMINGS DIESEL GENERATOR BUILDING |
| 6. PUMP HOUSE/WATER TREATMENT BLDG. | 39. SWIMMING POOL/RESTROOMS | 74. DIESEL FUEL PUMP | |
| 7. LEVER BUILDING-ROCKING-LOFT | 40. MAINTENANCE SHOPS | 75. ATMOSPHERIC SCIENCE TRAILER | |
| 8. SWIMMING POOL/RESTROOMS | 41. BOWLING SHACK | 77. INTERFERENCE MONITORING SHACK | |
| 9. BARRACKS | 42. BARRACKS | 78. SCIENTIFIC OFFICES TRAILER | |
| 10. MAINTENANCE SHOPS | 43. BARRACKS | 79. ELECTRONIC TRAILER (W/SPAREPARTS) | |
| 11. BARRACKS | 44. BARRACKS | 80. COMPUTER TRAILER | |
| 12. ANTENNA TESTING RANGE | 45. BARRACKS | 81. ELECTRONIC TRAILER | |
| 13. PAINT STORAGE BUILDING | 46. BARRACKS | 82. ELECTRONIC TRAILER (SPAREPARTS) | |
| 14. OPTICAL LABS | 47. BARRACKS | 83. HP TRANSMITTER BUILDING | |
| | 48. BARRACKS | | |
| | 49. BARRACKS | | |
| | 50. BARRACKS | | |
| | 51. BARRACKS | | |
| | 52. BARRACKS | | |
| | 53. BARRACKS | | |
| | 54. BARRACKS | | |
| | 55. BARRACKS | | |
| | 56. BARRACKS | | |
| | 57. BARRACKS | | |
| | 58. NORTH V.S.Q. UTILITY BLDG. | | |



Arecibo, Puerto Rico



CAPACIDAD MAXIMA
5 PERSONAS
EX CALORIER MONETRO
VERIFICAR CUANDO LA LUP



Major Components of the Draft Environmental Impact Statement

Executive Summary

Purpose and Need

Description of Proposed Action and Alternatives

Affected Environment

Provides an overview of the existing physical, biological, economic, and social conditions at Arecibo Observatory

Environmental Consequences

Provides an evaluation of the potential environmental impacts of the Proposed Action under the five proposed action Alternatives and the No-Action Alternative; the impacts of each alternative's implementation and operations phase are assessed. Impacts, which can be direct, indirect, or cumulative, are identified and their duration (short-term or long-term), intensity (negligible, minor, moderate, or major), and scale (local or regional) are provided where possible.

In addition, mitigation measures to reduce the duration, intensity or scale of the impacts are identified within the resource evaluations. Resource areas evaluated include: biological, cultural, air quality, geology and soils, groundwater, hazardous materials, solid waste, noise, health and safety, and socioeconomics. Methodology for assessing impacts is provided for each resource area.

Notifications, Public Involvement, and Consulted Parties





Arecibo Observatory Operations

What is the Proposed Action?

The National Science Foundation (NSF) is conducting public meetings to obtain feedback on the Draft Environmental Impact Statement (EIS) for proposed operational changes due to funding constraints for Arecibo Observatory. A range of Alternatives is being considered and evaluated in an EIS. These proposed Alternatives include the following:

- Continued NSF investment for science-focused operations (No-Action Alternative)
- Collaboration with interested parties for continued science-focused operations (Preferred Alternative)
- Collaboration with interested parties for transition to education-focused operations
- Mothballing of facilities (suspension of operations in a manner such that operations could resume efficiently at some future date)
- Full deconstruction and site restoration
- Partial deconstruction and site restoration

What is NEPA?

The National Environmental Policy Act of 1969 (NEPA) requires federal agencies to consider the potential environmental consequences of proposed actions on the environment prior to making final decisions. The NEPA review process is intended to provide the public with an opportunity to comment and provide input on those decisions. On May 23, 2016, NSF announced the beginning of the scoping process and solicitation of public comments to identify issues to be analyzed in an EIS. The purpose of the public scoping process was to determine relevant issues that influenced the scope of the environmental analysis, including identification of viable alternatives. On October 28, 2016 NSF announced the beginning of a 45-day public comment period to solicit comments from the public on the Draft EIS. It is anticipated that, in the Spring of 2017, the Final EIS will be ready for review. No decision will be made until at least 30 days following the issuance of the Final EIS.

What is Section 106?

NSF has initiated consultation under Section 106 of the National Historic Preservation Act (NHPA) to evaluate potential effects on the Arecibo Observatory, which is a

historic property listed in the National Register of Historic Places. Section 106 of the NHPA requires federal agencies to consult with interested parties and the State Historic Preservation Officer regarding potential effects of their proposed actions on significant historic properties, such as the Arecibo Observatory.

Who owns, funds, and manages Arecibo Observatory?

NSF owns and funds the Arecibo Observatory and, as a federal agency, is responsible for NEPA compliance. SRI International, with Universities Space Research Association (USRA) and Universidad Metropolitana (UMET), receives funding from NSF via a Cooperative Agreement to operate and maintain the Arecibo Observatory for the benefit of research communities. The National Aeronautics and Space Administration (NASA) provides additional funding to the Universities Space Research Association (USRA) to support solar system radar studies.

EIS Timeline

Draft EIS public comment period

- 45-day comment period on Draft EIS, starting October 28 and ending December 12, 2016

Public meetings on Draft EIS: November 16-17, 2016

- Public meeting November 16, 6:00 p.m. in Arecibo
- Public meeting November 17, 10:00 a.m. in San Juan

Final EIS target: Spring 2017

NSF Record of Decision target: Summer 2017

How to Submit Comments

Comments on the DEIS will be accepted through December 12, 2016 and may be submitted during the public meetings or by the following methods:

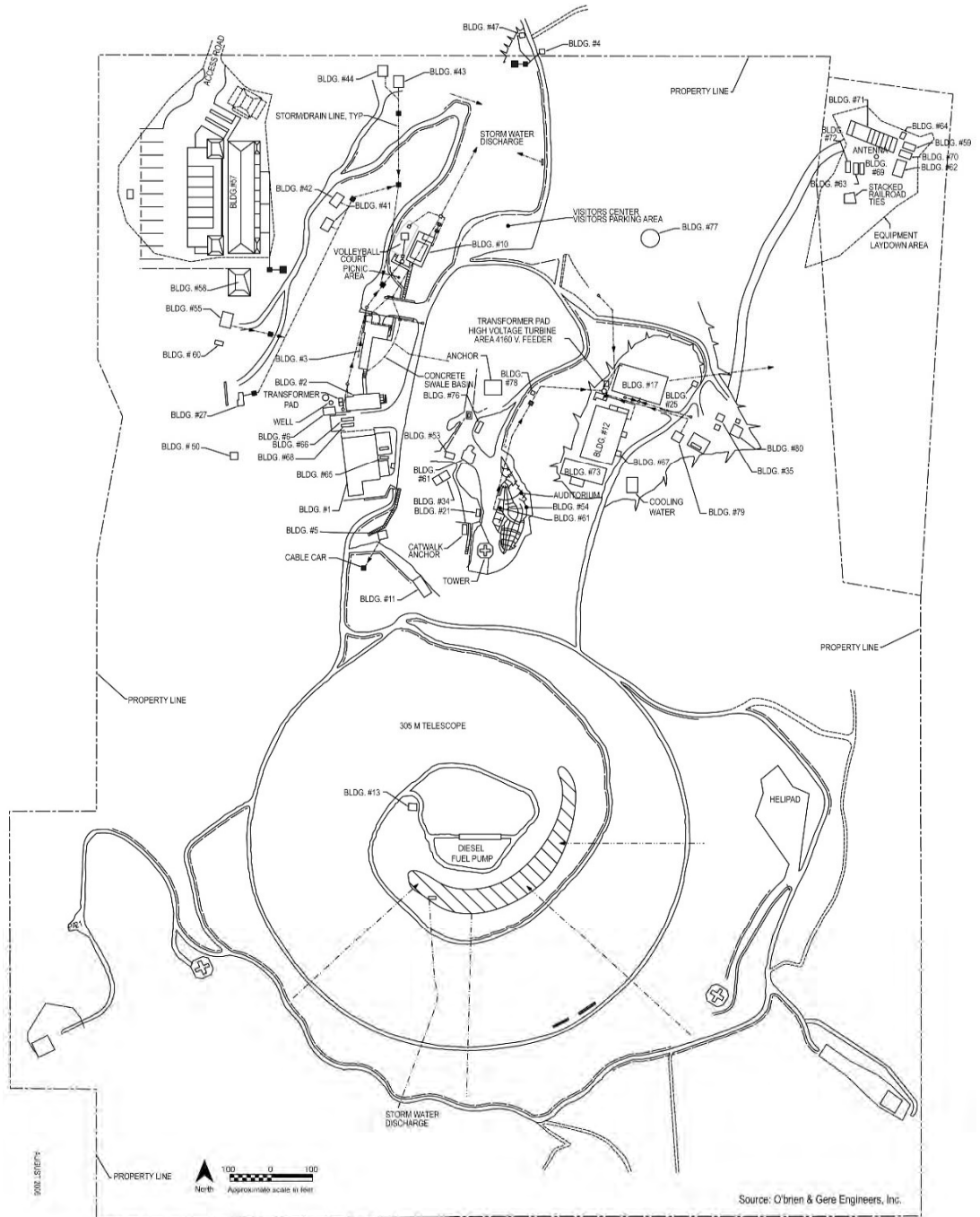
Email: Envcomp-AST@nsf.gov

Mail: Ms. Elizabeth Pentecost, National Science Foundation, Division of Astronomical Sciences, Suite 1045, 4201 Wilson Blvd., Arlington, VA 22230.

Additional information will be posted throughout the EIS process at www.nsf.gov/AST.



Site Plan

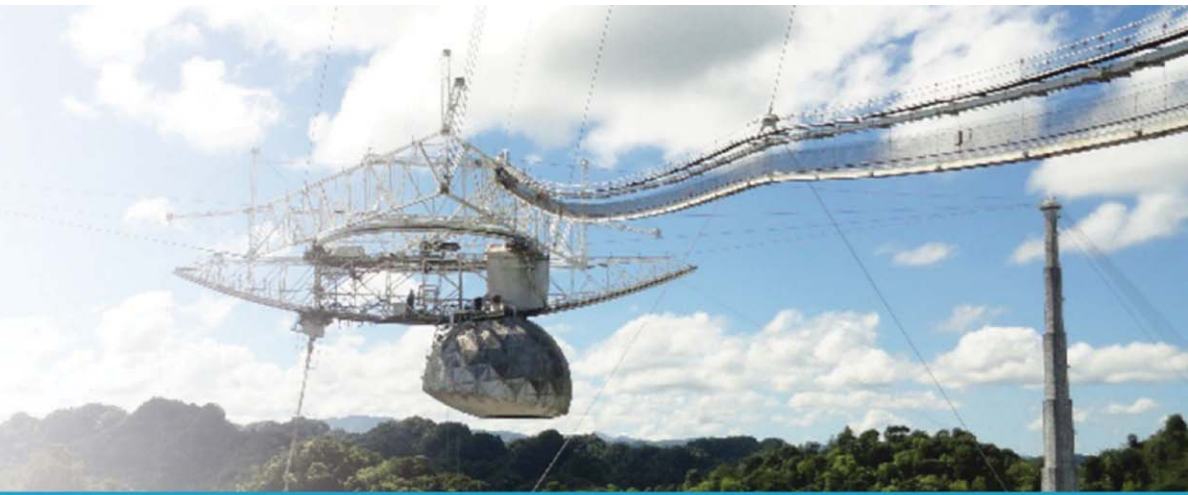


- | BUILDING NO. DESCRIPTION | | | |
|--|--|-------------------------------------|--|
| 1. OPERATIONS BUILDING | 34. HIGH VOLTAGE POWER SUPPLY BLDG. | 59. VISITOR CENTER TRAILER | 76. INSPIRATION FOR SCIENCE TRAILER |
| 2. ADMINISTRATION BUILDING | 35. CUMMINGS GENERATOR CONTROL BLDG. | 60. ANT. RECE. TESTING BLDG. | 77. PHASE REFERENCE ANTENNA (12M) |
| 3. VISITING SCIENTIST QUARTERS AND CAFETERIA | 41. WEST HILL V.S.Q. BACHELOR UNIT NO. 1 | 61. LEARNING CENTER | 78. COFFEE HUT |
| 4. ENTRANCE GUARD HOUSE | 42. WEST HILL V.S.Q. BACHELOR UNIT NO. 2 | 62. HF STORAGE TRAILER | 79. ENGINEERING OFFICE BUILDING |
| 5. CABLE CAR HOUSE | 43. WEST HILL V.S.Q. FAMILY UNIT NO. 1 | 63. IONOSPHERE TRAILER | 80. CUMMINGS DIESEL GENERATOR BUILDING |
| 6. PUMP HOUSE/WATER TREATMENT BLDG. | 44. WEST HILL V.S.Q. FAMILY UNIT NO. 2 | 64. ELECTRONIC TRAILER | |
| 7. SWIMMING POOL/RESTROOMS | 47. MAIN GATE RESTROOM | 65. SHIELDED TRAILER | |
| 8. LEWIS BUILDING-RIGGING LOFT | 50. INTERFERENCE MONITORING SHACK | 66. ATMOSPHERIC SCIENCE TRAILER | |
| 9. MAINTENANCE SHOPS | 51. GREASE PIT | 67. CRYOGENICS LAB TRAILER | |
| 10. BOWL SHACK | 53. EMERGENCY GENERATOR BLDG. | 68. SCIENTIFIC OFFICES TRAILER | |
| 11. WAREHOUSE | 54. VISITOR CENTER BLDG. | 69. ELECTRONIC TRAILER (WAVEGUIDE) | |
| 21. ANTENNA TESTING RANGE | 55. LIDAR LABORATORY BLDG. | 70. COMPUTER TRAILER | |
| 22. PAINT STORAGE BUILDING | 57. NORTH V.S.Q. BLDG. | 71. ELECTRONICS CABLE TRAILER | |
| 23. OPTICAL LABS | 58. NORTH V.S.Q. UTILITY BLDG. | 72. ELECTRONIC TRAILER (CRYOGENICS) | |
| | | 73. HF TRANSMITTER BUILDING | |



National Science Foundation

ARECIBO
OBSERVATORY



Public Meeting on the Draft Environmental Impact Statement

Reunión Pública Sobre el Borrador de la Declaración de Impacto Ambiental

November 16th, 2016, 6-8 PM at College of Engineers and Land Surveyors, Arecibo

November 17th, 2016, 10 AM-12 PM, at Doubletree by Hilton, San Juan



Public Meeting Overview

Resumen de la Reunión Pública

- Introduction of team members and description of materials and transcript
- Presentación de los miembros del equipo y descripción de materiales y transcripción
- Purpose of the meeting
- Propósito de la Reunión
- Draft Environmental Impact Statement (DEIS) Summary
- Resumen del Borrador de la Declaración de Impacto Ambiental (BDIA)
- Public Comments
- Comentarios del Público



Introductions

Presentaciones

Representative Representante	Role	Rol
National Science Foundation: Lead Federal Agency Agencia Federal Líder		
<i>Ralph Gaume</i>	Arecibo Observatory Program Director & Deputy Division Director of Astronomical Sciences	Director del Programa del Observatorio de Arecibo y Subdirector de la División de Ciencias Astronómicas
<i>Caroline Blanco</i>	Assistant General Counsel	Consejera General Adjunta
<i>Kristen Hamilton</i>	Environmental Compliance Officer	Oficial de Cumplimiento Ambiental
<i>Karen Pearce</i>	Senior Legislative Affairs Specialist	Especialista Senior de Asuntos Legislativos
<i>Ivy Kupec</i>	Public Affairs Specialist	Especialista de Relaciones Públicas
CH2M HILL: Environmental Contractor Contratista Ambiental		
<i>Lori Price</i>	Cultural Resources Lead	Líder de Recursos Culturales
<i>Richard Reaves</i>	Ecology and NEPA Lead	Líder de Ecología y NEPA



Materials

Materialles

- Fact sheet and informational boards
- Hoja informativa y carteles informativos
- This presentation, electronic versions of the fact sheet and informational boards will be posted on the web following the public meetings at:
www.nsf.gov/ast
- Esta presentación, versiones electrónicas de la hoja informativa y los carteles informativos, estarán publicados en la página de Internet luego de las reuniones públicas en:
www.nsf.gov/ast



Purpose of this meeting

Propósito de esta reunión

- A Draft Environmental Impact Statement (DEIS) has been prepared to evaluate potential environmental impacts of proposed operational changes due to funding constraints for the Arecibo Observatory
- Un Borrador de la Declaración de Impacto Ambiental ha sido preparado para evaluar los efectos ambientales potenciales de los cambios operacionales propuestos debido a restricciones en financiamiento para el Observatorio de Arecibo
- The purpose of this meeting is to allow for public comments on the DEIS, which will help inform the Final EIS.
- El propósito de esta reunión es recibir los comentarios del público sobre el BDIA, que servirá para informar la DIA Final.
- A Section 106 consultation meeting will be held November 17 at 1pm.
- Una reunión de consulta sobre la Sección 106 se llevará a cabo el 17 de noviembre a la 1pm.



Purpose of the Proposed Action Propósito de la Acción Propuesta

- The purpose of the Proposed Action is to substantially reduce NSF's contribution to the funding of Arecibo Observatory
- El propósito de la Acción Propuesta es reducir sustancialmente la contribución de NSF al financiamiento del Observatorio de Arecibo



Need for the Proposed Action

Necesidad de la Acción Propuesta

- NSF needs to maintain a balanced research portfolio with the largest scientific return for the taxpayer dollar; the scientific community, through reviews and surveys, has indicated that the scientific capability of the Arecibo Observatory is lower in priority than other scientific capabilities NSF funds
- La NSF necesita mantener un portafolio de investigación balanceado con el mayor valor científico dada la inversión monetaria del contribuyente; la comunidad científica, a través de evaluaciones y encuestas, ha indicado que la capacidad científica del Observatorio de Arecibo tiene una prioridad más baja que otras capacidades científicas que financia la NSF



Panel/Committee Reports

Informes de Panel/ Comité

(1)

- With regards to the Arecibo Observatory:
 - The 2012 report of the MPS/AST Portfolio Review Committee: *Advancing Astronomy in the Coming Decade: Opportunities and Challenges* stated:

“AST should reevaluate its participation in Arecibo and SOAR later in the decade in light of the science opportunities and budget forecasts at that time. If funding remains tight later in the decade, then the scientific need for continued AST funding for Arecibo and SOAR must be weighed against the needs in the grants programs.”
- Con respecto al Observatorio de Arecibo:
 - El informe de 2012 del Comité de Evaluación del Portafolio de MPS/AST titulado: *“Avanzando la Astronomía en la Siguiete Década: Oportunidades y Retos”*, indicó:

“El AST debe reevaluar su participación en Arecibo y SOAR más tarde en la década a la luz de las oportunidades de ciencia y las proyecciones de presupuesto en ese momento. Si el presupuesto sigue ajustado mas tarde en la década, entonces la necesidad científica para la otorgación de fondos de parte del AST a Arecibo y SOAR deben ser evaluados en relación a las necesidades de los programas de propuestas.”



Panel/Committee Reports

Informes de Panel/ Comité

(2)

- With regards to the Arecibo Observatory:
 - The August 2016 report of the National Academy Committee *New Worlds, New Horizons: A Midterm Assessment* stated:

“The NSF should proceed with divestment from ground-based facilities that have a lower scientific impact, implementing the recommendations of the NSF Portfolio Review, which is essential to sustaining the scientific vitality of the U.S. ground-based astronomy program as new facilities come into operation.”
 - Con respecto al Observatorio de Arecibo:
 - El informe de agosto de 2016 del Comité de la Academia Nacional titulado “*Nuevos Mundos, Nuevos Horizontes, una Evaluación de Medio Término*” indicó:

“La NSF debe proceder con el retiro de instalaciones basadas en tierra que tengan menor impacto científico, implementando las recomendaciones de la Evaluación del Portafolio de NSF, el cual es esencial para sostener la vitalidad científica del programa de astronomía basado en tierra de EE.UU. mientras nuevas instalaciones comienzan a operar.”



Panel/Committee Reports

Informes de Panel/ Comité

- With regards to the Arecibo Observatory:
 - The March 15, 2016 report of the *Astronomy and Astrophysics Advisory Committee* stated:
“Strong efforts by NSF for facility divestment should continue as fast as is practical. Efforts to explore partnerships, interagency cooperation and private resources to maintain some access to facilities for the US community that may mitigate the loss of open access should continue. Transferring the cost of operating a facility outside of the NSF/AST budget is preferable to complete loss of a capability from the suite of capabilities used by US researchers.”

(3)

- Con respecto al Observatorio de Arecibo:
 - El informe del 15 marzo de 2016 del Comité de Consejo de Astronomía y Astrofísica indicó:
“El arduo esfuerzo por parte de la NSF para retirar instalaciones debe continuar tan rápido como sea práctico. Los esfuerzos para explorar asociaciones, cooperación interagencial y recursos privados para mantener algún acceso a instalaciones para la comunidad de EE.UU. que pueda mitigar la pérdida de acceso abierto debe continuar. Transferir el costo de operar una instalación fuera del presupuesto de la NSF/AST es preferible a la pérdida completa de una capacidad del conjunto de capacidades utilizadas por investigadores de EE.UU.”



Alternatives Evaluated in the DEIS

Alternativas Evaluadas en el BDIA

Preferred Alternative

1. Collaboration with interested parties for continued science-focused operations

2. Collaboration with interested parties for transition to education-focused operations

3. Mothballing of facilities

4. Partial deconstruction and site restoration

5. Full deconstruction and site restoration

6. No-Action: Continued NSF investment for science-focused operations

1. Colaboración con las partes interesadas para la continua operación con enfoque científico

2. Colaboración con partes interesadas para transición a operaciones con enfoque educativo

3. Suspensión de la actividad en las instalaciones

4. Desconstrucción parcial y restauración del sitio

5. Desconstrucción completa y restauración del sitio

6. No Acción: La continua inversión de NSF para operaciones con enfoque científico



Alternatives Evaluated in the DEIS Alternativas Evaluadas en el BDIA

Note that, for each proposed Alternative, NSF has identified which buildings and infrastructure would be retained, deconstructed, mothballed, or safe abandoned (see Table 2.3-1 in the DEIS). This level of detail is helpful in ensuring the environmental impact analysis adequately addresses each proposed Alternative.

Note que, para cada una de las Alternativas propuestas, la NSF ha identificado los edificios e infraestructura que sería retenida, deconstruida, suspendida o abandonada de manera segura (ver Tabla 2.3-1 del BDIA). Este nivel de detalle es útil en asegurar que el análisis de impacto ambiental atiende cada una de las Alternativas propuestas.

It is possible that a subset of the buildings and infrastructure identified under proposed Alternatives 1 and 2 could be retained, deconstructed, mothballed, or safe abandoned as the EIS process moves forward.

Es posible que un subconjunto de los edificios e infraestructura identificados en las Alternativas propuestas 1 y 2 puedan ser retenidos, desconstruidos, suspendidos o abandonados de manera segura mientras el proceso de la DIA se mueve hacia adelante.



Public Scoping

Definición de Alcance con el Público

- Public scoping conducted May 23-June 23, 2016
- Definición de alcance con el público llevado a cabo del 23 de mayo al 23 de junio de 2016
 - Scoping meetings and 30-day comment period
 - Reuniones de definición de alcance y período de comentario de 30 días
- Comments addressed in the DEIS
- Comentarios atendidos en este BDIA



DEIS-Contents

DEIS-Contenido

- Executive Summary (provided in Spanish)
- Resumen Ejecutivo (provisto en español)
- Purpose and Need
- Propósito y Necesidad
- Description of Proposed Action and Alternatives
- Descripción de la Acción y las Alternativas Propuestas
- Affected Environment
- Impacto al Medio Ambiente
- Environmental Consequences
- Consecuencias Ambientales
- Notifications, Public Involvement, and Consulted Parties
- Notificaciones, Participación del Público y Partes Consultadas



DEIS- Impacts

BDIA - Impactos

- Impacts can be direct, indirect, or cumulative; they can be adverse or beneficial
- Los impactos pueden ser directos, indirectos, o acumulativos; pueden ser adversos o beneficiosos
- Impact duration can be short- or long-term
- La duración del impacto puede ser a corto o largo plazo
- Impact intensity can be negligible, minor, moderate, or major
- La intensidad del impacto puede ser insignificante, menor, moderada o mayor
- Impact scale can be local or regional
- La escala del impacto puede ser local o regional



DEIS- Resource Areas Considered

BDIA – Áreas de Recursos Consideradas

- Biological Resources
- Cultural Resources
- Geological Resources
- Groundwater
- Hazardous and Solid Waste
- Health and Safety
- Noise
- Socioeconomics
- Traffic
- Visual Resources
- Environmental Justice
- Recursos Biológicos
- Recursos Culturales
- Recursos Geológicos
- Aguas Subterráneas
- Desperdicios Peligrosos y Sólidos
- Salud y Seguridad
- Ruido
- Socioeconomía
- Tráfico
- Recursos Visuales
- Justicia Ambiental



DEIS Availability

Disponibilidad del BDIA

- www.nsf.gov/AST (“AST Facilities-Environmental Reviews”, “Arecibo Observatory”)
 - Local libraries
 - Bibliotecas locales
-
- Biblioteca Electrónica Pública Municipal Nicolás Nadal Barreto, Arecibo
 - Archivo General y Biblioteca Nacional de PR, San Juan



How to submit comments on the DEIS

Cómo someter comentarios sobre el BDIA

- Verbal comments may be provided during this meeting
- Se pueden proveer comentarios verbales durante esta reunión
- Written comments (emailed or mailed) will be accepted through December 12, 2016
- Se aceptarán comentarios por escrito (a través de correo electrónico o por correo regular) hasta el 12 de diciembre de 2016
 - envcomp-AST@nsf.gov
 - Ms. Elizabeth Pentecost, National Science Foundation, Division of Astronomical Sciences, Suite 1045, 4210 Wilson Blvd, Arlington VA 22230



Target Dates Fechas Clave



30-day comment period with public meetings/Período de comentario de reuniones públicas
Preparar draft EIS
Preparar el borrador de la DIA

45-day comment period with public meetings/Período de comentario de reuniones públicas
Prepare final EIS/
Preparar DIA Final

≥30-day cooling off period/Período de apaciguamiento de ≥30 días

National Historic Preservation Act Compliance

Cumplimiento con la Ley Nacional de Preservación Histórica

Endangered Species Act Compliance

Cumplimiento con la Ley de Especies en Peligro



Record of Decision

Récord de Decisión

- Discussion of all the factors, including:
- Discusión de todos los factores, incluyendo:
 - Science priorities
 - Prioridades científicas
 - Feasibility (responses to solicitations, etc.)
 - Viabilidad (respuesta a solicitudes, etc.)
 - Environmental considerations and mitigation
 - Consideraciones ambientales y su mitigación
 - Budget
 - Presupuesto



Your verbal comments are now welcome
Sus comentarios verbales son bienvenidos ahora

- One speaker at a time, may require time limit
- Un orador a la vez, puede requerir límite de tiempo
- Please state & spell your name for the court reporter
- Por favor diga y deletree su nombre para el taquígrafo
- Direct your comments/questions to the contents of the DEIS; NSF will not address comments at this time. They will be addressed in the Final EIS.
- Dirija sus comentarios/preguntas al contenido del BDIA; la NSF no abordará sobre los comentarios en este momento. Éstos serán considerados en la DIA Final.



Thank you for your participation!
¡Gracias por su participación!

Information and materials are posted at:
La información y los materiales están publicados en:

www.nsf.gov/AST

NSF Point of Contact/Punto de Contacto de la NSF:
Ms. Elizabeth Pentecost, (703) 292-4907, epenteco@nsf.gov.

5-I- DEIS Comment Response

SUMMARY TABLE OF ALL COMMENTS RECEIVED ON DEIS -APPENDIX 5H

New Comment Number	First Name	Last Name	Affiliation	Comment	Category	Key Topic as Presented in the Following Response Documents	Comment Source	Date Comment Received
1a	Henri	Radovan	Professor Department of Physics University of Puerto Rico	<p>I'm disappointed about your attitude toward two gems of US radio astronomy -- the Arecibo Observatory (AO) and the Green Bank Observatory. Both observatories are entering an uncertain future that might well lead to its extinguishing. Please allow me to voice my concerns that exist on four different levels.</p> <p>1. I'm disappointed at the astronomy level. While the AO is over 50 years old, it is a state-of-the-art national facility with the highest sensitivity of any tracking-enabled radio telescopes worldwide and the one with the highest intensity radar. The AO offers unparalleled views of the Milky Way and beyond, possibly for years to come. It is outfitted with the most modern signal processing units and attracts some of the world's most distinguished scientists</p>	Against Closure/Reasons Why	Not Applicable	Email	12/3/2016
1b	Henri	Radovan	Professor Department of Physics University of Puerto Rico	<p>2. I'm disappointed at the national interest level. You will extinguish US radio astronomy if you close down both observatories. It appears to me that the path you are taking is effectively outsourcing radio astronomy by supporting facilities on foreign soil (most notably ALMA in Chile), while trying to abandon domestic facilities. As you know, technological advances have their roots in fundamental science. Curbing the latter will ultimately adversely affect the first.</p>	Against Closure/Reasons Why	Not Applicable	Email	12/3/2016
1c	Henri	Radovan	Professor Department of Physics University of Puerto Rico	<p>4. I'm disappointed at the academic level. For the past two years I was working in establishing a minor-type program at my home university -- the University of Puerto Rico Mayaguez. Our new program will officially commence next year and will be the only such program at this level in Puerto Rico. It will attract local students to pursue astronomy/astrophysics studies and research by using the world-class AO radio telescope that [still] is virtually in our backyard.</p>	Against Closure/Reasons Why	Not Applicable	Email	12/3/2016
2	Robert	Steele	Shareholder: Baker, Donelson, Bearman, Caldwell & Berkowitz, P.C.	<p>We are emailing you today officially to request that NSF extend the public comment period on the Draft Environmental Impact Statement (DEIS) for the proposed Arecibo Observatory project in Puerto Rico for an additional period of time beyond the current stated comment submission deadline of December 12, 2016. At this time we would request the ability to submit relevant comments to NSF on this DEIS by January 11, 2017, an extension of 30 days (although a longer time would be acceptable as well).</p> <p>We have clients that have only recently gained a more heightened awareness and understanding of this very important matter. They need more time in order to review the lengthy, complex, and detailed document that has been produced and made available to the public, along with the previous work product elements cited throughout the DEIS. Such an extension of time would not materially delay the work of the NSF on these issues, while at the same time it would show fairness and due process to all interested parties. This comment period extension would also move the response deadline beyond the remainder of the holiday season and business year-end to allow for more thorough analysis and reasoned input and dialogue. We are aware that there was a scoping process performed earlier in 2016 and that recently there were two public meetings held in Puerto Rico on this matter. We are also aware of certain concerns raised as to whether notices were sufficiently disseminated in the community there (even if technical regulatory compliance may have taken place) and some people either not being able to attend or having their time to speak shortened due to the heightened interest in the situation, times of day for these events, or time taken for necessary translation for many speakers during these meetings. NSF reasonably granting more time now for written comment from the public and all parties may help to alleviate certain concerns on the front end and make for a stronger process and better result when completed by NSF. Finally, I would note that your regulations at 45 CFR 640.5(a) and elsewhere under CEQ/NEPA refer to DEIS comments being accepted for a "minimum" of 45 days after DEIS publication, but the rules should not preclude a somewhat longer period being allowed when necessary or appropriate.</p> <p>Please consider this request and let us know as soon as possible if an extension of the public comment period may be granted in this case. If there is NSF counsel or other official with whom we should speak about this in addition to yourself, such as my contacting you or others by telephone tomorrow (November 29) if needed, then please so advise. Thank you very much for your consideration and best regards.</p>	Procedural	Procedural	Email	11/28/2016
3a	Daniel R., Myra E., Carmen A.	Altschuler, Lebrón, Pantoja	Former Director of the Arecibo Observatory, Former Research Associate of the Arecibo Observatory, Former REU Coordinator for the Arecibo Observatory and Faculty Members,	<p>The future of the Arecibo Observatory in Puerto Rico is again a matter of public discussion We would like to add with these short comments to that public discussion, and clarify a few issues which have confused the public. Our long time association with the observatory allows us to make the following comments.</p> <p>Although it recently celebrated its fiftieth anniversary, it continues to serve scientific research in several areas, and in some of them it is a unique instrument. In a 2006 headline, the journal Nature declared that Arecibo might be "no longer the dish of the day", but then it never was! It has always been something of a gourmet dish, and definitely something very special.</p>	Against Closure/Reasons Why	Not Applicable	Letter	11/22/2016

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			University of Puerto Rico, Rio Piedras Campus	In particular, its radar capabilities, are unique and allow important investigations in the areas of atmospheric science and planetary radar. We begin by expressing our disagreement with statements that seem to imply that because it is no longer the largest single dish aperture on our planet, being surpassed by the recently inaugurated FAST telescope (Five hundred meter Aperture Spherical Telescope) in China, it has therefore become obsolete. It is still the second largest single dish in the world, mainly serving the US scientific community, and FAST is in China. It is also not true that the SKA (Square Kilometer Array) being constructed in South Africa and in Australia, makes Arecibo obsolete. The SKA is under construction and at any rate does not and will not have certain capabilities which Arecibo does have (Radar).				
3b	Daniel R., Myra E., Carmen A.	Altschuler, Lebrón, Pantoja	Former Director of the Arecibo Observatory, Former Research Associate of the Arecibo Observatory, Former REU Coordinator for the Arecibo Observatory and Faculty Members, University of Puerto Rico, Rio Piedras Campus	In particular we wish to point out that even if all that Arecibo could do was planetary radar, this capability is well worth the relatively small budget needed to maintain the Arecibo Observatory open. It is needed to establish the precise orbit of a near earth asteroid which could represent a threat to a region of the earth in the event of an impact which, although of low probability, is not impossible. Arecibo represents a first line of defense to verify such a threat. An insurance premium of \$12 million a year is a real bargain. (Total NSF budget is about \$7.4 billion).	Against Closure/ Reasons Why	Not Applicable	Letter	11/22/2016
3c	Daniel R., Myra E., Carmen A.	Altschuler, Lebrón, Pantoja	Former Director of the Arecibo Observatory, Former Research Associate of the Arecibo Observatory, Former REU Coordinator for the Arecibo Observatory and Faculty Members, University of Puerto Rico, Rio Piedras Campus	Furthermore, it is not just another telescope. It is an international scientific icon and has been designated by the Institute of Electrical and Electronics Engineers (IEEE) as an important historical milestone of electrical engineering. The American Society of Mechanical Engineers (ASME) declared it a monument of mechanical engineering, both events happening in 2001. It was registered in the national registry of historic places by the U.S. Department of the Interior National Park Service in 2008. Closing or decommissioning have therefore implications which go beyond strictly scientific matters, since attention must also be given to section 106 of the federal code for the protection of historical sites. (www.achp.gov).	Against Closure/ Reasons Why	Not Applicable	Letter	11/22/2016
3d	Daniel R., Myra E., Carmen A.	Altschuler, Lebrón, Pantoja	Former Director of the Arecibo Observatory, Former Research Associate of the Arecibo Observatory, Former REU Coordinator for the Arecibo Observatory and Faculty Members, University of Puerto Rico, Rio Piedras Campus	Many of our colleagues agree that closing the Observatory is a bad move. Changes in its operation will also have significant consequences beyond the issues mentioned above, including a negative effect on the already gloomy economic situation of Puerto Rico.	Against Closure/ Reasons Why	Not Applicable	Letter	11/22/2016
3e	Daniel R., Myra E., Carmen A.	Altschuler, Lebrón, Pantoja	Former Director of the Arecibo Observatory, Former Research Associate of the Arecibo Observatory, Former REU Coordinator for the Arecibo Observatory and Faculty Members, University of Puerto Rico, Rio Piedras Campus	We think that the preferred option by the NSF, of finding partners for funding the Observatory, must be looked upon with some concern, especially if the idea is to "offer" the observatory to the local government, (likely through the University of Puerto Rico). The alternative of transforming the observatory into an educational institution is also not a good one, and just another way to find local money for a federal facility mostly used by US scientists. The telescope is not an adjunct to the educational activities, it is exactly the opposite.	Against Closure/ Reasons Why	Not Applicable	Letter	11/22/2016

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3f	Daniel R., Myra E., Carmen A.	Altschuler, Lebrón, Pantoja	Former Director of the Arecibo Observatory, Former Research Associate of the Arecibo Observatory, Former REU Coordinator for the Arecibo Observatory and Faculty Members, University of Puerto Rico, Rio Piedras Campus	Furthermore, aside from its scientific value, the observatory has served as inspiration and training ground for many Puerto Rican students who have very limited local opportunities to do so. Some of them went on to obtain their doctoral degrees in science. If NSF wants to further the participation in STEM by minorities and women, closing or otherwise limiting the operation is again a bad idea.	Against Closure/ Reasons Why	Not Applicable	Letter	11/22/2016
4	Kevin	Shocket	Puerto Rico Pyther Group	The Arecibo Observatory is a Puerto Rican national treasure and every possibility that could save it should be explored. While it may have been surpassed by telescopes newer and more efficient, but it's unique capabilities and location make this telescope worthy of preserving. Every measure should, regardless of the outcome, be taken to save the facility and can continue to be a source of important source of scientific and cultural significance and inspiration. Let us not see the telescope fall into the same state as the Puerto Rico's 360° light house system in the late 1800s, this system protected maritime traffic in and around Puerto Rico. Now, the Arecibo telescope protects the planet from asteroids. Let's not let history repeat itself, many of those lighthouses are abandoned and in disrepair. Don't let the same happen to our national treasure.	Against Closure/ Reasons Why	Not Applicable	Public Meting Written Comment Card. Commenter provided these comments at the 11-17-2016 10:15am public meeting and the verbal comments are addressed with the written comments.	11/17/2016
5a	Carlos M. Padín	Bibiloni	Chancellor of Universidad Metropolitana and member of the management team of Arecibo Observatory	My name is Carlos M. Padin Bibiloni, and I am the Chancellor of Universidad Metropolitana (UMET) and a member of the management team of the Arecibo Observatory. This statement reflects the views of Universidad Metropolitana and the Ana G. Mendez University System of Puerto Rico regarding the Educational and Public Outreach of the Arecibo Observatory and the socio-economic impact of the Agency-preferred Alternative (Alternative 1 - Collaboration with Interested Parties for Continued Science-focused Operations). It is our understanding that the role of the Arecibo Observatory in Puerto Rico and its impact on our education efforts and socioeconomic situation was not adequately reflected nor considered in the Declaration of Environmental Impact Draft Statement published by the National Science Foundation in October 2016. First, the five (5) alternatives presented in said document underestimate the impact of the Education and Public Outreach Program of the Observatory in Puerto Rico,	Resource Considerations for Document Analysis	Socioeconomics	Letter. Commenter provided these comments at the 11-17-2016 10:15am public meeting and the verbal comments are addressed with the written comments.	11/17/2016
5b	Carlos M. Padín	Bibiloni	Chancellor of Universidad Metropolitana and member of the management team of Arecibo Observatory	and second, the Draft Statement does not recognize the significant role of the Arecibo Observatory on the economic development of the island.	Resource Considerations for Document Analysis	Socioeconomics	Letter. Commenter provided these comments at the 11-17-2016 10:15am public meeting and the verbal comments are addressed with the written comments.	11/17/2016
5c	Carlos M. Padín	Bibiloni	Chancellor of Universidad Metropolitana and member of the management team of Arecibo Observatory	For over 53 years, the Arecibo Observatory has established a significant track record of scientific accomplishments in astronomy, planetary science, and space and atmospheric sciences. Its world-renowned scientists have served as mentors to many young scientists throughout the STEM pipeline in the United States. Here in Puerto Rico, and in contrast with many scientific research facilities in other locations, and particularly during these past five (5) years, the Arecibo Observatory and its surrounding society have established a close and significant partnership. The Government of Puerto Rico, through its Department of Education, has invested more than \$600,000 in training teachers in the use of the Arecibo Observatory in their classroom teachings. The Angel Ramos Foundation and the Ana G. Mendez University System have invested \$2.1 M to revamp the Science and Visitors Center because both partners are certain of the educational contribution of this cutting-edge research facility and its potential to positively impact the STEM pipeline in Puerto Rico. The Puerto Rico Infrastructure Financing Authority (AFI, for its initials in Spanish) also provided \$828,635 for infrastructure improvements at the Observatory. These actions all point to a real commitment of the people of Puerto Rico to the Arecibo Observatory.	Resource Considerations for Document Analysis	Socioeconomics	Letter. Commenter provided these comments at the 11-17-2016 10:15am public meeting and the verbal comments are addressed with the written comments.	11/17/2016

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5d	Carlos M. Padín	Bibiloni	Chancellor of Universidad Metropolitana and member of the management team of Arecibo Observatory	Another key aspect of the Arecibo Observatory is its role in the economic landscape of the island; specifically, in its impact on our tourism industry, the development of our Aerospace Cluster, and its broader impact on the development of a STEM workforce on the island. The Aerospace Cluster is part of the economic recovery strategy of the government of Puerto Rico, aimed at integrating aerospace manufacturers, providers and related institutions to develop strategies and foster synergies that will enhance the business environment in the areas where cluster members conduct their operations. Virtually overnight, Puerto Rico has become a magnet for some of the world's leading aviation and aerospace companies. With a long history of manufacturing expertise and a strong pipeline of engineering talent, the island has attracted multimillion-dollar investments by these and other major firms during recent years. The Arecibo Observatory is part of Puerto Rico, part of this strategy and a key asset for the development of this aerospace cluster. (See attached map for a visual representation of the Aerospace Cluster.)	Resource Considerations for Document Analysis	Socioeconomics	Letter. Commenter provided these comments at the 11-17-2016 10:15am public meeting and the verbal comments are addressed with the written comments.	11/17/2016
5e	Carlos M. Padín	Bibiloni	Chancellor of Universidad Metropolitana and member of the management team of Arecibo Observatory	The many activities implemented by the Education and Public Outreach component of the Arecibo Observatory evidences the broader impact of this research facility, which meets the goals of the agency to broaden the participation of underrepresented groups in STEM initiatives. Since October 2011, the Angel Ramos Foundation Science and Visitor Center at the Observatory has hosted more than 450,000 visitors; approximately 30% of these are school children. In addition, the activities hosted have included Saturday academies for high school students; Research Experiences for Undergraduates (REU) projects sponsored by NSF; Observation nights in consortia with the Puerto Rico Astronomy Society, which attract more than 700 participants per event; research opportunities as part of undergraduate capstone/practicum courses from various local higher education institutions; and mentoring for theses (master and PhD level). In addition, the creation of the Arecibo Observatory Council of Chancellors and Stakeholders has enabled different universities to come together to use, promote, and create innovative programs that broaden the opportunities for students across the island to become part of a nationally recognized research institution. These opportunities create the real, meaningful pathways that increase the STEM workforce.	Resource Considerations for Document Analysis	Socioeconomics	Letter. Commenter provided these comments at the 11-17-2016 10:15am public meeting and the verbal comments are addressed with the written comments.	11/17/2016
5f	Carlos M. Padín	Bibiloni	Chancellor of Universidad Metropolitana and member of the management team of Arecibo Observatory	The Agency-preferred Alternative includes the deconstruction of over 26 buildings at the site and implies the elimination of the planetary radar, and the space and atmospheric science capabilities at the Arecibo Observatory. These actions will negatively impact the promotion of the aerospace cluster and will limit the possibilities of the Arecibo Observatory Management Team to pursue other sources of income for the financial stability of this outstanding research facility.	Resource Considerations for Document Analysis	Socioeconomics	Letter. Commenter provided these comments at the 11-17-2016 10:15am public meeting and the verbal comments are addressed with the written comments.	11/17/2016
5g	Carlos M. Padín	Bibiloni	Chancellor of Universidad Metropolitana and member of the management team of Arecibo Observatory	This alternative will also limit the educational research opportunities for undergraduate and graduate students, the space academy and all active and current educational activities. Furthermore, eliminating most of the housing at the site will reduce the opportunities to host scientists, teachers, and students who avail themselves of these options due to the geographical and logistic challenges related to the location of the site.	Resource Considerations for Document Analysis	Socioeconomics	Letter. Commenter provided these comments at the 11-17-2016 10:15am public meeting and the verbal comments are addressed with the written comments.	11/17/2016
5h	Carlos M. Padín	Bibiloni	Chancellor of Universidad Metropolitana and member of the management team of Arecibo Observatory	We feel it is imperative that the DEIS explain in more detail the impact of the alternatives on the Education and Public Outreach component of the Observatory, the local economy, and the science that only occurs at Arecibo.	Resource Considerations for Document Analysis	Socioeconomics	Letter. Commenter provided these comments at the 11-17-2016 10:15am public meeting and the verbal comments are addressed with the written comments.	11/17/2016
5i	Carlos M. Padín	Bibiloni	Chancellor of Universidad Metropolitana and member of the management team of Arecibo Observatory	The Agency-preferred Alternative will most likely negatively impact the possibilities of obtaining funds from the private sector and from other federal agencies, such as NASA.	Against Closure/ Alternatives Considered	Alternatives	Letter. Commenter provided these comments at the 11-17-2016 10:15am public meeting and the verbal comments are addressed with the written comments.	11/17/2016

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5j	Carlos M. Padín	Bibiloni	Chancellor of Universidad Metropolitana and member of the management team of Arecibo Observatory	UMET, as well as the Puerto Rico Council of Chancellors and Stakeholders of the Arecibo Observatory, strongly believes that the best option for a sustainable and productive future for the Arecibo Observatory is to maintain the site with multiple scientific research capabilities. Our vision of the Arecibo Observatory is one that will continue supporting the STEM pipeline in Puerto Rico and the economic development of the island.	Against Closure/ Reasons Why	Not Applicable	Letter. Commenter provided these comments at the 11-17-2016 10:15am public meeting and the verbal comments are addressed with the written comments.	11/17/2016
6	Luis Ortíz	Ortíz	Executive Director at the Common Wealth of Puerto Rico	<p>I would like to point out that the Puerto Rico Industrial Development Company's business development program to attract Aerospace companies has benefited from the Arecibo Observatory. Closing this research institution will not serve the interest of the people of Puerto Rico and it will be a setback in establishing this sector as a main contributor in the economic development of the Island.</p> <p>For many years, the Arecibo Observatory stood proud but somewhat isolated from the economic development of the Island. But in 2007, the stakeholders began to incorporate the research capability of the institution to attract innovation-driven companies mostly in aerospace. In ten years, the industry grew from less than 1,000 employees to 5,000 employees.</p> <p>Today, it is anticipated that this sector will double the number employees in a 5-year period. Companies in the space subsector will contribute the most and are the one that requires ground support to receive communications from the satellites as well as space weather data and analytics to assist in their missions. The Arecibo Observatory has the capability and the talent to assist this new breed of companies looking at space for commercialization. We certainly understand NSF's financial concerns in keeping the facility open for research and education but the center has being both a symbol and a driver for innovation to many Puerto Rican students in their pursuit of science and engineering knowledge. Therefore, it is time to reinvent the business model of the center to meet the challenges of the scientist community and to become active participant of the business innovation community.</p> <p>Closing is not the answer. Changes must be instituted. New services and educational activities must be incorporated.</p> <p>PRIDCO supports Alternative 1 with a new and sustainable operation of the Arecibo Observatory in a manner consistent with the principles of the NSF. Given a short period of time the center will flourish and will continue to be an economic development tool for the betterment of Puerto Rico and humankind.</p>	Resource Considerations for Document Analysis	Socioeconomics	Letter. Jose Castro presented Ms. Ortiz's comment at the public meeting on 11-17-2016 at 10:15am and the verbal comments are addressed with the written comments.	11/16/2016
7a	Tracy M.	Becker	Southwest Research Institute Space Science and Engineering Division	<p>I am writing to you with grave concern for the future of the Arecibo Observatory. Not only does the observatory continue to produce significant contributions in multiple fields (planetary sciences, radio astronomy, and space & atmospheric sciences), but it also remains a critical tool for planetary defense; it is vital for identifying and characterizing potentially hazardous objects that could threaten the planet Earth.</p> <p>I believe that the AO Management team's statement in response to the NSF Draft Environmental Impact Statement (DEIS) written by Francisco Cordova addresses the specifics of the issues within the DEIS better than I possibly could; however, I would like to highlight and reiterate the concern for dismantling the unique radar and space weather capabilities of the observatory that (1) make the telescope unique and more powerful than any other in the world;</p>	Against Closure/ Reasons Why	Not Applicable	Letter	12/6/2016
7b	Tracy M.	Becker	Southwest Research Institute Space Science and Engineering Division	2) destroy prospects of future partnerships through the destruction of these capabilities; and	Against Closure/ Reasons Why	Not Applicable	Letter	12/6/2016
7c	Tracy M.	Becker	Southwest Research Institute Space Science and Engineering Division	3) are critical for planetary defense.	Against Closure/ Reasons Why	Not Applicable	Letter	12/6/2016
7d	Tracy M.	Becker	Southwest Research Institute Space Science and Engineering Division	Instead I will focus on several other crucial contributions that the Arecibo Observatory has made to me, the field and to the public. My personal journey as a planetary scientist began at the Arecibo Observatory. In 2008, as a college junior at Lehigh University, I applied to the NSF Research Experience for Undergraduates (REU) program and was astonished when I was accepted to work at such a celebrated telescope. At that time, I had no research experience or computer programming skills, only passion and extreme curiosity. As it turned out, the wise scientists at the observatory were looking to bring students like me – students from smaller universities with fewer research opportunities – to their REU program to give us the tools and experience that we would not have had otherwise and are essential for a successful future in a STEM field. The aid, knowledge, support, and encouragement I received from my mentors at AO were beyond	Against Closure/ Reasons Why	Not Applicable	Letter	12/6/2016

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				exceptional and my experience at the Arecibo Observatory was indisputably the foundation for my career as a planetary scientist. In May of 2016 I earned my PhD in physics & planetary science from the University of Central Florida and I am currently a postdoctoral scientist at the Southwest Research Institute. The research I began at the observatory as an inexperienced student led to my first peer-reviewed publication. That research focused on the first-ever detection of a near-Earth asteroid that had its own two small satellites. The discovery was made at the Arecibo Observatory a few months prior to my internship, and was thought by many to be an impossible asteroid system until the AO observations proved otherwise. The triple asteroid could not have been discovered without radar (the satellites are small and close to the primary asteroid) and yet it is critical for understanding the evolution of the asteroids that come closest to our planet.				
7e	Tracy M.	Becker	Southwest Research Institute Space Science and Engineering Division	<p>The exciting research I conducted at the Arecibo Observatory is not the only reason I remained in the field. I was one student among eight REU students that summer – half of whom were young women. Several of the students were from Puerto Rico and one student was international. The diversity among us was not only fun, but also encouraging. A number of science staff of all levels at the observatory were women, including my direct advisor and a postdoc with whom I often interacted. My introduction into the world of science was far more welcoming and inclusive than that experienced by many of my colleagues and many of the young scientists currently being introduced into the field. This remains true for AO – I am aware of several early career scientists of diverse backgrounds currently employed at the observatory.</p> <p>The most obvious and critical contribution that the Arecibo Observatory has made and continues to make towards diversity and inclusivity in the field is that of increasing the historically underrepresented group of Latinos in STEM. Most recently, the Arecibo Observatory Space Academy has proven to be a wildly successful program for recruiting, preparing, and retaining Puerto Rican high school students in STEM majors in college. The program's first graduating class produced students so well prepared that they had a college graduation rate of 100%. This does not even address the profound impact that the observatory has had on the countless number of Puerto Rican students that visit on school field trips or the pride most Puerto Ricans carry as host to the most powerful single dish radio telescope in the world.</p>	Against Closure/Reasons Why	Not Applicable	Letter	12/6/2016
7f	Tracy M.	Becker	Southwest Research Institute Space Science and Engineering Division	In addition to the observatory's public service as a teaching and outreach resource, the observatory serves as a critical instrument for studying the skies. Radar is one of the most powerful and unique tools at the Arecibo Observatory and is threatened by the planned changes to the observatory. It is from radar images, in conjunction with light curves and direct imaging of the asteroids, that we can build up highly accurate shape models of the objects. Radar is the best way to "see" an asteroid without sending a spacecraft to it. Radar observations are also essential for spacecraft missions, since estimates for the shape and gravity field of the bodies are crucial for asteroid flybys, orbits, and especially future landings. Radar is also the absolute best method for determining the velocity of an asteroid and determining its trajectory.	Against Closure/Reasons Why	Not Applicable	Letter	12/6/2016
7g	Tracy M.	Becker	Southwest Research Institute Space Science and Engineering Division	<p>The Arecibo Observatory is one of the most iconic U.S. observatories for the public. Whether they recognize the telescope from social media shares of ghostly radar images of asteroids, the detection of the WOW signal, or as the dish in a James Bond film, the impact that the observatory has made on the public is undeniable; its power to detect and characterize asteroids may have an even more important impact in the future. In addition to serving as an inspiration to me and to thousands of other students and visitors, the Arecibo Observatory is a fully functioning, critical instrument for exploring our universe and protecting our planet.</p> <p>As a planetary scientist and a U.S. citizen, I implore the National Science Foundation to reconsider the proposed changes that would be devastating to the indispensable science conducted at the Arecibo Observatory.</p>	Against Closure/Reasons Why	Not Applicable	Letter	12/6/2016
8a	Joyce	Stanley	Regional Environmental Officer	The U.S. Department of the Interior (Department) has reviewed the Draft Environmental Impact Statement (DEIS) for the National Science Foundation Arecibo Observatory (AO) Project in Arecibo, Puerto Rico. Our comments are provided as technical assistance under the Endangered Species Act (ESA; 87 Stat. 884, as amended; 16 United States Code 1531 et seq.) and Fish and Wildlife Coordination Act (FWCA; 48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). The National Science Foundation (NSF) prepared this DEIS to analyze the potential environmental impacts associated with the potential funding changes for AO. The five action alternatives analyzed in the DEIS are: 1) collaboration with interested parties for continued science-focused operations (NSF-preferred alternative), 2) collaboration with interested parties for transition to education-	Resource Considerations for Document Analysis	Biological	Letter	12/2/216

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				<p>focused operations, 3) mothballing of facilities, 4) partial deconstruction and site restoration, and 5) complete deconstruction and site restoration.</p> <p>Our comments are specifically related to the species listed under the ESA that were included in the DEIS. On June 24, 2016, we provided comments to NSF regarding the presence or potential presence of federally-listed species within the AO property. Those species and the potential impacts of the proposed project are included in the submitted DEIS. After reviewing the document, we offer the following comments:</p> <p>(1) The DEIS recognizes the presence of a Puerto Rican broad-winged hawk (BWAH) nest in a Maria tree on the south rim wall, above the 305-meter telescope dish. Although this and other Maria trees in the vicinity would not be impacted by deconstruction activities, it is important to indicate that this nest represents a BWAH territory and that there is a possibility of additional BWAH territories within the AO. According to Hengstenberg and Vilella (2004), the BWAH has a home range of 262 ac. Therefore, we recommend that NSF uses this information as well as survey data of the area to determine the number of territories occupied by this species. Such information will help develop appropriate conservation measures for the protection of the BWAH. Identification of territories becomes more relevant because for Alternative 5, the DEIS contemplates the use of explosives to deconstruct towers and other infrastructure. Even if deconstruction activities are conducted outside of the BWAH breeding season, disturbance from explosions and deconstruction activities may alter the behavior of the species and result in abandonment of occupied territories.</p>				
8b	Joyce	Stanley	Regional Environmental Officer	(2) <i>Auerodendron pauciflorum</i> - According to Axelrod (2011, p. 296) this species also occurs in the northern limestone hills of Puerto Rico (i.e., Arecibo and Isabela). Therefore, we believe this species may also occur at the AO area. Table 3.1-1 of the DEIS indicates this species does not have the potential to occur at the AO.	Resource Considerations for Document Analysis	Biological	Letter	12/2/2017
8c	Joyce	Stanley	Regional Environmental Officer	(3) <i>Thelypteris verecunda</i> - As stated in the DEIS, this species is known to occur on privately owned lands in the municipalities of Hatillo, Quebradillas, and San Sebastián. However, the species that occurs in the municipality of Yauco and Los Tres Picachos in Ciales is <i>T. yaucoensis</i> , not <i>T. verecunda</i> (5 yr. review, 2015). (4) <i>Eugenia haematocarpa</i> - According to the species' 5 yr. review (2014), a new locality was reported in 2011 in the municipality of Isabela by Marcos Caraballo and Dr. Eugenio Santiago (University of Puerto Rico, Río Piedras). The species was also found in two locations within the boundaries of the Guajataca Commonwealth Forest. (5) <i>Daphnopsis hellerana</i> - Approximately 2,047 individuals of <i>D. hellerana</i> were found within the proposed right of way of highway PR-10 in Arecibo (5 yr. review, 2013).	Resource Considerations for Document Analysis	Biological	Letter	12/2/2017
8d	Joyce	Stanley	Regional Environmental Officer	(6) <i>Cordia alliodora</i> - Due to its biology, this species has the potential to occur in areas that were previously disturbed for the construction of AO (e.g., areas that will be deconstructed). Therefore, we recommend searching for this species in the surroundings of buildings and infrastructure to be deconstructed. (7) <i>Solanum drymophilum</i> - This species was found during the construction of highway PR-10 and at the Río Abajo Commonwealth Forest (5 yr. review, 2015). Due to its biology, it may also be found in areas that were disturbed (e.g., areas that will be deconstructed). Therefore, we recommend searching for this species in the surroundings of buildings and infrastructure to be deconstructed.	Resource Considerations for Document Analysis	Biological	Letter	12/2/2017
8e	Joyce	Stanley	Regional Environmental Officer	(8) The DEIS states that the habitat that has developed beneath the 305-meter telescope dish is suitable to support the two listed fern species: <i>Tectaria estremeirana</i> and <i>Thelypteris verecunda</i> . To mitigate for impacts to these two species from removal of the telescope dish, NSF proposes to retain or restore the mesic partial sun microclimates beneath the telescope dish as appropriate following removal, or would restore areas of existing fern habitat using native woody species to create mesic partial sun microclimates that would be conducive to fern growth. The document further indicates that under a restoration scenario, controlled propagation (either greenhouse rising of tissue culture propagation) of the two species would be done and the propagules would be outplanted into the restored habitat once it had developed sufficiently to support the ferns.	Resource Considerations for Document Analysis	Biological	Letter	12/2/2017
				<p>The Department acknowledges and agrees with the controlled propagation efforts under this scenario. However, the restored habitat will take too long (> two decades) to provide the microclimate conditions appropriate for the two ferns. Instead, we recommend that following the removal of the 305-meter telescope dish, that area be restored with native tree species, and that any propagated material of the two fern species be planted in already existing mature suitable habitat within the AO property. With appropriate monitoring, this strategy will hopefully increase the chance of survival of planted individuals.</p>				

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8f	Joyce	Stanley	Regional Environmental Officer	9) The DEIS indicated that deconstructed areas would be naturally revegetated or re-landscaped after the deconstruction period, and open spaces would be revegetated with native vegetation to minimize the potential for the spread of exotic invasive species. The Department strongly recommends the use of native vegetation (i.e., species that naturally occur in the AO) for reforestation practices, and reducing to the maximum extent possible the use of species that are non-native to the area for landscaping purposes.	Resource Considerations for Document Analysis	Biological	Letter	12/2/2017
8g	Joyce	Stanley	Regional Environmental Officer	(10) The DEIS indicates that soil would be brought in for vegetation establishment in disturbed areas where the remaining soils following infrastructure removal are insufficient. The Department caution NSF with the use of this practice because bringing soil from other areas particularly from outside the AO, has a high potential of also bringing seeds of exotic plant species and create a management issue on restoration areas. If soil is needed, we recommend using soil from within the AO property.	Resource Considerations for Document Analysis	Biological	Letter	12/2/2017
8h	Joyce	Stanley	Regional Environmental Officer	In addition to the NEPA process, NSF is consulting with the Department for this project under Section 7 of the ESA to determine appropriate minimization, conservation, and mitigation alternatives for the protection of federally listed species. On this regard, October 25, 2016, NSF submitted a Draft Biological Assessment (DBA) for our evaluation. We reviewed the DBA and take this opportunity provide the following comments: (1) Clearly identify on a GIS map the areas that will be affected by all alternatives, including any forested area that may be affected by deconstruction, use of heavy equipment, and the use of explosives (i.e., foot print and any additional areas such as access roads and staging areas).	Resource Considerations for Document Analysis	Biological	Letter	12/2/2017
8i	Joyce	Stanley	Regional Environmental Officer	(2) Broad-winged hawk: we believe that at least 1 territory will be affected independently of conservation measures for Alternatives 4 and 5, because of the presence of a potential nest in the area. Definitely no project's activities should take place during the breeding season as stated in the DBA. However, a cumulative effect may occur if as a result of changes in the habitat due to deconstruction or disturbance caused by explosives result in the abandonment of the territory by the BWHA.	Resource Considerations for Document Analysis	Biological	Letter	12/2/2017
8j	Joyce	Stanley	Regional Environmental Officer	(3) In the absence of plants surveys, and without a clear idea of the area/habitat to be affected, all listed plant species may be affected, particularly in Alternatives 4 and 5. Surveys to determine the presence of listed plants within the project area are necessary as well as the map (item No. 1) in order to determine potential impacts to species.	Resource Considerations for Document Analysis	Biological	Letter	12/2/2017
8k	Joyce	Stanley	Regional Environmental Officer	(4) If ferns are not found beneath the 305-meter telescope dish, there is no need for restoration of that area for these particular species. Still, we recommend the implementation of restoration (reforestation with native species) practices in that area.	Resource Considerations for Document Analysis	Biological	Letter	12/2/2017
8l	Joyce	Stanley	Regional Environmental Officer	(5) We continue to recommend the establishment of a Conservation Easement as an effective conservation measure to set aside forested habitat for protection in perpetuity.	Resource Considerations for Document Analysis	Biological	Letter	12/2/2017
8m	Joyce	Stanley	Regional Environmental Officer	(6) Table 1 and boa protocols (attachment) are missing in DBA.	Resource Considerations for Document Analysis	Biological	Letter	12/2/2017
8n	Joyce	Stanley	Regional Environmental Officer	(7) In the absence of a figure depicting the components of the observatory (i.e., buildings, etc.), it is difficult to follow the areas that will be impacted under each alternative.	Resource Considerations for Document Analysis	Biological	Letter	12/2/2017
8o	Joyce	Stanley	Regional Environmental Officer	We recommend that NSF incorporates all the above recommendations into the final EIS and BA, in addition to any other recommendation provided to NSF staff during our November 16, 2016, meeting conducted at CESFO. You may also visit our website http://www.fws.gov/caribbean/ES for additional information on threatened and endangered species under our jurisdiction and Section 7 consultation process. Thank you for the opportunity to comment on this project. If you have any questions or require additional information, please contact José A. Cruz-Burgos at jose_cruz-burgos@fws.gov . I can be reached via email at joyce_stanley@ios.doi.gov or at (404) 331-4524.	Resource Considerations for Document Analysis	Biological	Letter	12/2/2017
9	Jocelyn Ann Satiago	Pérez	Biology Undergraduate Student at the University of Puerto Rico	I'd like to take a moment of your time to address my concerns about the funding cuts that are going to be done to the Observatory. Two years ago I was a part of the Arecibo Observatory Space Academy, a pre-college programs aimed for students with interests in STEM areas. Being a part of this program helped me	Against Closure/ Reasons Why	Not Applicable	Email	11/9/2016

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				develop important research skills that I now use in college and the possibility of this program not existing for future generations is incredibly disheartening. Also, I have bared witness to the incredible work the Observatory has done scientifically, the impact the Visitor's Center has on those who stop by and how much it helped me to have the onsite housing, among other facilities. To reduce or eliminate NSF funding would mean to ignore the great contributions of the scientists who have worked there and the impact the Observatory has had in the scientific community.				
10a	Doug	Currie		I am very sad to hear of the possible permanent closure and loss of the Arecibo Observatory which was until recently the largest radio telescope in the world and is still the largest in the Americas. I was born in 1960 and heard that Arecibo was built or commissioned in 1959 and have grew up with it all my life with my life-long interest in astronomy and space exploration.	Against Closure/ Reasons Why	Not Applicable	Email	11/7/2016
10b	Doug	Currie		I heard it is still in good operating condition and could continue to be funded for operations for only a total of 12 million dollars a year. I heard that NASA is already funding 4 million a year of the 12 million for radar studies particularly for very real threats from near-earth asteroids.	Against Closure/ Reasons Why	Not Applicable	Email	11/7/2016
10c	Doug	Currie		We saw what damage and injury an earth impact from even a moderately large asteroid can do with the impact a couple years ago in Cheralbynsk, Russia in which the striking asteroid destroyed over 1 million square feet perhaps square meters of glass and injured about 1500 people and I am sure did other damage. The Arecibo Observatory, if continued to be kept in use, would be helpful to give more early warning of future such events including possibly in the future in United States. This could minimize damage and injuries with the large size and sensitivity of the Arecibo facility. I believe this near-earth asteroid monitoring is the part of Arecibo Observatory's use by NASA in its radar applications and for which it is paying a substantial fraction of Arecibo's operating costs	Against Closure/ Reasons Why	Not Applicable	Email	11/7/2016
10d	Doug	Currie		However Arecibo has been used and I believe in some areas continues to be used in many other areas of astronomy or space exploration such as monitoring radio sources in our galaxy or more distant radio sources, perhaps doing more mapping of objects in our solar system at radio wavelengths and I think it can be used for determining molecules in space and perhaps in the atmospheres of planets in our solar system or other solar systems or their magnetic fields. Arecibo with its ability to transmit as well as receive could also have potential to be used more for communicating with what might be any intelligent extraterrestrial life and have more power that almost any existing or perhaps planned American radio observatory to do that. Arecibo in its early use may have contributed to humanity's realization that the planet Venus was actually very hot with an extreme greenhouse effect from its carbon dioxide atmosphere and sulfuric acid clouds that was a major astronomical discovery and has very practical lessons and warnings for us on Planet Earth. Arecibo would have superior detection capability in many of these areas because of its huge diameter and receiving area including probably more than not only most existing radio facilities but some that might be contemplated or planned by the United States or other countries.	Against Closure/ Reasons Why	Not Applicable	Email	11/7/2016
10e	Doug	Currie		I also heard from Sky and Telescope magazine it might cost \$300 million dollars to destroy the observatory and restore it to a natural state. Isn't that a waste of money when it would only take \$12 million a year in total or \$8 million a year from the National Science Foundation's budget to keep it operating and for it to continue to do useful science. I heard that part of the reason that NSF is considering closing the Arecibo Observatory is because the NSF budget has been flat for quite a few years and that the NSF has put the priority on funding new projects. This is even though there are many areas of the US government that receive much more funding and don't do nearly as much work of practical or inspirational or possible long term beneficial work. I would encourage your department to instead of considering closing Arecibo Observatory (and some other still high quality and good condition observatories such as Green Bank) that you help make and advertise to the US government to get increased funding for the NSF including apparently needed from Congress or from American or other interested entrepreneurs such as Yuri Milner and Marc Zuckerberg are partly contributing already to maintain operations of Greenbank. Could your department also not put new much more expensive projects on a slower funding path that could easily allow for continuing funding of Arecibo or Greenbank or other existing radio observatory facilities at current or modest rises due to inflation etc. that would allow these facilities to keep operating and contributing useful science results for more of their useful scientific operating lifetimes? Perhaps this current shortfall amount for operating Arecibo (and Greenbank and the National Radio Observatory in western US) could be covered by NASA. Although NASA also has some funding squeeze issues with its current funding levels and existing or projected commitments, its budget of about \$19 billion	Against Closure/ Reasons Why	Not Applicable	Email	11/7/2016

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				a year should be able to readily cover the \$8 million or several million a year to keep operating Arecibo, Green Bank and other telescopes now funded by NSF				
10f	Doug	Currie		<p>I was quite sad when the United States a couple decades ago lost its leading role in nuclear physics with the failure to follow through with funding the Superconducting Supercollider in Texas and then closed Fermilab which I visited as a teenage and has let all the leadership in high-energy nuclear physics go to Europe with the Large Hadron Collider of CERN. Although China has built the new FAST radio telescope that is somewhat larger than Arecibo, Arecibo is still quite comparable and can still do competitive and leading edge science research and I would therefore encourage your department to keep it operating for the foreseeable future or perhaps make a more serious effort to find other public or private partnerships to keep it operating.</p> <p>I am grateful that there is this opportunity for the public, including myself and others outside United States that have still benefited from it, to comment and indicate our support for the practical and inspirational importance the Arecibo (and Greenbank etc.) Observatory has been and that we urge you and your department or committee and the new president and Congress or whoever controls the overall funding to help ensure for the foreseeable future the continuing operations, scientific contributions and ongoing living scientific heritage to the United States and the world given by the operating of Arecibo Observatory. I also follow Professor Abel Mendez on Twitter from the University of Puerto Rico and I hope you will help Arecibo stay open to help people of Hispanic background from Puerto Rico or elsewhere in the United States get experience and contribute to science in a leading scientific facility more convenient to and especially inspirational to them. Thank you in advance for the time and consideration from you and the Environmental Review Committee associated with NSF and the Arecibo (and Greenbank etc.) telescopes and I hope there will be positive decision by you all to keep these great heritage and still in good scientifically viable facilities to operate at their modest budget.</p>	Against Closure/ Reasons Why	Not Applicable	Email	11/7/2016
11	Michael W.	Busch	Research Scientist, SETI Institute	<p>I am Michael Busch, a planetary scientist based at the SETI Institute. My research focuses on studying near-Earth asteroids with radar and radio techniques. I have worked extensively with the asteroid radar group at the Arecibo Observatory for the past 11 years. I find the Arecibo Draft EIS extremely disappointing and dismaying in how incorrectly it represents the value of the Observatory and in the options presented for the Observatory's future. I will focus my comments here on section 4.7.1.1. of the Draft EIS, "Public Safety", because it is the section on which I am most qualified to give an expert opinion. The Public Safety section grossly misrepresents both the asteroid impact hazard and Arecibo's role in addressing it. As the draft section does correctly not, there is perhaps a ~10% chance of an asteroid sufficiently large to cause regional-scale damage (>50-100 m in diameter) impacting Earth in the next few hundred years. However, directly contrary to incorrect statements made in the draft section: the extremely high precision of Arecibo radar ranging is critical to rule out or to identify potential impacts decades to centuries in advance. This has been demonstrated in many cases, including those of the asteroids Apophis (potential impacts throughout the 21st century now ruled out), Bennu (potential impacts during 2175-2200), and 1950 DA (potential impact in 2880). No other current or expected facility has comparable capabilities to Arecibo in terms of long-term asteroid trajectory prediction. Also contrary to incorrect statements made in the draft section, there are multiple technologies in development to deflect any asteroid that is found to be on an Earth-impacting trajectory onto a non-impacting trajectory. Two such technologies are to be tested on by upcoming space missions: gravity tractor deflection, by NASA's Asteroid Redirect Mission; and kinetic impactor deflection, by the joint NASA and ESA project AIDA. For both missions, Arecibo radar observations of the target asteroids will be required to demonstrate that they have been deflected as intended. This makes the continued operation of Arecibo through the next decade critical to addressing the asteroid impact hazard. The current draft section does not mention either the Asteroid Redirect Mission or AIDA. This is a glaring omission. The section also unaccountably neglects to mention the Chelyabinsk impact of 2013. On 2013 February 15, a small asteroid, ~15-20 m in diameter, airburst in the atmosphere over the city of Chelyabinsk. 1491 people were injured due to the shockwave from the airburst. No one died, but that was strictly a matter of luck. The ATLAS survey and other optical observing programs now intend to provide days to a couple of weeks of warning for most future Chelyabinsk-like small impactors. There is a roughly 35% chance of such an event happening somewhere on Earth in the next 10 years (given an average event rate of 1 per 25 years). Contrary to statements in the draft section, in the event that such a small impactor is found with a week of notice, there are established civil protection procedures in place in many places to prevent injuries like those that happened in Chelyabinsk - either by evacuation or sheltering in place. NASA and FEMA have held a series of joint exercises over the past several years to verify such procedures for the United States, and similar efforts have taken place in several other countries.</p>	Resource Considerations for Document Analysis	Safety	Email	11/14/2016

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				Regardless of where the next Chelyabinsk-like event happens, rapidly reducing the uncertainty in the upcoming impact location is crucial to implement civil protection. Arecibo radar observations would provide the exact impact location a few days earlier than any other facility could, giving the time necessary to prevent injuries or deaths. An approximate estimate of the positive benefit to public safety of continued radar observations at Arecibo is a statistical few tens of lives saved each year due to the ~10% chance of identifying any upcoming large impact with decades of notice and enabling tests of asteroid deflection technology; and a few injuries avoided each year due to more rapid localization of the impact zone prior to any future Chelyabinsk-like impact event.				
12	Gabriela T. Rosado	González		My name is Gabriela T. Rosado Gonzalez and I write on behalf of the Arecibo Observatory in Puerto Rico. It has come to my notice that funding changes are to be made in such an important investigation site as the Arecibo Observatory. I am one of the many students that has learned about research (identifying debris in the Arecibo Observatory dish), global warming (plan towards a zero-waste site), design of a second and third place of a space settlement called BANA, among many other things. As an undergraduate I could explore many different laboratory techniques with my mentor Luisa Fernanda. Currently I am an undergraduate chemistry student in the University of Puerto Rico, with high GPA. I owe a lot of my success in college to the teachings of Luisa Fernanda in the Arecibo Observatory. The same way I have been impacted positively by the Arecibo Observatory, many researchers and visitors have too	Against Closure/ Reasons Why	Not Applicable	Email	11/10/2016
13a	Zsolt	Paragi	Head of User Support	Zsolt Comment: I cannot contribute much to the discussions on the various options on future funding of Arecibo, but I have been an Arecibo user (through VLBI projects) all my career and have seen in many cases the difference Arecibo sensitivity made for cutting-edge science projects like - first direct evidence of AGN jet feedback in a galaxy with spectral line VLBI observations (Morganti et al. 2013, published in Science) - study of pairs of active galactic nuclei [claiming a candidate triple system] (Deane et al. 2014, published in Nature) - study of Fast Radio Bursts with Arecibo and the EVN --- a series of high-impact papers are on the way, to be published early next year It is fascinating that all these results, for which Arecibo participation was absolutely substantial, have emerged in the past few years! This clearly demonstrates how the science landscape has changed recently, and that Arecibo as a unique facility remains a key instrument for these emerging new fields. I sincerely hope that continued science operations will remain possible with Arecibo.	Against Closure/ Reasons Why	Not Applicable	Email	11/9/2016
13b	Zsolt	Paragi	Head of User Support	In this draft document, NSF has defined options for the future state of the Arecibo Observatory, given the need to significantly decrease or eliminate NSF funding of the Observatory.	Against Closure/ Reasons Why	Not Applicable	Email	11/10/2016
13c	Zsolt	Paragi	Head of User Support	The options considered are the following: Alternative 1 – Collaboration with Interested Parties for Continued Science-focused Operations (Agency-preferred Alternative) Alternative 2 – Collaboration with Interested Parties for Transition to Education-focused Operations Alternative 3 – Mothballing of Facilities Alternative 4 – Partial Deconstruction and site Restoration Alternative 5 – Complete Deconstruction and Site Restoration No-Action Alternative –Continued NSF Investment for Science-focused Operations The NSF has selected Alternative 1 – Collaboration with Interested Parties for Continued Science-focused Operations as the Agency preferred alternative. The text below is an excerpt from the document, providing more insight into the details listed under Alternative 1. “Alternative 1 would involve collaborations with new stakeholder(s) who would use and maintain the Arecibo Observatory for continued science-focused operations. NSF would reduce its funding of the Observatory and the new stakeholder(s) would be responsible for future maintenance and upgrades.....This proposed Alternative includes deconstruction activities that would remove 26 buildings from the site [emphasis added]. Most onsite housing, recreation facilities, and other buildings determined to be obsolete would be deconstructed.” The detailed list of buildings to be deconstructed under each alternative can be found in the DEIS document. It is important to note that alternatives 1, 2, 4 and 5 include deconstruction activities. The only Alternatives that do not include deconstruction activities are Alternative 3 – Mothballing and the No Action Alternative which would continue the current operational model.	Against Closure/ Reasons Why	Not Applicable	Email	11/10/2016
14	Sven	Littkowski		Possible Usages After US Decline Of Funding (in brief words)	Against Closure/ Reasons Why	Not Applicable	Email	11/6/2016

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				- Make Arecibo available to the international astronomical community, connectable to home computers - Arecibo can be used as outlet of other observatories who take over parts of the funding				
15	Dr. Alan	Potts		I am a sentient English, intellectual. The potential termination of the Arecibo telescope is a global disgrace. Truly! I saw this in the UK when some clever chaps posed the Mark IA Jodrell Bank radio telescope up for sale...they said, on ebay, it needed some land. In the UK or USA. We are investigators of the external universe. Arecibo, has always been a key foir all humans, exploring our universe. Make sure this can never happen! A potential disgrace. Push come to shove. We, the world, needs Arecibo!	Against Closure/ Reasons Why	Not Applicable	Email	11/4/2016
16a	Jeffery T.	Grady		My name is Jeff Grady, and I'm a software engineer who has had the privilege of visiting the Arecibo Observatory in Puerto Rico, as well as meeting the amazing scientists and engineers who work there. I'm writing to you today to express my thoughts on the critical role Arecibo plays in not only the scientific community but in the continued safety of humanity, and thus the importance of providing adequate and sustained funding for the operation of the observatory. I'm sure you're well aware of the many discoveries Arecibo has made, as well as contributions to at least one Nobel Prize in Physics, but it is also an indispensable tool in our continued vigilance against near-Earth objects. I believe that successfully observing, tracking, and someday preventing asteroid impacts is a basic required function for any intelligent species in the Universe who wishes to endure and survive in the long-term. Success in this endeavor will require sustained effort over a long period of time, and we need to keep and maintain the tools available to us.	Against Closure/ Reasons Why	Not Applicable	Email	11/5/2016
16b	Jeffery T.	Grady		In addition to its scientific and existential functions, continued adequate funding for the Arecibo Observatory can also play an important role in supporting the struggling Puerto Rican economy.	Against Closure/ Reasons Why	Not Applicable	Email	11/5/2016
16c	Jeffery T.	Grady		If you desire more information on this subject, I encourage you to read this excellent article in Sky & Telescope: "Arecibo Observatory Faces Uncertain Future" http://www.skyandtelescope.com/astronomy-news/arecibo-observatory-faces-uncertain-future/ Finally Ms. Pentecost, I would like to implore you to use the power you have to support the continued funding of Arecibo Observatory. The United States should be proud to have such an instrument at its disposal, and in the long-term, it will make us wise and safe	Against Closure/ Reasons Why	Not Applicable	Email	11/5/2016
17	Andrew	Seymour		In section 2.3.1 of the DEIS it states, "Alternative 1 would involve the least change to the current facility" wouldn't Alternative 6 "No Change" be the least change? The draft should be we worded such that all options are equally considered since "no decision has been made" of the future of the Arecibo Observatory.	Against Closure/ Alternatives Considered	Alternatives	Email	11/21/2016
18a	Dr. Nicholas E.	White	Universities Space Research Association (USRA)	USRA Statement in Response to the NSF Draft Environmental Impact Statement (DEIS) for the Arecibo Observatory My name is Dr Nicholas White. I am the Universities Space Research Association (USRA) Senior Vice-President for Science. USRA is a non-profit organization with 105 member Universities all granting PhDs in the Space Sciences. USRA is one of the three partners managing the Arecibo Observatory and is responsible for the Astronomy and Planetary Radar Science at the observatory. I will focus my comments on the Planetary Radar, which the Draft EIS incorrectly summarizes the safety hazard. You may have read in the newspapers that last month NASA, the Federal Emergency Management Agency and other government agencies engaged in a planetary protection exercise at the NASA Jet Propulsion Lab to consider the potentially devastating consequences of a 330-foot asteroid hitting the Earth. While this may seem like science fiction, these events are a real possibility. One just has to remember the 2013 Chelyabinsk impact in Russia, which was caused by an object only ~20 meters across. Despite its relatively small size, it caused damage to 7,200 buildings and injured 1,500 people. How is this relevant to the discussion today? Well the Arecibo Observatory is the world's most powerful and sensitive radar system which is used to track these killer objects. It is a vital part of our planetary defense system. These hazardous asteroids are found by optical telescopes that scan the sky looking for moving points of light. Once an Asteroid is found Arecibo Observatory within days turns its radar to pinpoint its orbit. Arecibo Observatory determines to better than 1 part in 10 million the path of the asteroid and whether it will or will not hit the Earth at some point in the future. Such is the precision Arecibo Observatory can predict the Asteroid orbits decades, even centuries into the future. The earlier we can find one of these killer Asteroids, the more time there is to deal with it.	Resource Considerations for Document Analysis	Safety	Letter. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15am public meetings and the verbal comments are addressed with the written comments.	11/18/2016

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				Many of these asteroid may go on to orbit the sun for decades, before their paths cross the Earth. In these cases, we will have time to send a spacecraft to deflect it well ahead of time. Even in the worst case scenario, when we find the Asteroid when it is already on a direct collision course, Arecibo Observatory allows us to predict the time and place of its impact and take action to save lives. I want to emphasize that there is no other dedicated capability to match Arecibo in the world today. The NASA Goldstone radar is also part of this Planetary Defense network, but has other demands on its time and is not as powerful or as flexible in scheduling. The recently commissioned 500m FAST radio telescope in China has no radar capability and so will not provide a capability to replace Arecibo in this critical area. The criticality of Arecibo Observatory has been recognized by the National Academies of Sciences. In a report published in 2010 ["Defending Planet Earth: Near-Earth Object Surveys and Hazard Mitigation Strategies"] the Academy recommended "Immediate action is required to ensure the continued operation of the Arecibo Observatory at a level sufficient to maintain and staff the radar facility". This recommendation has resulted in NASA providing \$3.7M a year, through USRA, to enable this capability, fully one third of the total funding for the observatory. In 2005, the United States Congress passed the George E. Brown, Jr. Act that directed NASA to detect, track, and characterize near-Earth objects larger than 140 m in diameter. In 2010, the goals of the George E. Brown, Jr. act were incorporated in the National Space Policy of the United States of America that guides the NASA administrator to pursue capabilities, in cooperation with other departments, agencies, and commercial partners, to "detect, track, catalog, and characterize near-Earth objects to reduce the risk of harm to humans from an unexpected impact on our planet". Shutting down the planetary radar operations at Arecibo Observatory will put lives and property at risk. NSF is the Federal steward for this facility and it is USRA's expectation that NSF will maintain the national need to track and characterize Near Earth Asteroids. The DEIS fails to note all these critical facts and USRA requests that it be corrected.				
18b	Dr. Nicholas E.	White	Universities Space Research Association (USRA)	We suggest that an option be included that continues operation of the facility with the prime purpose to support the NASA funded Planetary Radar. I would like to end by saying that USRA, along with our partners SRI and UMET, remain committed to maintaining the full operation of the site. As part of this we are seeking all interested parties who can bring funding to utilize the scientific assets or the site itself to ensure that the NSF preferred option can be realized.	Against Closure/ Alternatives Considered	Alternatives	Letter. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15am public meetings and the verbal comments are addressed with the written comments.	11/18/2016
19	Andrew	Seymour		In the abstract of DEIS there is no mention of the option of "no change of funding from NSF" seen in ES.4.6. Please make sure that all options are listed in this abstract.	Against Closure/ Alternatives Considered	Alternatives	Email	11/21/2016
20	Andrew	Seymour		The NSF has produced this draft (and I quote from the draft) "to analyze the potential environmental impacts associated with potential funding changes for the Arecibo Observatory". In sections 3.1.5 Threatened and Endangered Species and 3.1.6 Migratory Birds of this draft use the Information for Planning and Conservation (aka IPaC) Trust Report as its sole reference to list all the protected species known from Arecibo. Yet, the IPaC Trust Report states multiple times (and I quote), "This [IPaC Trust] report is for informational purposes only and should not be used for planning or analyzing project level impacts." Since the IPaC Trust Report is not a proper study of the site, states it should not be used to analyze the impact level, and is not satisfactory under Section 7 of the Endangered Species Act, all the material based on the IPaC report should be stricken from the Environmental Impact Statement. Along with this all sections in the draft that refer to mitigation of migratory birds, and threatened and endanger species should be reevaluated. Seeing that no studies to the environmental impact on threatened, endangered species and migratory birds have been done for the site, an intensive full year study should be conducted. This study should include endangered species, migratory birds, seasonal plants, insects, and fungi that are using this site as a refuge. Regardless, the EIS should only be finalized when a proper study of the site is concluded. While this is a difficult process for all, a proper job must be done to ensure we reduce the impact from any of these options and to ensure that this document is correct when referenced in the future.	Resource Considerations for Document Analysis	Biological	Email. Commenter provided these comments at the 11-16-2016 6:15pm public meeting and the verbal comments are addressed with the written comments.	11/21/2016
21	Santa L. Pérez	Cortés	AOSA Alumni Undergraduate Student Department of Geology University of Puerto	Greetings Respect of the Arecibo Observatory situations, for me, is really sadly that this is happening . In the Arecibo Observatory kids, younger and adults enjoy that science that in our school isn't available. I will explain myself, the Arecibo Observatory explore the boundaries and go further than that science that we learn at school. The Arecibo Observatory is the home of a younger (and probably now adults) that we increase our knowledge of geology, chemistry, engineering and space by the Arecibo Observatory Space	Against Closure/ Reasons Why	Not Applicable	Email	11/19/2016

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New Comment Number	First Name	Last Name	Affiliation	Comment	Category	Key Topic as Presented in the Following Response Documents	Comment Source	Date Comment Received
			Rico Mayaguez Campus	Academy. Thanks to Arecibo Observatory, I can be who I am today, I can be in college, trying to learn and apply what I did in AOSA to contributed to the scientific community, same as AO is doing for 45 years. I saw how Arecibo Observatory impacts myself, but the example that I'm so excited and happy to share with you is from my niece, Ruth Noemi. Ruth is 7 years old right now, she is a little science passionate girl, especially for space. Probably other kids have the opportunity to go to museums, some space stations (NASA) and other space and science exploration centers, but in Puerto Rico the situation is different. Here we have the Observatory. (And we are so proud of it) You don't know how proud I feel when my niece tells everyone: "I went to the Arecibo Observatory!" "I love it!" "I want to be a scientific" "I love space! We can learn a lot in the Observatory!". She understands the importance of our second biggest radar of the world. If this is expressions from a 7 years old girl, imagine how important is this observatory for the rest. Imagine how this Observatory marks the life of thousands of Puerto Ricans and not-Puerto Ricans, residents, visitors and researchers. This Observatory changes the life and inspires the future generations of scientific, we can't take away this tool from them				
22a	Joshua Serrano	Lopez		You should continue funding the Arecibo Observatory	Against Closure/ Reasons Why	Not Applicable	Email	11/18/2016
22b	Joshua Serrano	Lopez		and to respect the telescope's listing as a national historic place.	Against Closure/ Reasons Why	Not Applicable	Email	11/19/2016
23a	Donald	Campbell	Professor, Cornell University and former Arecibo Observatory and NAIC Director.	Preamble: The Arecibo telescope remains a critically needed facility for several high impact astronomical research programs; the detection of gravitational waves at nano-Hertz frequencies (NANOGrav), the detection and understanding of the origins of Fast Radio Bursts (FRBs), and astrometric and characterization radar observations of near-Earth asteroids. With the addition of a 40-beam L-band phased array feed system, the telescope would be instrumental in testing the current Lambda-CDM cosmological model. A proposal for such a feed system has been submitted to the NSF. Since Arecibo has about 5 times the sensitivity of the 100 m Green Bank Telescope, which also has an uncertain future, and the EVLA at the frequencies of interest, most of this research will not be carried out if Arecibo is closed. Once the Chinese FAST telescope is fully operational, likely not for another two years or so, it will be able to substitute for Arecibo for a number of these research objectives. Given their importance, I would not like to see these research areas ceded to China.	Against Closure/ Reasons Why	Not Applicable	Email	11/16/2016
23b	Donald	Campbell	Professor, Cornell University and former Arecibo Observatory and NAIC Director.	Senior and Portfolio reviews: The DEIS gives emphasis to the recommendations of the 2006 Senior Review and does not fully quote those of the 2012 Portfolio Review. With regard to the Arecibo Observatory, the more recent Portfolio Review stated "Recommendation 10.3: Our recommended portfolio includes ALMA, ATST, VLA, Gemini, Blanco, DST, NISP, Arecibo and Soar." The review goes on to say "Recommendation 10.4: AST should reevaluate its participation in Arecibo and SOAR later in the decade in light of the science opportunities and budget forecasts at the time." It does not specify how the "reevaluation" should be done but points out that pulsar timing had a large science return and, as the above preamble describes, the impact of high precision pulsar timing is potentially very large and the recently discovered enigmatic Fast Radio Bursts may be equally significant. Arecibo is preeminent in these areas of research. The recent LIGO detection of gravitational waves makes the use of high precision pulsar timing to detect nano-Hertz gravitational waves – a different frequency from LIGO – of significantly higher interest than previously and the decision to possibly abandon the capability to do this should be rethought.	Against Closure/ Reasons Why	Not Applicable	Email	11/16/2016
23c	Donald	Campbell	Professor, Cornell University and former Arecibo Observatory and NAIC Director.	It has been my understanding that the mid-term evaluation would include community input but I am not aware of any specific actions directed to this end. While there are committees such as the Astronomy and Astrophysics Advisory Committee, there was not a process that clearly sought input from the "grass roots" community	Against Closure/ Reasons Why	Not Applicable	Email	11/16/2016
23d	Donald	Campbell	Professor, Cornell University and former Arecibo Observatory and NAIC Director.	Since Arecibo is very important to some areas of planetary science, in 2015 the Division of Planetary Science members passed a resolution of support for the continuation of Arecibo, real community support. It is very unclear that any consideration was given to this resolution. NASA puts in almost \$4M per year to support Arecibo's planetary radar program and has indicated that it will continue to do so if the telescope and radar system are available. There is virtually no mention of this in the DEIS.	Against Closure/ Reasons Why	Not Applicable	Email	11/16/2016
23e	Donald	Campbell	Professor, Cornell University and former	The DEIS: Short of Alternative 6, continuing operations as they are, the NSF has chosen the next preferable option, Alternative 1, continuing science operations in collaboration with interested parties. Several comments on this option:	Against Closure/ Reasons Why	Not Applicable	Email	11/16/2016

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			Arecibo Observatory and NAIC Director.	<p>1. If NSF funding is reduced to about \$2M, \$1M each from AST and ATM, what access will there be for the US astronomical and atmospheric science communities? Assuming a budget of about \$10M, does this mean that only about 10% of the telescope time will be available to each of these communities? If NASA continues its ~\$4M of funding for the planetary radar program then planetary astronomers will continue to have access.</p> <p>2. Given my long association with the Arecibo Observatory, I very much doubt that an effective atmospheric science program can be run for only \$1M. Is it anticipated that one or more of the "interested parties" will contribute to this program?</p>				
23f	Donald	Campbell	Professor, Cornell University and former Arecibo Observatory and NAIC Director.	<p>3. The buildings listed for deconstruction include:</p> <p>a) Deconstructing the S--band high voltage power supply; NASA has indicated that, given the correct conditions, it intends to continue its support of the S--band planetary radar program, especially the near--Earth research component, at a level close to \$4M per year. Deconstructing the high voltage power supply would end any S--band radar observations.</p> <p>b) Deconstructing the HF transmitter building will end the ionospheric modification program in atmospheric sciences.</p> <p>c) Deconstructing the Administration building would eliminate all the scientific staff offices and the library yet the Alternative 1 plan includes retaining the scientific staff.</p> <p>d) Deconstructing the warehouse eliminates storage for the myriad spare parts needed to keep the telescope operational.</p> <p>e) Deconstructing the Bachelor (B) and Family (F) visiting scientist housing units would remove the only quarters that have kitchens. Since the cafeteria is currently closed on evenings and weekends this means that visitors would need to make frequent 10 mile trips to Arecibo to eat. Newly hired non--local staff with families would have nowhere convenient to stay until they could find permanent housing.</p>	Against Closure/ Alternatives Considered	Alternatives	Email	11/16/2016
23g	Donald	Campbell	Professor, Cornell University and former Arecibo Observatory and NAIC Director.	<p>Alternatives 5, complete deconstruction and site restoration: The DEIS states that total deconstruction and return to close to a greenfield site can be achieved by 25 workers plus truck drivers working for 38 weeks at a cost of \$18.7M. This seems highly unrealistic and I would urge the NSF to obtain a second expert assessment of the costs. About 10 years ago, the NSF had a decommissioning study done that, if I remember correctly, had a number of up to about \$80M depending on the degree of decommissioning. This is supported by a February 23, 2012 Congressional Research Service report on the Arecibo Ionospheric Observatory that states that the cost of closure could approach \$88M.</p>	Against Closure/ Reasons Why	Not Applicable	Email	11/16/2016
23h	Donald	Campbell	Professor, Cornell University and former Arecibo Observatory and NAIC Director.	<p>Socioeconomics: While I appreciate that this is an environmental impact statement, the discussion of the impact of the loss of 136 (Alternative 5) or 130 (Alternative 4) jobs on the employees themselves, the nearby local communities and the municipality of Arecibo is particularly poorly done. While the number may "only" be about 1% of the labor force in the Arecibo area as stated, these are well paid jobs in relation to the local norm, many of them very well paid, and, typically, each such job in a community supports one more. Their loss would be more than a "negligible, adverse, long--term impact to employment and income" as stated in the DEIS. 1% is important and will have a detrimental effect on the local economy, one that is already suffering severely. If 1% of the jobs in the United States, about 1.5 million, were suddenly lost it would be regarded as a national disaster. On the issue of the employees themselves, the EIS should at least acknowledge the very serious impact on them from losing their jobs, a large number of them have worked for the Observatory for decades. Many of them have undoubtedly read the DEIS and must be left with the feeling that the NSF just does not care about them.</p>	Resource Considerations for Document Analysis	Socioeconomics	Email	11/16/2016
24	Kelby D.	Tomes	AOSA	<p>Hola. Hello. I'm a student from the Recinto Universitario de Mayaguez currently majoring in Physics. The Arecibo Observatory has been a home for me for more than a year. As an Islander and a pursuer of science in space and physics, the Arecibo Observatory has given me an opportunity in the fall of 2015. I entered their high school program, Arecibo Observatory, Space Academy (AOSA). For me as a high school student, at the time it gave me an opportunity to apply my skills and curiosity to make endeavors for the first time in a place where I could actually do something with guidance. I manage to develop an idea with help and develop a research project on its early stage. It managed to make impressive progress but not to be a complete research but as an experience. Arecibo Observatory has also been in my views as a scientist to pursue and develop knowledge using its technology. Furthermore, as an Islander having such instrument closely to the people can also help spread the love for science and STEM fields. This propagation of love for</p>	Against Closure/ Reasons Why	Not Applicable	Public Meeting Written Comment Card	11/16/2016

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				space and science could help get people to follow such path and get people to use. Right now as a freshman of the Mayaguez University I need as a tool for my growth and scientific experience The Observatory of Arecibo to be part of it. As an emerging young person just entering the world and love for science, want to grow as much as I can. With the Arecibo Observatory the closest tool to us science lovers is the best beginning for us to prosper. Furthermore, on being a college student, I would appreciate every opportunity I can get. Arecibo Observatory is capable of giving such things. As the other great opportunity for example the REU program, which is an internship program offered in the establishment could be one of many things that it could give to jump start this program. To be something that is at reach to us but suddenly takes away or not fully appreciates to give us what we need to start as young scientist perusing the gain as what we need. This feeling that would lead me to have is having something so close but too far.				
25	Carlos	Catalans	AOSA	As an AOSA alumni graduate (Spring 2016, class that lasted 6 months Jan.-May.). I have experienced one of the ways the Arecibo Observatory (AO) has contributed to the diffusion of knowledge to Puertorican locals (mostly minorities) and even national and worldwide kids, future generations and populations. When I learned about the plans of NSF to defund the AO just after I graduated from it, it startled me. I really couldn't believe the National Science Foundation, which obviously promotes science knowledge, would even, consider to shut down the most important "eye of the sky" center in P.R. (only in the Island, I could say, in the Caribbean) and to the whole world. The scientific output the Observatory has is humongous, and not only does P.R. benefit from it, but the whole humanity relies on it. If you are going to shut it down, it'll only (preferably) be because a new one is being built. We cannot keep losing scientific centers, we need to build more. As I read somewhere, "the human species is one that relies on science but that barely all know about it." That's why I think it's a mistake to mothball activities or even worse to convert it into a museum shut it down. We need to expand the knowledge of science, create more research institutions and promote science! One of the best things that happened in my life was to graduate from AOSA, and I want others to enjoy it too. The deconstruction of building sites are an analogy of unbuilding science foundations for the future. Thank you for your understanding and I hope you choose the best option.	Against Closure/ Reasons Why	Not Applicable	Public Meeting Written Comment Card	11/16/2016
26	Judy-Ann	Mitchell	Chief Sustainability and Multimedia Programs Branch. USEPA	<p>In accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, the U.S. Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement (DEIS) prepared for the National Science Foundation (NSF) to evaluate the potential environmental effects of proposed operational changes due to funding constraints for the Arecibo Observatory in Arecibo, Puerto Rico (CEQ#20160252). The Arecibo Observatory is located in the western portion of the Island of Puerto Rico, approximately 10 miles (16 kilometers) south of the City of Arecibo at the southern terminus of Puerto Rico Highway 625 (PR-625). A key component of the Arecibo Observatory is a 305-meter-diameter, fixed, spherical reflector. The Arecibo Observatory infrastructure includes instrumentation for radio and radar astronomy and ionospheric physics, office and laboratory buildings, a visitor and education facility, and lodging facilities for visiting scientists. The Observatory employs 128 persons, including approximately 16 scientific staff. The remainder of the employees work in support roles, including food service, software, maintenance, and as telescope operators (NAIC, 2016a; SRI International, 2016). The Angel Ramos Foundation Science and Visitor Center receives over 90,000 visitors per year. Approximately 30 percent of these visitors are schoolchildren. The Agency-preferred Alternative includes deconstruction activities that would remove 26 buildings from the site. Most onsite housing, recreation facilities, and other buildings determined to be obsolete would be deconstructed. Paved roads serving areas that would no longer be used would be removed. Site restoration would include reestablishing landscaping in areas where buildings were deconstructed and may involve transporting soil to the site to support landscaping in areas where building foundations or excavated bedrock would prevent vegetation establishment. According to the DEIS the Agency-preferred Alternative would produce no cumulative impacts. The DEIS addresses hazardous and solid waste management practices properly, however there is very limited discussion of any potential sustainability, recycling and re-use practices that could apply during deconstruction activities for the Agency preferred Alternative. You may wish to add or consider the following information to sections 4.5 and/or 4.6 where applicable.</p> <ul style="list-style-type: none"> Recycling and/or reuse of construction and demolition (C&D) material can lessen the impacts of increasing disposal at solid waste facilities. The project should incorporate recycling, reuse and disposal options for C&D waste associated with deconstruction/demolition as appropriate. You may find more detailed information about recycling of C&D waste at: http://www.epa.gov/osw/conservation/imr/cdm/recycle.htm. 	Resource Considerations for Document Analysis	Hazardous Materials	Letter	12/13/2016

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				<ul style="list-style-type: none"> As there may be potential for landscaping after removal of structures on site, EP A's GreenScapes program provides cost-efficient and environmentally friendly solutions for landscaping. For additional information, please see: http://www.epa.gov/wastes/ conserve/tools/ greenscapes/index.htm 				
26 Cont.	Judy-Ann	Mitchell	Chief Sustainability and Multimedia Programs Branch. USEPA	<ul style="list-style-type: none"> Use of diesel equipment will be required during project activities. Clean diesel options should be considered. For new equipment contract specifications requiring advanced pollution controls and clean fuels please see: http://www.northeastdiesel.org/pdf/NEDC-Construction-ContractSpec.pdf and http://www.epa.gov/cleandiesel/technologies/index.htm Consider implementing diesel controls, cleaner fuel, and cleaner construction practices for onroad and off-road equipment used for transportation, soil movement, or other construction activities, including: Strategies and technologies that reduce unnecessary idling, including auxiliary power units, the use of electric equipment, and strict enforcement of idling limits; and Use of clean diesel through add-on control technologies like diesel particulate filters and diesel oxidation catalysts, repowers, or newer, cleaner equipment. For more information on diesel emission controls in construction projects, please see: http://www.northeastdiesel.org/pdf/NEDC-Construction-Contract-Spec.pdf <p>Thank you for the opportunity to comment on the DEIS for the potential environmental effects of proposed operational changes due to funding constraints for the Arecibo Observatory in Arecibo, Puerto. EPA rates the DEIS as LO or "Lack of Objections" in accordance with EPA's national rating system. Our comments on the DEIS contained in this letter are intended to help provide useful information that will ultimately inform local, state and federal decision-making and review related to land and water resource use and impacts. Should you have any questions regarding the comments and concerns detailed in this letter, please feel free to contact Michael Poetzsch of my staff at 212-63 7-414 7.</p>	Resource Considerations for Document Analysis	Hazardous Materials		12/13/2016
27a	Rhys	Taylor	Postdoctoral Research, Astronomical Institute Prague 2013-present. Arecibo employee 2011-2013	Regarding the recent draft Environmental Impact Statement on the future of Arecibo Observatory, while the stated NSF support for the continuing operations at AO is commendable, the details of the DEIS are, to put it mildly, completely mad. The proposed demolition of 26 buildings will not make any financial savings; on the contrary, it would cause irrevocable damage to the Observatory. Removing the buildings necessary for the planetary radar would eliminate the possibility of the Observatory continuing to secure the millions of dollars of NASA funding it currently receives as one of only two facilities in the world capable of Solar System radar studies. Removal of the scientific offices and Visiting Scientists Quarters would effectively kill Arecibo as a scientific facility - it will not merely cease to support scientific staff for their own operations, but fail to provide observing support for external scientists. This is madness. The buildings are not obsolete, they are essential. Consequently any institute wishing to invest in Arecibo would inevitably face the added cost of having to rebuild the lost facilities. This is unnecessary and stupid.	Against Closure/ Alternatives Considered	Alternatives	Email	12/9/2016
27b	Rhys	Taylor	Postdoctoral Research, Astronomical Institute Prague 2013-present. Arecibo employee 2011-2014	Arecibo is both an iconic, inspirational facility and uniquely scientifically capable. Since starting my PhD 10 years ago, Arecibo data has been integral to my research. I have used data to teach students from high school to graduate level, many of whom have been inspired to pursue careers in science and technology, as well as to produce outreach materials that inform the general public about basic research. No planned or existing facility, including FAST or the SKA, offers Arecibo's unique capabilities, let alone at such a modest level of investment. Furthermore it is by far the most prominent scientific facility in Puerto Rico and local residents are justifiably proud of their historic instrument. For a paltry level of funding it continues to contribute not only to local culture but to global teaching and scientific activities not merely at a world-class level, but with capabilities which are simply impossible at other instruments. There is no prospect of a replacement, let alone superior, instrument in the next few decades, and the current prospect of rendering this magnificent telescope impotent is an absolute absurdity.	Against Closure/ Reasons Why	Not Applicable	Email	12/9/2016
28a	Nelson	Valazquez-Reyes	Assistant Secretary Office of the Assistant Secretary of Permits, Endorsements and Specialized Services	<p>In its reply, the DNER considered the potential impacts of the proposed deconstruction and site restoration (Alternatives 4 and 5 for the purposes of the DEIS), assuming that these impacts are absent from the other alternatives to the project.</p> <p>The DNER acknowledges that the NSF is facing funding limitations which may affect its continued operation of the Arecibo Observatory. However, based on its review of the information presented in the DEIS, and on the best information available from the standpoint of natural resources, the DNER understands that alternatives other than full or partial deconstruction and site restoration, especially the Preferred Alternative identified by the NSF (Alternative 1, above), could best serve the purposes of this project, since those alternatives will be performed, contingent on the availability of funds committed to this purpose, over an already developed footprint, and no significant impacts on natural and environmental resources</p>	Resource Considerations for Document Analysis	Biological	Letter. Hard copy in being mailed to NSF	12/12/2016

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				under our jurisdiction should be expected as a result. Therefore, the DNER does not object the proposed changes to the operations of the Arecibo Observatory, on the basis of the information presented in the DEIS.				
28b	Nelson	Valazquez-Reyes	Assistant Secretary Office of the Assistant Secretary of Permits, Endorsements and Specialized Services	However, in the event that either partial or full deconstruction and site restoration is finally implemented at the Arecibo Observatory site, an inspection of the area to be restored must be performed to determine the degree of the ecological disturbance and the appropriate restoration measures. It should be kept in mind that the degree of this ecological disturbance may range, from simply disturbing or removing the vegetation community, while soils are left mostly undisturbed, to areas where vegetation has been completely removed and soil conditions have become very different from the original. As stated in the available literature, ecological restoration may fail where environmental conditions are unforgiving or are not enriched due to inadequate nutrient concentration or aeration, more than to species interaction. (See Figure 16.1 in: Aber, John D. 1987. Restored Forests and the Identification of Critical Factors in Species-site Interactions. Pages 241-250 in: Restoration Ecology: A Synthetic Approach to Ecological Research. W.R. Jordan, III, M.E. Gilpin, J.D. Aber, eds. Cambridge, UK: Cambridge University Press.)	Resource Considerations for Document Analysis	Biological	Letter. Hard copy in being mailed to NSF	12/12/2016
28c	Nelson	Valazquez-Reyes	Assistant Secretary Office of the Assistant Secretary of Permits, Endorsements and Specialized Services	Should a mitigation plan need to be implemented for either of the site deconstruction and restoration alternatives, it should have clearly defined goals and objectives, along with accomplishment indicators (for example, a 50%-80% vegetation prevalence, less than 5% cover of exotic or invading plants, and less than 20% plant mortality, all by the end of the first year). A 5-year (or longer) monitoring program for the mitigation should be implemented, with quarterly inspections during the first two (2) years, biannual inspections during the third and fourth years, and annually from the fifth year on. Also, mid-course corrections should be included, to be implemented if and when necessary.	Resource Considerations for Document Analysis	Biological	Letter. Hard copy in being mailed to NSF	12/12/2016
28d	Nelson	Valazquez-Reyes	Assistant Secretary Office of the Assistant Secretary of Permits, Endorsements and Specialized Services	Also, if implemented, the deconstruction and site restoration project must comply with the following requirements: § Deconstruction activities must comply with Law No. 267 of September 11, 1998, as amended, and with Regulation No. 7245 of November 9, 2006, which govern the Puerto Rico Coordinating Center for Excavations and Demolitions (" Centro de Coordinaci6n de Excavaciones y Demoliciones de Puerto Rico").	Resource Considerations for Document Analysis	Biological	Letter. Hard copy in being mailed to NSF	12/12/2016
28e	Nelson	Valazquez-Reyes	Assistant Secretary Office of the Assistant Secretary of Permits, Endorsements and Specialized Services	§ A forestation program using native tree species is recorrundenado, in order to minimize erosion and to benefit local wildlife, consistent with the requirement of Law No. 97 of June 24, 1998 (in Spanish, "Ley para Fomentar la Siembra de Arbo/es Cuyas Frutas y/o Semillas Provean Alimento a Especies de Aves Silvestres de Puerto Rico"). Article 4 of Law No. 97, supra, states that for public and/ or privately funded forestation projects, a 15% of the total number of trees to be planted in rural project sites (or 10% for urban sites) must be tree species which provide fruits and/ or seeds as food source for wild birds residing temporarily or permanently in the project area.	Resource Considerations for Document Analysis	Biological	Letter. Hard copy in being mailed to NSF	12/12/2016
28f	Nelson	Valazquez-Reyes	Assistant Secretary Office of the Assistant Secretary of Permits, Endorsements and Specialized Services	§ The SOP for the Puerto Rican Boa (Appendix 4.1-A of the DEIS; see Mitigation Measure No. 3, above) should include the following as Points of Contact (POC), to be called in the event of finding Boas, Racer Snakes (particularly Borikenophis portoricensis, formerly under genus Alsophis), and other snakes at the Arecibo Observatory site, so that these reptiles can be safely relocated: § DNER Ranger Corps Regional Office, Arecibo: (787) 880-0656. § DNER Ranger Corps Headquarters, San Juan: (787) 724-5700. § DNER's Habitats and Biodiversity Research and Conservation Bureau, Terrestrial Ecology Division: (787) 772-2028. This office should be contacted only in the event that the Ranger Corps cannot be contacted, and only during DNER working hours: Monday to Friday, 7:30 AM-12:00 PM, 1:00-4:00 PM (AST/EDT).	Resource Considerations for Document Analysis	Biological	Letter. Hard copy in being mailed to NSF	12/12/2016
28g	Nelson	Valazquez-Reyes	Assistant Secretary Office of the Assistant Secretary of Permits, Endorsements and Specialized Services	§ In the event that deconstruction and site restoration is finally implemented, land ownership must be determined for all or part of the lands to remain at the Arecibo Observatory site. Should it be decided that the ownership of these lands must be transferred to the Corrunonwealth of Puerto Rico, options to be considered include fee simple land transfer to the DNER or to a qualified organization whose activities are consistent with recreation and/ or wildlife conservation purposes, among others. A Conservation Easement might need to be constituted, pursuant to Law No. 183 of December 27, 2001, as amended, known in Spanish as "Ley de Serooidumbre de Conseroaci6n de Puerto Rico". A certified copy of the corresponding Cession and Transfer Deed would need to be presented to the DNER, along with a copy of the Act of Presentation in the Property Registry, located under the Puerto Rico Department of Justice, for compliance	Resource Considerations for Document Analysis	Biological	Letter. Hard copy in being mailed to NSF	12/12/2016

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				with Regulation No. 8816 of September 19, 2016, the New Regulation for the Acquisition of Real Estate and Property Rights.				
28h	Nelson	Valazquez-Reyes	Assistant Secretary Office of the Assistant Secretary of Permits, Endorsements and Specialized Services	Please note that other aspects noted by the DNER in its letter of July 21, 2016, still need to be considered in the event that site deconstruction and restoration is implemented. These aspects include: the location of the Arecibo Observatory site within the Rio Abajo Karst Conservation Priority Area and the Restricted Special Planning Area of the Puerto Rican Karst (APE-RC), including its Buffer Zone; zoning as a "Non-residential, General" ("Dotacional General", DT-G) district, surrounded by Resource Conservation (CR) and Resource Preservation (PR) zoning; and location within the Caonillas-Dos Bocas Forest Legacy Area, with important environmental values that need to be protected. We should also note that the Arecibo Observatory lands are within the lands designated as part of the Puerto Rico Model Forest ("Bosque Modelo de Puerto Rico"), as per Article 4 of Law No. 182 of November 3, 2014. Law No. 182, supra, declares as Commonwealth policy the conservation and sustainable development of the ecological and forest landscape of the region thus designated, under a participation model where the local communities, the Commonwealth government, the academy, commerce and industry, professional or trade associations, private entities, farmers, natural resource advocacy groups, and non-profit service providers, among others, develop working alliances for conservation, food security, sustainable economic production and social improvement, within a participatory governance framework.	Resource Considerations for Document Analysis	Biological	Letter. Hard copy in being mailed to NSF	12/12/2016
28i	Nelson	Valazquez-Reyes	Assistant Secretary Office of the Assistant Secretary of Permits, Endorsements and Specialized Services	The DNER thanks you for the opportunity to comment on this matter, and reiterates its willingness to collaborate with the NSF and its Division of Astronomical Sciences in the planning and development of the proposed changes in the operation of the Arecibo Observatory, especially concerning the avoidance of adverse environmental impacts to natural resources under our jurisdiction.	Against Closure/ Reasons Why	Not Applicable	Letter. Hard copy in being mailed to NSF	12/12/2016
29a	Porter	Hall	Former REU Student	My name is Porter Hall and I was an REU student at Arecibo Observatory during the summer of 2014. I am writing to communicate the importance of preserving an institution that produces great science, enriches lives, and presents a marvel of human achievement. Arecibo Observatory and Puerto Rico gave me both cultural and academic gifts that I would surely not be the same without. By giving me the chance to live in Puerto Rico, a chance that is rarely bestowed in such a way while simultaneously giving me research experience that would not be possible without its observations is of great value to society. This REU and programs like it shape young scientists in profound ways that can surpass most other experiences. I was able to gain insight into a culture that was completely mysterious to me. During my time there I was able to learn a formidable amount of Spanish as well as interact directly with a culture different than my own.	Against Closure/ Reasons Why	Not Applicable	Email	12/11/2016
29b	Porter	Hall	Former REU Student	I made friends and advisors that will be great scientific colleagues in the future. At Arecibo, I learned how observational astronomy is carried out. I controlled the telescope with my own hands for the Arecibo Galaxy Environment survey and learned about processing the data. I spent hours in the 100°F dome facilitating the communication with the almost lost ISEE satellite in order to re-rout it to collect data from our Sun. I carried out a project in which real data was analyzed from raw form to astronomically significant findings and presented a poster at an American Astronomical Society meeting. I now attend Cornell University as a PhD student, and feel that my adventure at Arecibo Observatory and my advisor Robert Minchin were instrumental in preparing me for this adventure.	Against Closure/ Reasons Why	Not Applicable	Email	12/11/2016
29c	Porter	Hall	Former REU Student	I understand that an REU program alone does not necessarily warrant the total NSF budget that has been afforded to Arecibo Observatory. I also understand that a telescope has been completed in China which rivals in sensitivity to the 305-meter dish. However, it is important to note that AO employs hundreds of people in Puerto Rico, and enriches a place which is part of our great nation. Additionally 35 publications have come from data from AO or by AO scientists in 2016 as of September. It is a symbol of technological achievement and presents opportunities for America to progress. In this time in our society it is important to hold on to as many scientific outlets, and educational resources as possible.	Against Closure/ Reasons Why	Not Applicable	Email	12/11/2016
30a	Joan	Schmelz	Deputy Director of Arecibo Observatory	The STEM Education Mission of Arecibo Observatory Executive Summary Arecibo Observatory runs STEM education programs at many different levels. The scientific staff are intimately involved in the delivery of these programs. Much of this activity has been ignored in the draft Environmental Impact Statement (EIS), leading to an under-assessment of the socioeconomic impact of the various Alternatives. Finding 1: The scientific staff are essential to the educational mission of the Arecibo Observatory.	Resource Considerations for Document Analysis	Socioeconomics	Letter	12/11/2016

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				<p>Finding 2: The draft EIS is inconsistent in assuming that the scientific staff will remain employed at the Observatory in Alternative 2, where the Observatory ceases to be used scientifically, and in Alternatives 1 and 2 where the scientific offices are to be demolished. This leads to an underestimation of the socioeconomic impacts of these alternatives.</p> <p>Finding 3: The draft EIS correctly identifies that “major, adverse impacts would be expected from reduced regional educational activities” under either of the deconstruction alternatives (Alternatives 4 and 5).</p> <p>Finding 4: The loss of educational activity at the Observatory under Alternative 3 is the same as that under Alternatives 4 and 5, thus the impact must also be the same – major, adverse impacts from reduced regional educational activities.</p> <p>Finding 5: The draft EIS mischaracterizes the educational impact of Alternative 2 as a minor, adverse impact when this is clearly either a moderate or major, long-term, adverse impact. This assessment needs to be repeated taking into account the impact of all of the programs lost and the inspirational value of Arecibo as a scientific facility.</p> <p>Finding 6: The draft EIS assessment of the educational impact of Alternative 1 is false as it does not take into account the proposed demolition of buildings used for educational activities. This assessment needs to be repeated taking into account the impact of all of the programs lost.</p> <p>Finding 7: The Region of Interest for the Environmental Justice analysis is inconsistent with the Region of Interest identified for education and tourism. The Environmental Justice analysis thus fails to cover all economic and social effects.</p> <p>Finding 8: The loss of educational and tourism opportunities in Puerto Rico constitutes an environmental justice issue that has been obscured by not using the correct region of interest for these activities in the draft EIS.</p> <p>Finding 9: The educational impact of Arecibo Observatory needs to be assessed not just as part of the draft EIS, but also as part of the Observatory’s contribution to the NSF’s core strategy, strategic objectives, goals, and overall mission.</p>				
30b	Joan	Schmelz	Deputy Director of Arecibo Observatory	<p>Analysis</p> <p>The formal and informal STEM educational programs run at the Observatory are:</p> <ul style="list-style-type: none"> • The Angel Ramos Foundation Science Education and Visitors’ Center (all ages, a third of visitors are school children on organized trips) • The Arecibo Observatory Space Academy (high school students) • The Research Experience for Undergraduates (REU) program (undergraduates and teachers) • The National Astronomy and Ionosphere Center Single Dish School (graduate students and post-docs) <p>In addition to these, the Observatory has recently signed a Memorandum of Understanding with the Arecibo municipality to bring more school children to the Visitors’ Center.</p> <p>All but the first of these are run by the scientific staff; the first involves collaboration of the scientific staff with educators.</p> <p>Additionally, the Universities Space Research Association, which manages the astronomy, planetary science, IT and electronics departments at the Observatory, has recently signed a Memorandum of Understanding with the University of Puerto Rico Mayagüez (UPRM) to work together on undergraduate and graduate educational projects as well as to promote STEM degree programs focused in the space sciences (e.g., astronomy, planetary science, aeronautics, space engineering). This MOU has already led to the first formal degree program in astronomy in Puerto Rico through the physics department at UPRM, an MIT funded research project with the department of electrical and computer engineering at UPRM to study the near-field of the Arecibo HF, and an initiative within the geology department at UPRM in planetary science that has resulted already in several undergraduate student practicum projects. The Observatory is continuing these efforts by extending collaborations to the University of Puerto Rico Arecibo, and the University of Puerto Rico Humacao. These collaborations via MOUs with the UPR systems has been led by USRA scientists.</p> <p>Scientific staff also work in collaboration with the Visitors’ Center to deliver activities and inform the design of exhibits and educational programs. It is also extensively used for undergraduate and graduate research projects.</p>	Resource Considerations for Document Analysis	Socioeconomics	Letter	12/11/2016

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30c	Joan	Schmelz	Deputy Director of Arecibo Observatory	<p>Finding 1: The scientific staff are essential to the educational mission of the Arecibo Observatory. Education is included in the draft Environmental Impact Statement (EIS) as a socioeconomic impact. Socioeconomic impacts are analyzed in section 4.9 of the draft EIS.</p> <p>The draft EIS makes the statement (page 4-73) that “For the purposes of this analysis, it is assumed that the Arecibo Observatory and visitor center personnel would remain employed under Alternatives 1 and 2. Under Alternative 2, a reduction of fewer than six jobs related to the operation of the 305-meter-diameter telescope is assumed; these jobs are anticipated to be three telescope operators and three maintenance staff.” However, under Alternative 2, with no science being done at the Observatory, it must be considered highly unlikely that the scientific research staff would remain. Furthermore, both Alternative 1 and Alternative 2 include the demolition of the office building used by the scientific staff and the trailers used for the educational programs.</p>	Resource Considerations for Document Analysis	Socioeconomics	Letter	12/11/2016
30d	Joan	Schmelz	Deputy Director of Arecibo Observatory	<p>Finding 2: The draft EIS is inconsistent in assuming that the scientific staff will remain employed at the Observatory in Alternative 2, where the Observatory ceases to be used scientifically, and in Alternatives 1 and 2 where the scientific offices are to be demolished. This leads to an underestimation of the socioeconomic impacts of these alternatives.</p> <p>The summary assessment of the socioeconomic impact of the different alternatives considered in the draft EIS is as follows (pages ES-19 – ES-26):</p> <p>Alternative 1 – Collaboration with Interested Parties for Continued Science-focused Operations: Deconstruction activities would result in negligible, adverse, short-term impacts to housing and minor, adverse, short-term impact to education and tourism in the Municipality of Arecibo. There would be negligible, short-term benefits to employment, income, and the economy. There would be no socioeconomic impacts during operations.</p> <p>Alternative 2 – Collaboration with Interested Parties for Transition to Education-focused Operations: Deconstruction activities would result in negligible, adverse, short-term impacts to housing and minor, adverse, short-term impact to education and tourism in the Municipality of Arecibo. There would be negligible, short-term benefits to employment, income, and the economy. Impacts during operations would include negligible, adverse impacts to population, housing, the economy, employment and income. A minor, adverse, long-term impact would result from fewer regional education activities and science, technology, education, and math (STEM) opportunities.</p> <p>Alternative 3 – Mothballing of Facilities: Deconstruction activities would result in negligible, adverse, short-term impacts to housing in the Municipality of Arecibo. There would be negligible, short-term benefits to employment, income, and the economy during deconstruction. Impacts during the mothball period would include negligible adverse impacts to population, housing, the economy, employment, and income. A moderate, adverse, long-term impact would result from less regional education activities. A major, adverse impact would be expected from reduced STEM opportunities and tourism in Arecibo.</p> <p>Alternative 4 – Partial Deconstruction and Site Restoration: Deconstruction activities would result in negligible, adverse, short-term impacts to housing in the Municipality of Arecibo. There would be minor, short-term benefits to employment, income, and the economy during deconstruction. Impacts after deconstruction would include negligible, adverse impacts to population, housing, the economy, employment, and income. Major, adverse impacts would be expected from reduced regional education activities, STEM opportunities, and tourism in Arecibo.</p> <p>Alternative 5 – Complete Deconstruction and Site Restoration: Deconstruction activities would result in negligible, adverse, short-term impacts to housing in the Municipality of Arecibo. There would be minor, short-term benefits to employment, income, and the economy during deconstruction. Impacts after deconstruction would include negligible, adverse impacts to population, housing, the economy, employment, and income. Major, adverse impacts would be expected from reduced regional education activities, STEM opportunities, and tourism in Arecibo after deconstruction.</p>	Resource Considerations for Document Analysis	Socioeconomics	Letter	12/11/2016
30e	Joan	Schmelz	Deputy Director of Arecibo Observatory	<p>Finding 3: The draft EIS correctly identifies that “major, adverse impacts would be expected from reduced regional educational activities” under either of the deconstruction alternatives (Alternatives 4 and 5). The draft EIS correctly identifies that either partial or complete deconstruction would result in a major adverse impact on regional education. However, Alternative 3 involves an equal reduction in educational</p>	Resource Considerations for Document Analysis	Socioeconomics	Letter	12/11/2016

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				<p>activities, with no employment of researchers, educators or visitor’s center staff (table 4.9-1) so this must also logically be a major adverse impact.</p> <p>The draft EIS also states (page 4-75):</p> <p>Education. The Arecibo Observatory currently has 16 onsite researchers and accommodates numerous U.S. and international researchers who conduct scientific research remotely using the facilities at the Arecibo Observatory. An estimated 19,800 students visit the Arecibo Observatory each year for STEM purposes (SRI International, 2016). It is assumed that visiting researchers are housed entirely onsite and that the students travel from across the Commonwealth of Puerto Rico to visit the Arecibo Observatory. It is assumed that Alternatives 1 and 3 would continue to support this level of research and education. However, Alternative 2 would result in the potential loss of a portion of these scientific researchers and students because the reflector dish and 305-meter-diameter telescope would be placed in a “safe abandonment” condition. Deconstruction activities under Alternatives 4 and 5 would result in no educational activities or research continuing at the Arecibo Observatory.</p> <p>It is not explained how research and education are expected to continue while the Observatory is mothballed (Alternative 3) and no researchers or educators are employed (table 4.9-1). This appears to have led to an under-assessment of the impact on educational activities of Alternative 3.</p>				
30f	Joan	Schmelz	Deputy Director of Arecibo Observatory	<p>Finding 4: The loss of educational activity at the Observatory under Alternative 3 is the same as that under Alternatives 4 and 5, thus the impact must also be the same – major, adverse impacts from reduced regional educational activities.</p> <p>Alternative 2, Collaboration with Interested Parties for Transition to Education-focused Operations, is assessed for education as follows (page 4-82):</p> <p>Under Alternative 2, the 305-meter-diameter telescope would cease operation. This telescope supports the Research Experiences for Undergraduates and Research Experience for Teachers Program. As a result, there would be a reduction in STEM opportunities. The loss of this telescope operation would result in direct and indirect minor, adverse, long-term impacts to STEM education.</p> <p>Because Alternative 2 would be education-focused, it is expected that additional education opportunities would be developed to replace the lost education activities associated with the 305-meter-diameter telescope. It is expected that direct and indirect, minor, long-term benefits to education would result. This assessment neglects that the telescope is also used for the Single Dish School. This is the only school in the US training postgraduate and postdoctoral single dish radio astronomers – training which is vital for the exploration of time-domain science (identified by the Astronomy decadal survey in 2010 as one of the key science areas). It also neglects the highly probably loss of the scientific staff in an alternative where no science activities are taking place, and thus the loss of the Arecibo Observatory Space Academy. The definition of a ‘minor’ impact is: “The proposed Alternative would result in a change to socioeconomic resources but the change (beneficial or adverse) would be small and localized.” The loss identified here of the REU program would remove a major opportunity for Puerto Rican students to participate as undergraduates in research. Most of the graduates of this program have gone on to obtain PhDs. Hispanics remain one of the most underrepresented groups in Astronomy, making up only 3% of the population of US astronomers [https://aas.org/files/resources/aas_members_workforce_survey_final_jan2014v2.pdf]. The effects of the loss of this program alone would thus neither be small nor localized.</p> <p>The Arecibo Observatory Space Academy is a semester-long precollege program for high school students in Puerto Rico, run by scientists at the Observatory. In the 5 years that it has been running, all of the college-age graduates of the Academy have enrolled in STEM degree programs. The Academy continues to support its graduates through college, and the first students will receive their bachelor’s degrees this year (2016) [http://womeninastronomy.blogspot.com/2016/10/celebrating-national-hispanic-heritage.html]. The program has impacted nearly 600 students, which come from 75% of Puerto Rican municipalities, and are represented equally in gender. This is a major boost to the STEM education and workforce of Puerto Rico, which will be threatened by the loss of scientists at Arecibo Observatory. The loss of this program has been ignored in the assessment of the impact of Alternative 2 due to the assumption that the scientists running the program would continue to be employed at the Observatory despite the loss of the science, the office buildings where the scientists work, and the buildings used to deliver the program.</p>	Resource Considerations for Document Analysis	Socioeconomics	Letter	12/11/2016

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30g	Joan	Schmelz	Deputy Director of Arecibo Observatory	The draft EIS also fails to mention the impact on undergraduate education more generally of the loss of the 305-m telescope. There are a number of undergraduate research teams making use of the Observatory, including the Undergraduate ALFALFA Team (UAT), the Arecibo Remote Command Center (ARCC), and students from universities including Yale and the University of Puerto Rico Mayagüez. The UAT includes students and faculty from the University of Puerto Rico Río Piedras, while the ARCC is based at University of Texas Rio Grande Valley. This loss would therefore impact greatly on astronomy education in Puerto Rico and in the Hispanic-majority area of Texas's Rio Grande valley. The assessment also ignores the detrimental impact on education from the loss of Arecibo Observatory as a landmark scientific facility that has inspired many Puerto Ricans into STEM careers. As Dr. Daniel Altschuler, a professor at UPR Río Piedras, said "aside from its scientific value, the observatory has served as inspiration and training ground for many Puerto Rican students who have very limited local opportunities to do so. Some of them went on to obtain their doctoral degrees in science. If NSF wants to further the participation in STEM by minorities and women, closing or otherwise limiting the operation is again a bad idea." Overall, the draft EIS has not taken into account many of the educational effects of the Observatory's use as a scientific facility. When these are considered, it is clear that the impact of Alternative 2 would be either a moderate "The proposed Alternative would result in a measurable and consequential change to socioeconomic resources" or major "The proposed Alternative would result in a substantial change to socioeconomic resources; the change (beneficial or adverse) would be measurable and result in a severely adverse or major beneficial impact," long-term, adverse impact.	Resource Considerations for Document Analysis	Socioeconomics	Letter	12/11/2016
30h	Joan	Schmelz	Deputy Director of Arecibo Observatory	Finding 5: The draft EIS mischaracterizes the educational impact of Alternative 2 as a minor, adverse impact when this is clearly either a moderate or major, long-term, adverse impact. This assessment needs to be repeated taking into account the impact of all of the programs lost and the inspirational value of Arecibo as a scientific facility. Alternative 1, Collaboration with Interested Parties for Continued Science-focused Operations, includes the demolition of the building housing the scientific offices and the trailers used for student activities, as well as some of the visiting scientist quarters, including those used for the REU program. If this were to be carried out, it would severely limit the educational programs that can be delivered at the Observatory. It would not be possible to carry out the REU program, the Space Academy, or the Single Dish School under Alternative 1 as presented here. The assessment that "Under Alternative 1, there would be no change in education activities at the Arecibo Observatory. Therefore, there would no impact to education." (page 4-79) is obviously false. The impact would not be as severe as under Alternative 2, as the Observatory would retain its inspirational value as a scientific facility and would still be used for undergraduate research programs at universities, but would still have an effect beyond the local area and would therefore be either moderate or major.	Resource Considerations for Document Analysis	Socioeconomics	Letter	12/11/2016
30i	Joan	Schmelz	Deputy Director of Arecibo Observatory	Finding 6: The draft EIS assessment of the educational impact of Alternative 1 is false as it does not take into account the proposed demolition of buildings used for educational activities. This assessment needs to be repeated taking into account the impact of all of the programs lost.	Resource Considerations for Document Analysis	Socioeconomics	Letter	12/11/2016
30j	Joan	Schmelz	Deputy Director of Arecibo Observatory	The draft EIS states (page 3-31) that "The ROI [Region of Interest] for education and tourism is the Commonwealth of Puerto Rico because the education and tourism activities offered draw students and visitors from across the island." However, it also claims (page ES-13) that "Impacts from any of the proposed Alternatives would not result in disproportionately high and adverse to minority and low-income populations. Therefore, there would be no environmental justice concerns associated with the Proposed Action." To be clear, environmental justice is not simply about the natural environment, but is defined in the EIS (page 1-10) as "Environmental Justice: Potential impacts, including human health, economic, and social effects, from the Proposed Action on minority and low-income communities". The assessment of environmental justice is required under Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (page 4-106).	Resource Considerations for Document Analysis	Environmental Justice	Letter	12/11/2016
30k	Joan	Schmelz	Deputy Director of Arecibo Observatory	The assessment of environmental justice uses a methodology that starts by defining "The ROI [Region of Interest] for environmental justice is the Municipality of Arecibo." (page 4-107). However, this contradicts the earlier statement that the ROI for education and tourism is the Commonwealth of Puerto Rico, meaning that these aspects – which are clearly part of the economic and social effects, as demonstrated by their	Resource Considerations for Document Analysis	Environmental Justice	Letter	12/11/2016

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				inclusion in socioeconomic impacts – have not been correctly measured by the environmental justice analysis in the draft EIS.				
30l	Joan	Schmelz	Deputy Director of Arecibo Observatory	<p>Finding 7: The Region of Interest for the Environmental Justice analysis is inconsistent with the Region of Interest identified for education and tourism. The Environmental Justice analysis thus fails to cover all economic and social effects.</p> <p>The Commonwealth of Puerto Rico has a population that is 99% Hispanic (table 4.12-1) and (using the methodology on page 4-112 and the figure of 45% below the poverty line from table 4.12-2) 90% low income. As this is the ROI for education and tourism, as identified by the draft EIS, this should be compared to the general population of the United States. As of 2015, the Hispanic population of the US is 17.6% of the total [http://www.census.gov/newsroom/facts-for-features/2016/cb16-ff16.html] and the official poverty rate is 13.5%, giving a low-income population of 27% [http://www.census.gov/library/publications/2016/demo/p60-256.html]. This indicates that there is a potential environmental justice issue here.</p> <p>As some of the impacts in education have already been judged as either moderate (Alternative 3) or major (Alternatives 4 and 5), this potential issue has been realized for these Alternatives. If our findings that Alternatives 1, 2, and 3 have been mis-characterized are accepted, then this becomes an environmental justice issue for all of the Alternatives.</p>	Resource Considerations for Document Analysis	Environmental Justice	Letter	12/11/2016
30m	Joan	Schmelz	Deputy Director of Arecibo Observatory	<p>Finding 8: The loss of educational and tourism opportunities in Puerto Rico constitutes an environmental justice issue that has been obscured by not using the correct region of interest for these activities in the draft EIS. According to the NSF Strategic Plan 2014-2018 [https://www.nsf.gov/pubs/2014/nsf14043/nsf14043.pdf], the mission of the NSF has two parts: “(1) advancing the progress of science while (2) benefitting the Nation”. The strategic goals of the NSF (from the same document) are to: (1) Transform the frontiers of science and engineering; (2) Stimulate innovation and address societal needs through research and education; and (3) Excel as a Federal Science Agency. The strategic plan also states that the NSF Division of Mathematical and Physical Sciences (MPS), of which AST is a part, contributes to strategic goals 1 and 2 and, within those goals, to the relevant strategic objectives mentioned below. Strategic Objective 2 for Goal 1 is to “Integrate education and research to support development of a diverse STEM workforce with cutting-edge capabilities,” as part of the plan for accomplishing this, the Strategic Plan states that “NSF is committed to increasing access for currently underrepresented groups to STEM education and careers through our investments in research and education” – note that investment in research is specifically included in how NSF intends to meet this commitment. Strategic Objective 2 for Goal 2 is to “Build the capacity of the Nation to address societal challenges using a suite of formal, informal, and broadly available STEM educational mechanisms.” Similarly, the NSF’s core strategies include “Ensure[ing] diversity is at the forefront of all of NSF’s internal and external activities to develop the Nation’s intellectual potential.”</p>	Resource Considerations for Document Analysis	Environmental Justice	Letter	12/11/2016
30n	Joan	Schmelz	Deputy Director of Arecibo Observatory	<p>Finding 9: The educational impact of Arecibo Observatory needs to be assessed not just as part of the draft EIS but also as part of the Observatory’s contribution to the NSF’s core strategy, strategic objectives, goals, and overall mission.</p>	Resource Considerations for Document Analysis	Socioeconomics	Letter	12/11/2016
31a	Joan	Schmelz	Deputy Director of Arecibo Observatory	<p>The Planetary Radar Mission of Arecibo Observatory Executive Summary</p> <p>1. The Arecibo Observatory planetary radar system is a necessary asset for national and international security, both for tracking and the physical characterization of potentially hazardous objects and for validating impact mitigation technologies. NSF fails to recognize these capabilities in the draft Environmental Impact Statement (EIS).</p> <p>2. Several scientific boards and committees, including the decadal survey “Vision & Voyages for Planetary Science in the Decade 2013-2022,” endorse the capabilities of the Arecibo planetary radar system as unmatched, essential, and unique. The AST Portfolio review committee strongly encouraged NSF AST to continue to support the Arecibo planetary radar program.</p> <p>3. Several national laws, policies, and mandates require the continued operation of the planetary radar at Arecibo Observatory.</p>	Against Closure/ Reasons Why	Not Applicable	Letter	12/11/2016
31b	Joan	Schmelz	Deputy Director of Arecibo Observatory	<p>Analysis</p>	Against Closure/ Reasons Why	Not Applicable	Letter	12/11/2016

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				<p>Finding 1: The Arecibo Observatory planetary radar system is a necessary asset for national and international security, both for tracking and the physical characterization of potentially hazardous objects and for validating impact mitigation technologies. NSF fails to recognize these capabilities in the draft Environmental Impact Statement (EIS).</p> <p>Radar is originally an acronym for "RAdio Detecting And Ranging". As traffic radar measures a vehicle's velocity and weather radar locates rain clouds, planetary radar determines the velocity of and distance to an asteroid to very high accuracy.</p> <p>It is a common misconception that when an asteroid is discovered, scientists will automatically know its location for the foreseeable future. Instead, because optical instruments can only detect a near-Earth asteroid in the two dimensions of the plane of sky and typically for only a short amount of time after discovery, often their motion is not well characterized. Optical observations do not directly provide velocity information and can only provide distance information accurate up to hundreds or thousands of kilometers. As a consequence, up to 40% of newly discovered asteroids are immediately "lost," meaning their future positions cannot be accurately predicted and they will need to be "discovered" again in the future. The inability to predict when a potentially hazardous asteroid will next approach Earth renders its discovery essentially ineffectual.</p> <p>The power of planetary radar comes from its ability to very accurately constrain the orbits of asteroids in a minimal amount of time. Often within minutes of observation, radar can provide measurements of distance and velocity along the third dimension (perpendicular to the plane of sky) that optical observations cannot constrain without weeks, if not years, of dedicated observing. In fact, the Arecibo planetary radar can measure the distance to an asteroid, which is typically billions of meters away, to an accuracy of tens of meters and measure its velocity to an accuracy of millimeters per second. These high-accuracy measurements are crucial complements to optical observations and can reduce uncertainties in orbital parameters of newly discovered asteroids by a factor of 100,000, preventing them from being lost, and extending our ability to predict their locations by decades or centuries, which is vital for tracking potentially hazardous asteroids. In 2013 and 2014, the Arecibo planetary radar program corrected the distances (predicted by optical observations) to three asteroids by approximately one Earth diameter each, which can be the difference between an impact and a near miss.</p>				
31b Cont.	Joan	Schmelz	Deputy Director of Arecibo Observatory	<p>In addition to greatly refining our knowledge of asteroid orbits, the planetary radar can determine or constrain the size, shape, spin, and density as well as the physical and chemical composition of asteroids. All of these are crucial for informing the development of impact mitigation techniques.</p> <p>The Arecibo planetary radar detects about 100 near-Earth asteroids each year, approximately 30 of which are defined as potentially hazardous, due to their combination of size and proximity to Earth, and essentially all are large enough to cause airbursts like that in Chelyabinsk, Russia in 2013 if they were to collide with Earth. To date, Arecibo has detected approximately 250 out of the 1759 asteroids that are classified to be potentially hazardous by the Minor Planet Center (as of December 9, 2016).</p> <p>The draft EIS claims that because Arecibo only sees 30% of the sky, it cannot see the majority of asteroids. Asteroids are moving targets on the sky and the majority move in and out of Arecibo's field of view. In fact, an internal NASA study, submitted as a white paper to the Vision & Voyages planetary science decadal survey, finds that Arecibo could detect over 80% of potentially hazardous asteroids more than a year before impact. The flawed argument that Arecibo can see only a minority of asteroids is used in the draft EIS to claim that Arecibo is unlikely to see an impactor in its field of view. This is not correct.</p> <p>Compared to the Goldstone Solar System Radar in California, Arecibo's planetary radar is about 20 times more sensitive, a combination of greater transmitted power and a larger collecting area. Thus, Arecibo can "see" twice as far into space as Goldstone. Arecibo has also contributed two-thirds of all radar astrometry, distance and velocity measurements that determine asteroid orbits, in the last decade. For objects passing very near the Earth, bistatic (using one station to transmit and another to receive) observations are required, where the combination of Goldstone and Arecibo is the most sensitive radar system in the world. If Goldstone is left alone, such sensitive observations would not be possible.</p>	Against Closure/ Reasons Why	Not Applicable	Letter	12/11/2016
31b Cont.	Joan	Schmelz	Deputy Director of Arecibo Observatory	<p>In the draft EIS, impacts are dismissed as having a negligible effect on public safety and that even if an impacting asteroid were detected, there are no tested technologies to prevent the impact. It is correct that impacts are low-probability, high-risk events. Yet, the NASA Planetary Defense Coordination Office and the Federal Emergency Management Agency (FEMA) regularly carry out mock asteroid impact scenarios to practice disaster response. The Space Missions Planning Advisory Group, Impact Disaster Planning Advisory</p>	Against Closure/ Reasons Why	Not Applicable	Letter	12/11/2016

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				<p>Group, and the International Asteroid Warning Network, all sanctioned by the United Nations, also consider such scenarios. The risk to public safety from an asteroid impact is taken very seriously on a national and international level rather than dismissed.</p> <p>While impact mitigation technologies have not yet been tested, two proposed technology demonstrations require the accuracy of the Arecibo planetary radar to validate their successes. The Asteroid Impact and Deflection Assessment (AIDA) mission concept is an international collaboration among the European Space Agency (ESA), NASA, Observatoire de la Côte d’Azur (OCA), and the Johns Hopkins University Applied Physics Laboratory (JHU/APL) aiming to demonstrate the kinetic impactor technique to change the motion of an asteroid in space. AIDA is a dual-mission concept, involving two independent spacecraft – NASA’s Double Asteroid Redirection Test (DART) and ESA’s Asteroid Impact Mission (AIM). The DART spacecraft will deliberately collide with the small moon in orbit about asteroid Didymos. The collision will change the velocity of the moon in its orbit around Didymos by only a fraction of one percent, but enough to be measured by the Arecibo planetary radar. The NASA Asteroid Robotic Redirect Mission (ARRM) aims to lift a boulder from the surface of an asteroid and use the mass to demonstrate a gravitational tractor to alter the asteroid’s motion, a subtle change that only the accuracy of the Arecibo planetary radar can detect.</p> <p>References: http://minorplanetcenter.net/mpc/summary http://www.jpl.nasa.gov/news/news.php?feature=6669 https://www.nasa.gov/planetarydefense/aida</p>				
31c	Joan	Schmelz	Deputy Director of Arecibo Observatory	<p>Finding 2: Several scientific boards and committees, including the decadal survey “Vision & Voyages for Planetary Science in the Decade 2013-2022,” endorse the capabilities of the Arecibo planetary radar system as unmatched, essential, and unique. The AST Portfolio review committee strongly encouraged NSF AST to continue to support the Arecibo planetary radar program.</p> <p>National Research Council (in “Near-Earth Object Surveys and Hazard Mitigation Strategies”, 2009): “It [Arecibo planetary radar] is about 20 times more sensitive than NASA’s Goldstone Solar System Radar, the world’s only other operational planetary radar; and it can resolve features on NEOs down to several meters in size. Arecibo can obtain this resolution on NEOs that are millions of kilometers from Earth and unresolved by the largest ground- and space-based optical telescopes. Arecibo thus plays an important role in investigation of NEO sizes, shapes, spin states, and surface properties, as well as in discovering companions that often orbit NEOs. Its highest spatial resolution is surpassed only by spacecraft during rendezvous or flyby missions.”</p> <p>Space Studies Board (in SSB annual report, 2010): “The Arecibo and Goldstone radar systems play a unique role in the characterization of NEOs, providing unmatched accuracy in orbit determination and offering insight into size, shape, surface structure, and other properties for objects within their latitude coverage and detection range.”</p> <p>National Research Council (Committee on the Planetary Science Decadal Survey, Space Studies Board, Division on Engineering and Physical Sciences, in “Vision & Voyages for Planetary Science in the Decade 2013-2022” (V&V), 2011): “The Arecibo and Goldstone radar telescopes are powerful, complementary facilities that can characterize the surface structure and three-dimensional shapes of the near-Earth objects within their reach of about one-tenth of the Earth-Sun distance. Arecibo has a sensitivity 20 times greater than Goldstone, but Goldstone has much greater sky coverage than Arecibo. Continued access to both radar facilities for the detailed study of near-Earth objects is essential to primitive bodies studies. The large number of primitive bodies in the solar system requires sufficient telescope time to observe statistically significant samples of these populations to expand scientific knowledge and plan future missions. Characterization of this multitude of bodies requires access to large ground-based telescopes as well as to the Goldstone and Arecibo radars. The Arecibo radio telescope is essential for detailed characterization of the shape, size, morphology, and spin dynamics of NEOs that make close approaches to Earth. These radar observations also provide highly accurate determinations of orbital parameters for primitive bodies critical to modeling and planning future exploration.”</p> <p>“The scientific study of primitive bodies can be advanced during the next decade if the following activities are addressed: [--] Ground-based Telescopes—Assure access to large telescopes and the LSST for planetary science observations and maintain the capabilities of the Goldstone and Arecibo radar systems. The large number of primitive bodies in the solar system requires sufficient telescope time to observe statistically significant samples of these populations to expand our scientific knowledge and plan.”</p>	Against Closure/Reasons Why	Not Applicable	Letter	12/11/2016

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31c Cont.	Joan	Schmelz	Deputy Director of Arecibo Observatory	<p>AST Portfolio Review Committee (in “Advancing Astronomy in the Coming Decade: Opportunities and Challenges”, 2012): “The Arecibo capability is unique and is supported in all scenarios.”</p> <p>“AST divestment from Arecibo might also cripple the radar characterization of small bodies in the Solar System, which was one of the most highly ranked V&V priorities for ground-based observations for the next decade.”</p> <p>“AST must carefully consider its current portfolio in light of NWNH and V&V priorities and the anticipated budgets.”</p> <p>Small Bodies Assessment Group (SBAG meeting findings, January 2016): “Arecibo is a critical national asset whose loss would not only affect science return but also increase the nation’s risk exposure,” and in a meeting in June 2016: “Any disinvestment in Arecibo facilities and maintenance could have major scientific and security implications.”</p> <p>NASA (response to SBAG findings, 2016): “NASA considers the capabilities of the Arecibo Planetary Radar to be extremely important to the national research infrastructure. PSD [planetary science division] of NASA does not have sufficient resources on its own to fully operate the observatory, but has communicated to NSF its willingness to continue support for Arecibo’s planetary radar capabilities at the present level.”</p> <p>The Planetary Society (excerpt from a response during the first comment period of the Arecibo EIS process, 2016): “Arecibo’s radar allows for the characterization of near-Earth asteroids and is a critical capability to maintain. Closing down Arecibo is not in the nation’s interest, and its unique capabilities are crucial to providing insight into the low probability, high impact event of an asteroid collision. We believe that the small operating cost of Arecibo must be maintained within the NSF, particularly considering the cost to re-create Arecibo’s capabilities at a later date. We know that there is a large community of scientists expressing support for Arecibo’s continued operations as well as representatives at NASA, who have signaled their intention to continue using Arecibo’s capabilities for the foreseeable future. For over 50 years, the Arecibo Observatory has provided the world with a uniquely sensitive instrument for listening to the cosmos, as well as a uniquely powerful radar to directly interrogate it. While it was forged during the Cold War, Arecibo represents how our worst instincts can be channeled to create something truly beneficial by advancing humanity’s frontiers of knowledge. We urge the NSF to continue Arecibo’s operations, and to preserve this unique asset of scientific exploration and near-Earth object characterization.”</p> <p>AAS Division for Planetary Sciences (excerpt from a response during the first comment period of the Arecibo EIS process, 2016): “The Division for Planetary Sciences of the American Astronomical Society hereby recognizes the importance of the Arecibo Observatory and its planetary radar capability to our science and to planetary defense issues. We strongly encourage all of the concerned institutions to work together to resolve Arecibo’s budgetary and other issues so that the Observatory can continue to be a scientifically productive facility for planetary science, radio astronomy, and atmospheric studies.”</p>	Against Closure/ Reasons Why	Not Applicable	Letter	12/11/2016
31c Cont.	Joan	Schmelz	Deputy Director of Arecibo Observatory	<p>References:</p> <ul style="list-style-type: none"> • http://www.lpi.usra.edu/sbag/findings/index.shtml#jan2016 • https://books.google.com.pr/books?id=Aheur-PfwQ8C&pg=PA66&lpg=PA66&dq=nasa+authorization+act+arecibo+observatory&source=bl&ots=WLVQjtgUra&sig=NrSwX1YyQTLg6qkuZYsblav4YGY&hl=en&sa=X&ved=0ahUKEwir1qzfwqjQAHXHMSYKHeYUDGEQ6AEIRTAJ#v=onepage&q=nasa%20authorization%20act%20arecibo%20observatory&f=false • https://books.google.com.pr/books?id=eHUloaOCm8YC&pg=PA60&lpg=PA60&dq=space+studies+board+arecibo+observatory&source=bl&ots=7WiBDH5CnM&sig=rgR2W_vvaxjpbqkcy0sl1EbKE&hl=en&sa=X&ved=0ahUKEwju6K3FrajQAHVkfyYKHcBWBKEQ6AEIHDA#v=onepage&q=space%20studies%20board%20arecibo%20observatory&f=false • https://www.nap.edu/catalog/12738/near-earth-object-surveys-and-hazard-mitigation-strategies-interim-report • http://solarsystem.nasa.gov/docs/Vision_and_Voyages-FINAL.pdf • https://www.nsf.gov/mps/ast/env_impact_reviews/arecibo/eis/DEIS.pdf • https://www.nsf.gov/mps/ast/env_impact_reviews/arecibo/eis/Appendices_DEIS.pdf 	Against Closure/ Reasons Why	Not Applicable	Letter	12/11/2016
31d	Joan	Schmelz	Deputy Director of Arecibo Observatory	Finding 3: Several national laws, policies, and mandates require the continued operation of the planetary radar at Arecibo Observatory.	Against Closure/ Reasons Why	Not Applicable	Letter	12/11/2016

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				<p>The National Space Policy Act of 2010 states that NASA should “pursue capabilities, in cooperation with other departments, agencies, and commercial partners, to detect, track, catalog, and characterize near-Earth objects to reduce the risk of harm to humans from an unexpected impact on our planet and to identify potentially resource-rich planetary objects.”</p> <p>The Space Act, Public Law No. 111 – 314, in 2010, specifically reaffirmed congress’ support for national planetary defense capabilities and their previous statements in the NASA Authorization Act of 2008, and specifically affirms the value of planetary radar, section 71104.</p> <p>The NASA Authorization Act of 2008, specifically calls for funding of Arecibo and continued operation of its planetary radar program, pending a review by the National Research Council, which released a statement the following year affirming the vital role Arecibo plays in planetary defense.</p> <p>References:</p> <ul style="list-style-type: none"> • https://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf • https://www.congress.gov/bill/110th-congress/house-bill/6063/text • http://www.nasa.gov/sites/default/files/atoms/files/public_law_111-314-title_51_national_and_commercial_space_programs_dec._18_2010.pdf 				
32a	Carlos	Estevez Galarza	Space Research Director at Pratian LLC T.A. & Physics M.S. Student at UPR-RP	<p>Exactly three years ago, I participated in a study tour to Europe that allowed me to get to know different people and their cultures for the first time. I had the pleasure of witnessing some of humanity’s most important achievements, places, and contributions to art. During the road trips, I began reading Carl Sagan’s literary works, which allowed me to conclude that astronomy is the bridge between both of my passions, art and science. When I was a child, my family took me to the Arecibo Observatory. As I glanced at the radio telescope, my mother told me that the observatory lands were once owned by my great-great-grandfather, so I immediately felt a connection to astronomy. At this point, I started to connect the dots that made me realize my true calling.</p> <p>After taking diverse courses in physics and mathematics I felt ready to get involved in the Puerto Rican astronomy community. I contacted Dr. Edgard Rivera Valentin, a staff planetary scientist at the Arecibo Observatory, interviewed, and was hired as a Student Research Assistant under his NASA Mars Data Analysis Program proposal. Dr. Rivera-Valentin is a “local expert” on the Mars Science Laboratory’s (MSL) Rover Environmental Monitoring Station (REMS) instrument and a co-investigator on HABIT, an ESA instrument on the Exomars surface platform mission. The MSL’s REMS was recently used to suggest an unexpected discovery: the possibility of liquid water formation via deliquescence of perchlorate salts during the Martian night (Martín-Torres et al., 2015). As a researcher, I analyzed REMS data from sols 10-602 (Ls 156.1° through 114.7° of the next Martian year) to look for thermodynamic evidence in favor of deliquescence in Mars’ Gale Crater. In my work, I found evidence of exothermic dominated reactions occurring during the night, which supports Martin-Torres et al., 2015 results. It was hard work, but it was all worth it. This experience gave me the chance to do relevant work in the fields of astronomy and physics while living in a community of scientists from all around the world. This exchange provided me with insights in the fields of atmospheric science, radio astronomy, solar system studies, electric engineering and archeology, among other disciplines. In addition, I was able to volunteer in the Arecibo Observatory REU program.</p>	Against Closure/Reasons Why	Not Applicable	Email	12/10/2016
32b	Carlos	Estevez Galarza	Space Research Director at Pratian LLC T.A. & Physics M.S. Student at UPR-RP	<p>The Mars research work has been a pivotal experience in my life, as it also presented the opportunity to write my very first scientific article, which has been submitted to the Geophysical Research Letters. Also, I presented my research work at the Lunar and Planetary Science Conference 2016 in Houston, Texas. The most important thing about my experience at the Arecibo Observatory is that I found my purpose. I feel that the human race has lost its focus. Our lifestyles are based on the assumption that we have infinite resources, but we don’t, so we can’t exploit them. In the short time we’ve been here we have accomplished so many incredible things that it would be a pity if we destroyed ourselves. During my time in Arecibo, I learned that planetary science is all about understanding our world better by comparing it with other worlds. I think most of the people ignore science because its apparent difficulty scares them off, but somehow planetary science gets to people. It’s something people can visualize and feel identified with. I truly believe that planetary science can give everyone the same feeling I got while doing my research. Only by studying other planets we will know how fortunate we are to be here and hopefully, we will learn to appreciate our only home, planet Earth.</p>	Against Closure/Reasons Why	Not Applicable	Email	12/10/2016

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32c	Carlos	Estevez Galarza	Space Research Director at Pratian LLC T.A. & Physics M.S. Student at UPR-RP	Puerto Ricans are multicultural people as we are a genetic mixture of Europeans, Africans, and Taínos, the local indigenous group. We are globally recognized for their passion towards arts and sports and I want to work so that we are also recognized as people who are devoted to the advancement of science. The Arecibo Observatory is a center devoted to the advancement of science and education, not only to Puerto Ricans, but to the whole world, as proven by the AO Space Academy and the AO REU program. The Arecibo Observatory and its staff were the only ones who believed in me, when no one did. Even with a 3.80 GPA and previous research experience I couldn't get into any REU program in the United States. If the Arecibo Observatory would've been closed by that time, I don't know what would have been of my scientific career. In my case, I hope the Arecibo Observatory remains open because I plan to do more research as I do my masters here in Puerto Rico. There are many talented Puerto Rican students who deserve the chance that I had.	Against Closure/Reasons Why	Not Applicable	Email	12/10/2016
32d	Carlos	Estevez Galarza	Space Research Director at Pratian LLC T.A. & Physics M.S. Student at UPR-RP	During the months I lived in Arecibo, I saw how everyday a bunch of locals and tourists visited the Observatory. Economically speaking, the closing of the Arecibo Observatory would be another devastating hit to Puerto Rico.	Against Closure/Reasons Why	Not Applicable	Email	12/10/2016
32e	Carlos	Estevez Galarza	Space Research Director at Pratian LLC T.A. & Physics M.S. Student at UPR-RP	SAFETY- Furthermore, the Arecibo Observatory plays a vital role in planetary defense as it possesses the most sensitive radar.	Against Closure/Reasons Why	Not Applicable	Email	12/10/2016
32f	Carlos	Estevez Galarza	Space Research Director at Pratian LLC T.A. & Physics M.S. Student at UPR-RP	It really makes no sense to close the facility that gave indirect evidence of gravitational waves and evidence of the first exoplanets, a facility that continues to be of great use to the scientific community.	Against Closure/Reasons Why	Not Applicable	Email	12/10/2016
33	Walter	Brisken		I am writing to provide my views on the importance of Arecibo Observatory's continued operation. Before I describe the particular importance of Arecibo to astronomical sciences and Space Situational Awareness I would like to make a general statement about decommissioning of any of the US radio astronomy facilities that have been recommended for divestment from NSF's portfolio. This also includes the Green Bank Telescope and the Very Long Baseline Array. The three instruments each offer unique capabilities that once decommissioned are not likely to be restored on the timescale of a century, or perhaps large fraction thereof. This is unlike the case for the optical telescopes slated for decommissioning where future generation replacements of essentially all capabilities are already well into planning phases (e.g., LSST and TMT). Now to Arecibo...I understand the several important science cases have already been brought to attention, including 1. the searching for and precision timing of millisecond pulsars which are currently placing the strongest constraints on several sectors of gravitation theory and hope soon to detect gravitational radiation in a waveband unreachable by any other proposed detector, and 2. the resolution of the Hipparcos Controversy through detect distance measurement to the Pleiades. Arecibo is a key participant in VLBI experiments, including frequently contributing to the High Sensitivity Array, an arrangement of the VLBA and four very large, sensitive radio telescopes, with Arecibo being the largest. Inclusion of Arecibo instantly doubles the sensitivity of the array. Some very exciting research is currently just at the sensitivity limit offered by the HSA. Envisioned upgrades to the HSA antennas could increase its sensitivity by a factor of 4 or more, bringing direct distances (and thus determination of intrinsic properties otherwise difficult or impossible to untangle) to Galactic globular clusters into reach. Also direct measurements of the motions of the local group galaxies will provide key information on the dynamics of the local group. Finally, with the increase in sensitivity the numbers and types of stars accessible to VLBI will grow substantially, opening VLBI up to a large group of scientists and growing the Arecibo (and VLBI) community. To keep my letter short I will not dwell on the radar capability that Arecibo has to offer, but would like to note this is absolutely unmatched by any instrument in the world and has significant potential not only for conventional radio astronomy but also for planetary science, space science, and space situational awareness research. In closing, I urge very careful thought when considering the closure of any instrument, including Arecibo. Consideration not only of the current capability but also that of its future capabilities and within the context of the other instruments it will be operating.	Against Closure/Reasons Why	Not Applicable	Email	12/9/2016

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34	Esteban	Araya	Associate Professor Physics Department Western Illinois University	This email is to express my concern with the potential funding changes for the Arecibo Observatory recommended in the Draft Environmental Impact Statement. I hope the committee takes into consideration that further cuts in the scientific operations of the 305m Arecibo Telescope will have negative consequences not only for the territory of Puerto Rico (scientists, students at all levels, and general public), and the user community from RI institutions, but also will negatively impact research work done at primarily undergraduate institutions like Western Illinois University, where students participate in remote observations, data reduction, and analysis of Arecibo data, and present results in multiple local, regional and national conferences. The 305m Arecibo Telescope is the most sensitive telescope for spectral line observations at frequencies below 10GHz, and thus, it is a greatly valuable US asset and should continue its scientific mission.	Against Closure/ Reasons Why	Not Applicable	Email	12/12/2016
35	Kathy	Kaldon		I received information recently about the possibility of closing down the Arecibo Observatory. This site has been valuable to my family in a very personal way. I visited this site in the summer of 2014 when my daughter was part of the REU program. She spent 11 weeks at the site and the knowledge she gained was amazing. We were provided a tour and met the staff who were enthusiastic about the site, it's operations and the REU program. She presented her investigation regarding "Searching for Fast Radio Bursts in GALFACTS Data" at Arecibo Observatory on August 7th as well as in Seattle at the American Astronomical Society Meeting, Penn State, and on her interviews. This program was rewarding to her personally and enhanced her career. She is currently working at MIT Lincoln Lab, where she was recruited to join during her senior year at Penn State. It was a difficult decision for her to travel on her own to a place where she did not know anyone. She was transformed, becoming an avid traveler who is comfortable in many different types of situations. She enjoyed working with all the personnel onsite and was provided with a unique experience. The project she worked on provided a solid background for her major of astrophysics and allowed her to gain experience with professionals who were working in related fields. She continues to return to Puerto Rico at few times a year and has developed long lasting relationships with the contacts she made during this time.	Against Closure/ Reasons Why	Not Applicable	Email	12/13/2016
36	John	Kaldon	President Broad Run Consultants Ltd	My daughter had the privilege of working at the Arecibo Observatory as an intern while at Penn State University. Because of this experience she has developed a love for Arecibo and Puerto Rico, and the experience helped her obtain a job at MIT. My wife and I visited the Observatory and were very impressed with the work performed at the site and the personnel. Please continue to support the Arecibo Observatory.	Against Closure/ Reasons Why	Not Applicable	Email	12/12/2016
37a	Juan	Ramirez-Lugo	President AAAS- Caribbean Division	The Caribbean Division of the American Association for the Advancement of Science (AAASCD) fulfills the mission of advancing science, engineering, and innovation for the benefit of all people and the environment of the Caribbean basin. The main goals of the Division are to develop and promote science and innovation initiatives that impact society, foster education in science and technology, and advance cooperation through scientific endeavors. These goals are shared and exemplified through the myriad vanguard research activities and diverse educational offerings provided by the scientists and educators at the Arecibo Observatory (AO). Because of their commitment to advancing science and serving society the American Association for the Advancement of Science's Caribbean Division fully supports efforts to ensure that the Arecibo Observatory continues its service for the benefit of science and society. The AO is a unique facility for research in radio astronomy, atmospheric physics, and planetary science. Since opening for operation in 1963, the AO has allowed scientists to precisely measure the rotation periods of planets, image planetary surfaces, the Moon, the rings of Saturn, comets, and discover hydrocarbon lakes on the surface of Titan, one of Saturn's moons. The large 305-meter antenna at Arecibo was instrumental in the discovery of the first binary pulsar by Joseph Taylor and Russell Hulse, a finding that led this duo to be awarded the Nobel Prize in Physics in 1993. In the last 20 years alone, research carried out at the AO has yielded over 500 scientific publications that have been cited over 17,000 times.	Against Closure/ Reasons Why	Not Applicable	Letter	12/12/2016
37b	Juan	Ramirez-Lugo	President AAAS- Caribbean Division	Furthermore, the AO is the most sensitive instrument in the world for the characterization of near-Earth astronomical objects. Thanks to these capabilities, the AO can accurately predict the trajectory of asteroids approaching Earth and is part of a group of facilities that represent the first line of defense to the dangers of impacts by asteroids and other astronomical objects.	Against Closure/ Reasons Why	Not Applicable	Letter	12/12/2016

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37c	Juan	Ramirez-Lugo	President AAAS-Caribbean Division	<p>In addition to being at the forefront of scientific discoveries and a sentinel against threats to human survival, scientists and educators use the facilities in Arecibo as a platform for diverse education and outreach activities. The Arecibo Observatory Space Academy (AOSA) trains secondary school students in the fields of Science, Technology, Engineering and Mathematics (STEM) to become leaders in these fields by early exposure to authentic scientific research through direct partnerships with scientist at the AO. Just as the academy provides formal education to secondary school students, the newly renovated Ángel Ramos Foundation Visitor Center and Museum provides informal education to more than 100,000 visitors per year, including a significant number of K-12 students from local schools, as well as visitors from around the world. The benefits of the AO to science and society are as colossal as the radio telescope itself. This large dish nestled into the karst topography of the north of Puerto Rico allows us to explore the mysteries of our atmosphere and to search for life beyond it. It lets us peer into the future by inspiring future generations of scientists while reminding us of the vastness of the universe.</p> <p>AAAS-CD urges the National Science Foundation (NSF) to seek sustainable solutions for the future of the AO in favor of continued service and support. Therefore, the AAAS-CD supports the No-Action Alternative included in the Draft Environmental Impact Statement for the Arecibo Observatory. AAAS-CD pledges its support to work along with the NSF to include governmental and scientific stakeholders from Puerto Rico and abroad in actions that guarantee and expand the AO's impact as a vital center for research and education in the Caribbean and beyond. It would be a great misfortune if the NSF fails to see the intellectual merits and broader impacts of facilities such as the AO in favor of newer telescopes, which will eventually be in the same position that the AO is in today. Just as the AO has allowed us to do for the past 53 years, we invite the NSF to look beyond.</p>	Against Closure/Reasons Why	Not Applicable	Letter	12/12/2016
38a	Miguel	Babilonia Vázquez	President Fundación de Investigaciones Espeleológicas del Karso Puertorriqueño - FIEKP -	We are writing to you as a concerned organization. The "Fundacion de Investigaciones Espeliologicas del Karso Puertorriqueiiio" (FIEKP) is a non-profit organization formed by citizens that live in Puerto Rico that are interested in Speleology and in science in general. The Arecibo Observatory is a unique facility with a broader scope of work that other observatories around the globe. The uniqueness is not only due to physical characteristics such as size, location, reflector flexibility,	Against Closure/Reasons Why	Not Applicable	Letter	12/12/2016
38b	Miguel	Babilonia Vázquez	President Fundación de Investigaciones Espeleológicas del Karso Puertorriqueño - FIEKP -	historical contribution to humanity, but also what it represents to the Puerto Rico scientific community. The observatory has been a tool to discover asteroids and the research conducted at the Observatory resulted in a Nobel Prize winner. Of course, that part is well documented and know to everyone in the scientific community.	Against Closure/Reasons Why	Not Applicable	Letter	12/12/2016
38c	Miguel	Babilonia Vázquez	President Fundación de Investigaciones Espeleológicas del Karso Puertorriqueño - FIEKP -	The Observatory is up to date and far from obsolete therefore from the operational aspect there is no reason for the NCF to stop funding. Furthermore, when compared to other observatories it provides a wider scope of research, and perhaps at a lower cost. However, the aspect that worries FIEKP the most is what the observatory means for the scientific community in Puerto Rico.	Against Closure/Reasons Why	Not Applicable	Letter	12/12/2016
38d	Miguel	Babilonia Vázquez	President Fundación de Investigaciones Espeleológicas del Karso Puertorriqueño - FIEKP -	The Observatory is the only true research facility for the Puerto Rico physicist and electrical engineers. It is the connection of these scientists with the rest of the world. Every day we lose scientists and engineers due to the lack of work and opportunities in the Island. The observatory is the most important scientific facility in Puerto Rico, and for many years helping the development of our scientist is Puerto Rican soil, a closure or significant cut in funding will only accelerate the migration of scientist and scholars. This in turn will further steepen our economic downturn and make harder for us the chances to improve productivity from the science and technology sourcing. The future of scientist depend on what is available for their development, and the Observatory is the best example of a facility that has served and continues to serve this purpose. Given its significance to the Puerto Rico scientific community FIEKP considers that the best alternative is to continue NSF support for science-focus operations. This alternative allows for the best use of the observatory and also provides a reasonable amount of time for which the Observatory operations and the puertorrican scientific community find additional sources of funding from the public and the private sector. FIEKP and other science oriented organizations are interested in preserving the Observatory for scientific use and is willing to help in finding ways to continue with the Observatory operations. For any questions, please call us at (787) 448-9960 or email us at Babilonia.miguel@yahoo.com.	Against Closure/Reasons Why	Not Applicable	Letter	12/12/2016

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39	Robert	Minchin		If Arecibo is left relying, in whole or in part, on selling telescope time to fund its continued operation, this makes the purchase of time by METI (Messaging to Extra-Terrestrial Intelligence, also known as Active SETI) projects inevitable. Some scientists (e.g. http://lifeboat.com/ex/shouting.at.the.cosmos) have said this risks attracting the attention of more advanced and possibly hostile alien civilisations, which could lead to the extinction or enslavement of the human race. The EIS should therefore contain a risk assessment of METI transmissions under the assumption that these will go ahead if Arecibo Observatory is left to seek its own funding.	Resource Considerations for Document Analysis	Safety	Email	12/12/2016
40a	Kristina	Kaldon	Employee at MIT Lincoln Laboratory	I am currently an employee at MIT Lincoln Laboratory in the space systems and technology division. I went to the Arecibo Observatory for the first time in May 2014 to start an NSF REU. Initially I was nervous to be in a new, exotic place but within minutes on the island, I realized my life was about to change. After seeing the observatory, the vastness of the dish, I felt small, passionate, and hopeful. I spent the next 11 weeks working at the observatory (I voluntarily asked to stay for an extra week). I learned so much; specifically how to code, how the electronics work, how to observe, how to present scientific work, and how to ask questions effectively. I felt personally inspired by my advisors, other staff (all whom were extremely intelligent, enthusiastic, and friendly), the research, and the culture of the island. That summer, I made life-long friends, mentors, and connections that help me succeed every day. I went on to present my Arecibo REU summer work in Seattle, Penn State, and MIT. I received three scholarships, monetary prizes for winning best poster awards, and was offered my job directly as a result from the work I did at Arecibo Observatory. Educationally, I thrived because I was able to learn many new things with enthusiastic, inspiring, and helpful experts. I also thrived because I was able to see so many new areas of STEM, including engineering, operations, agricultural, education, radar, ionosphere, and radio research. I have been inspired scientifically by the staff and their work to continue research and apply to graduate school.	Against Closure/ Reasons Why	Not Applicable	Email	12/12/2016
40b	Kristina	Kaldon	Employee at MIT Lincoln Laboratory	I have been inspired culturally in countless ways. It is my dream to live in Puerto Rico and work at the observatory full-time. I have been back to the island over three times a year since 2014. I am probably the most enthusiastic Puerto Rico supporter you could ever meet. My devotion has led me to be elected as a committee chair for MIT Lincoln Laboratory's Hispanic-Latino Network employee resource group. Through said group, I have recruited Latin American engineers, made people feel home, and hosted outreach events to educate children about Latin America and science. I have such respect for the island, it's people, and the opportunities the observatory provides for it. I truly hope you are able to see that Arecibo Observatory is one of the great marvels of the world. We need to save it, we need to fund it, and we need to share it. I am grateful for the opportunities I've had there and hope that many people can have the same opportunity I did. I think the biggest and best change in my life was the day I moved to the observatory. Anyone who has met me can vouch for my insistent love of Puerto Rico and Arecibo Observatory.	Against Closure/ Reasons Why	Not Applicable	Email	12/12/2016
41a	Dr. R.C.	Vermeulen	Director, Radio Observatory at ASTRON	As chairman of the Consortium Board of Directors of the European VLBI Network (EVN), I wrote on 20 June 2016 to express our grave concerns about the NSF investigation (the "Environmental Impact Study") into future options for the William E. Gordon 305-m Radio Telescope at Arecibo. Today, I write in reaction to the Draft Environmental Impact Statement (DEIS). The EVN, as the largest network of radio telescopes for VLBI on earth, is gravely concerned about the continued availability of "Arecibo", which, as an associated member, is irreplaceable for carrying out the most sensitive VLBI observations! For the EVN it is particularly disturbing to find in section ES.2 of the DEIS a statement that "... the scientific capability of the Arecibo Observatory is lower in priority than other scientific capabilities the NSF funds." Regardless of how that relative value judgment was derived, however, we stress that the contribution of the unparalleled sensitivity of Arecibo to VLBI observing is invaluable in absolute terms, and comes at an amazingly modest cost/benefit ratio. The EVN feels that the NSF would be remiss to divest and thus in part to divorce the US community from what has always been a collective investment in VLBI by the global radio astronomy community, to the benefit of all. As a recent example: I have confidentially been informed about the first confirmed localization of a Fast Radio Burst (FRB). This was carried out in an observation using the EVN including Arecibo. Unraveling the nature of these enigmatic FRBs is being fiercely pursued by multiple research groups, and could have profound implications on our understanding of the physics in the extreme conditions at the centers of galaxies. The VLBI result is sure to be a highlight at the January American Astronomical Society meeting, where it will be publicly announced.	Against Closure/ Reasons Why	Not Applicable	Letter	12/12/2016

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41b	Dr. R.C.	Vermeulen	Director, Radio Observatory at ASTRON	The EVN furthermore struggles to understand the intent and viability of the statement in the DEIS that the option preferred by the NSF is "Collaboration with Interested parties for Continued Science-focused Operations". Arecibo VLBI operations are carried out by its scientific staff; yet, the building housing that scientific is one of no less than 26 important buildings slated for demolition under this option. One cannot help but wonder how viable continuation of science-focused VLBI operations will be, regardless of whether interested (outside) parties may exist in principle. In summary, the EVN hopes that the NSF will find a continuation model for Arecibo, at perhaps comparatively modest cost, that that does not impede VLBI participation, but rather leverages a persistent very high absolute impact on science from the this great infrastructure.	Against Closure/ Reasons Why	Not Applicable	Letter	12/12/2016
42a	Yori & Philip	Kovalev & Edwards	RadioAstron International Science Council co-chairs	The RadioAstron International Science Council (RISC), hereby reiterates its concern, originally raised in their June 2016 submission to the EIS scoping meeting, in respect of what is currently the most sensitive telescope for Very Long Baseline Interferometry (VLBI), the William E. Gordon 305-m Radio Telescope at Arecibo. We wish to draw NSF's attention to two issues from the DEIS: (i) It is stated in section ES.2 that "... the scientific capability of the Arecibo Observatory is lower in priority than other scientific capabilities the NSF funds." We would argue that the contribution of the Arecibo 305-m radio telescope to high-sensitivity VLBI observations is invaluable. It is also a critical element of VLBI arrays, both ground-based arrays and space VLBI. Since the international space VLBI project, RadioAstron, commenced operations in 2012, the contribution of the Arecibo telescope to its enormous success has been of the highest importance. The RadioAstron satellite has an apogee height of ~300,000 km, fifteen times greater than previous space VLBI observations, and it has made a number of detections on baselines greater than 20 Earth diameters, in contrast to the expectations of many astronomers. Arecibo's participation has been instrumental in uncovering hitherto unknown rERactive substructure introduced by scattering in the interstellar medium, and fine details in quasars that challenge the long-accepted energy generation mechanism in such sources. VLBI is a global endeavor in which all partners contribute. For example, although the Russian satellite-based antenna provides the longest baselines, many countries provide ground-based support, and the investigators include scientists from all over the world; US-based researchers are often the P.I.'s on high impact science projects.	Against Closure/ Reasons Why	Not Applicable	Letter	12/12/2016
42b	Yori & Philip	Kovalev & Edwards	RadioAstron International Science Council co-chairs	(ii) the DEIS declares that the agency-preferred option is "Collaboration with Interested parties for Continued Science-focused Operations". However, that option contains the destruction of 26 observatory buildings, many vital and without which Arecibo operations would be rendered close to impossible. Among the buildings slated for destruction is that housing the science staff. We note that Arecibo VLBI operations are supervised and run by the scientific staff. On behalf of the RadioAstron International Science Council we express our resolute support to continuing operational status of the Arecibo Observatory.	Against Closure/ Reasons Why	Alternatives	Letter	12/12/2016
43	Robert	Minchin		At the moment, the sinkhole in which the Observatory is situated is kept from flooding by diesel-powered pumps. If the site were to be completely abandoned, the habitat would not, as incorrectly claimed in the EIS, be protected by woody growth. It would, in actuality, become a tepid pool, drowning the rare ferns and any other flora and fauna, and potentially becoming a breeding ground for mosquitos that could spread infections to the local community. The EIS needs to be re-visited to assess this overlooked risk of habitat destruction and possible risk to public health in scenarios 4 and 5 (partial and complete demolition).	Resource Considerations for Document Analysis	Biological	Email	12/12/2016
44	Joanna	Bi		My name is Joanna Bi and I am writing to express my hope that you will reconsider your funding distribution and help save Arecibo Observatory. Although I have not seen the observatory in person or done any work there, I have been inspired to learn more about the amazing, cutting-edge research that is done there due to a coworker who interned at the observatory during the summer of 2014. Since we began working together about 1.5 years ago, she has spoken nonstop about the incredible opportunity Arecibo Observatory provides for undergraduate students in furthering their research and career, allowing them to work with leading scientists at a location that hosts the largest single dish telescope, a unique environment that cannot be found elsewhere in the world. In addition to the educational opportunities, Arecibo Observatory also contributes greatly to three different areas of research: ionosphere research, radio astronomy research, and asteroid research. During my coworker's internship, the observatory detected pulsar stars for the very first time, an invaluable contribution to the scientific community. Furthermore, countless countries have used this single dish telescope; have come specifically to Arecibo Observatory to make use of its unique, one of a kind environment. Closing the observatory will be a terrible loss to the community at large. Please reconsider and help save Arecibo Observatory.	Against Closure/ Reasons Why	Not Applicable	Email	12/12/2016

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45	Cariangeli	León Moraza, Esq.	State Historic Preservation Officer	We acknowledge receipt of your documentation describing five proposed changes to the operation of the Arecibo Observatory; a property listed in the National Register of Historic Places at the national level of significance. We believe all five alternatives, including number 3 (which would change the character of the property's use for an indefinite period of time), meet the criteria of adverse effect. As such, we recommend you notify the Advisory Council on Historic Preservation (Council), pursuant to 36 CFR 800.G(a)(1), and continue consultation with the consulting parties to seek ways to resolve adverse effects. Considering the strong island wide interest in this undertaking and the national significance of the Arecibo Observatory, we recommend you invite the Council to participate in the consultation. Please include the SHPO project number in any future correspondence. If you have any questions, please contact Berenice Sueiro (bsueiro@prshpo.pr.gov) or Miguel Bonini (mbonini@prshpo.pr.gov) at our Office. You may also contact us by phone at (787) 721-3737.	Resource Considerations for Document Analysis	Cultural Resources	Letter	12/12/2016
46a	Joseph	Kania		I would like to voice my support for continued National Science Foundation operation and funding for the National Astronomy and Ionosphere Center. I was a summer student at Arecibo Observatory, funded by the NSF's Research Experiences for Undergraduates program. As a student at Arecibo I was able to participate in radio astronomy research that was beyond what I would have been able to do at my home institution.	Against Closure/Reasons Why	Not Applicable	Email	12/12/2016
46b	Joseph	Kania		The REU funding allowed me to immerse myself in my research project without having to divert time to help teach classes	Against Closure/Reasons Why	Not Applicable	Email	12/12/2016
46c	Joseph	Kania		I found that working at an observatory to be a valuable and interesting experience. Living at the observatory allowed me to better know the instrument my data came from, learn how the telescope is operated, and see the work on future improvements. The people that I met while at Arecibo have been invaluable for my personal and professional development. The skills that I learned at Arecibo served me well as a summer student at the Joint Institute for VLBI-ERIC, and I suspect they will continue to do so as I continue my studies in graduate school. Puerto Rico provided a rich historical and cultural backdrop in which to work. Continued NSF operation and at least partial funding is needed to continue allow students like myself to gain education and experience in Radio Astronomy. After I finish my education I hope to use the William E. Gordon Telescope's data products.	Against Closure/Reasons Why	Not Applicable	Email	12/12/2016
47a	Xavier	Siemens	Chair, NANOGrav; Director, NANOGrav Physics Frontiers Center; Associate Professor	We are writing on behalf of the North American Nanohertz Observatory for Gravitational waves (NANOGrav), to comment on the current draft of the EIS for the Arecibo Observatory. The NANOGrav collaboration is composed of over 100 students and scientists from 15 institutions in the US and Canada. The US portion of NANOGrav is largely funded by the National Science Foundation's NANOGrav Physics Frontiers Center.	Background	Not Applicable	Letter	12/13/2016
47b	Xavier	Siemens	Chair, NANOGrav; Director, NANOGrav Physics Frontiers Center; Associate Professor	In our response to the scoping notice dated June 23rd 2016 we requested that certain issues related to human and cultural environment be addressed in the EIS. Section 3.2 defines the region of influence (ROI) for cultural impacts as the property boundary of the observatory, and section 3.9 defines the ROI for population, housing, employment, economy, and income as the municipality of Arecibo. However, the human and cultural environment of the Arecibo Observatory goes well beyond the ROI considered in the report.	Resource Considerations for Document Analysis	Socioeconomics/Cultural Resources	Letter	12/13/2016
47c	Xavier	Siemens	Chair, NANOGrav; Director, NANOGrav Physics Frontiers Center; Associate Professor	Members of NANOGrav and the larger scientific user community depend on Arecibo for their research careers. Any scenario that reduces the amount of time available for scientific research negatively impacts the income and employment of this user group and that should be reflected and discussed quantitatively in the final EIS for all scenarios considered. Early-career scientists are especially impacted. As we wrote in our previous correspondence, over the past decade NANOGrav has involved a diverse group of hundreds of US high school and undergraduate students in Arecibo observations of pulsars and gravitational wave astronomy. These students are from institutions in Maryland, Michigan, Montana, New York, Ohio, Pennsylvania, Texas, Vermont, Virginia, Washington, West Virginia, and Wisconsin.	Resource Considerations for Document Analysis	Socioeconomics	Letter	12/13/2016
47d	Xavier	Siemens	Chair, NANOGrav; Director, NANOGrav Physics Frontiers Center; Associate Professor	Arecibo has played a particularly inspiring role in training our Hispanic students for whom Arecibo is a source of cultural pride. The excitement of our students in personally operating Arecibo has propelled many of them into careers in physics, astronomy, engineering, and other STEM fields. The effects of reducing or eliminating science-focused operations on this demographic is not accounted for in the EIS. We request that the final EIS address these points for all scenarios considered.	Against Closure/Reasons Why	Not Applicable	Letter	12/13/2016

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47e	Xavier	Siemens	Chair, NANOGrav; Director, NANOGrav Physics Frontiers Center; Associate Professor	Sections 3.9.3 and 4.9 of the EIS draft reference students and researchers at colleges and universities when assessing educational impacts. However, the report makes erroneous assumptions about how these individuals would be affected under scenario 1. It is assumed there would be no impact under scenario 1—this is incorrect. Partnerships will reduce the time available for open-skies science and possibly even contracted time for science. This scenario will result in reduced access to Arecibo for researchers at non-partner institutions, and will tend to decrease the total number of students and researchers who are able to use the telescope. We request that the final EIS address this point. We request that the final EIS consider "broader impacts" as defined by the NSF as a separate area of study. NSF defines broader impacts as those that <ul style="list-style-type: none"> • advance discovery while promoting teaching, training, and learning, • broaden participation of under---represented groups • enhance infrastructure for research and education • broaden dissemination to enhance scientific and technological understanding • benefit society. 	Against Closure/ Reasons Why	Not Applicable	Letter	12/13/2016
47f	Xavier	Siemens	Chair, NANOGrav; Director, NANOGrav Physics Frontiers Center; Associate Professor	NSF rightly considers broader impacts when evaluating the merit of proposals that it receives and funds, and it is appropriate that the EIS do the same. The Arecibo REU program and the hands-on training that many students have received over the years, and can continue to receive so long as Arecibo has a healthy scientific program, is a testament to its impact on teaching, training, and learning.	Against Closure/ Reasons Why	Not Applicable	Letter	12/13/2016
47g	Xavier	Siemens	Chair, NANOGrav; Director, NANOGrav Physics Frontiers Center; Associate Professor	Arecibo has a long tradition of serving groups underrepresented in the sciences, especially Hispanic students in Puerto Rico and beyond. For example, the Arecibo Remote Command Center (ARCC) is a program started at the University of Texas Brownsville (now UT Rio Grande Valley) that gives undergraduate students the opportunity to control Arecibo during pulsar observing. ARCC has expanded to a wide range of radio astronomy activities and in doing so has become an extremely successful avenue for Hispanic students to enter graduate school in STEM fields. ARCC has expanded to colleges and universities across the US and involves a large fraction of young women. As already detailed in the DEIS, Arecibo also contributes enormously to the scientific education of youth across Puerto Rico.	Against Closure/ Reasons Why	Not Applicable	Letter	12/13/2016
47h	Xavier	Siemens	Chair, NANOGrav; Director, NANOGrav Physics Frontiers Center; Associate Professor	We understand that some of these programs are considered in the DEIS but they are not discussed within the specific scope of NSF's broader impacts criteria.	Against Closure/ Reasons Why	Not Applicable	Letter	12/13/2016
47i	Xavier	Siemens	Chair, NANOGrav; Director, NANOGrav Physics Frontiers Center; Associate Professor	Finally, the report states that NSF prefers to find partners for continued science-focused operations of Arecibo. However, all of the scenarios studied in detail in the DEIS involve the deconstruction of some buildings on the site. These include critical infrastructure for operating the S-Band radar system, administrative and office space for observatory staff, and quarters for visiting scientists. No justification is given for deconstructing these particular facilities, but they are important to a viable continued operation of the observatory, and to finding new partners. The S-Band radar system in particular may be one of the most attractive elements for potential partners, and losing this infrastructure would cripple our ability to track near earth objects. The impact resulting from such a loss could be disastrous. The administrative building, where observatory staff work, also appears to be considered for deconstruction and the impact seems to not be explored in the DEIS. We request that the final EIS 1) justify which, if any, buildings are to be deconstructed under all scenarios, and 2) fully accounts for the impacts that any building deconstruction would have on the operational capabilities of the observatory.	Against Closure/ Alternatives Considered	Alternatives	Letter	12/13/2016
48a	Tyler	Cohen	Research Intern Gemini Observatory	My name is Tyler Cohen and I am writing to you regarding the recent NSF Environmental Impact Statement and ongoing efforts to divest Arecibo Observatory. I am currently working as a Research Intern at Gemini Observatory in Hilo, HI studying galaxy evolution. The opinions expressed herein do not necessarily reflect those of my employer. Arecibo Observatory has had a profound personal impact on my career and my education. In the Summer of 2015, while studying physics and astronomy at Stony Brook University, I was awarded an REU at Arecibo Observatory. I am grateful to the NSF for giving me this opportunity. For ten weeks I worked under the mentorship of Chris Salter and Tapasi Ghosh searching for and studying Fast Radio Bursts (FRBs). FRBs are highly energetic, short duration pulses of radiation of unknown extragalactic	Against Closure/ Reasons Why	Not Applicable	Email	12/13/2016

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				origin. Though their progenitor is unknown, research has suggested that they may be associated with Gamma Ray Bursts (DeLaunay et al. 2016), the most energetic radiating events in the universe. Only eighteen FRBs have ever been observed, one of which was discovered by Arecibo in 2012 (Spitler et al. 2014). FRBs are particularly enigmatic because until this year, they had been observed as non-repeating events. Spitler et al. 2016 discovered 10 repeating bursts from FRB 121102, suggesting a possible neutron star progenitor. All of these discoveries were made using Arecibo's L-Band Feed Array (ALFA), which offers superior L-Band sensitivity and sky coverage. The continued operation of Arecibo Observatory is essential to the study of FRBs, which allow astronomers to probe extreme cosmic environments. My own research at Arecibo entailed searching through massive records of ALFA data in search of an FRB signal and developing software to automate this search. My REU at Arecibo Observatory was a formative experience and inspired me to pursue a PhD in astrophysics. I will be enrolling in New Mexico Tech for graduate school in the Fall of 2017 where I hope to continue studying FRBs and other high-energy radio phenomena. The continued operation of Arecibo Observatory is vital to my career goals. I can say with confidence that without the REU experience at Arecibo, I would not have been hired by AURA at Gemini Observatory. I have read the relevant sections of the EIS and I understand the NSF's desire to maintain a balanced research portfolio under a constrained budget. However, I believe the NSF has undervalued the Observatory's contribution to the scientific community and to STEM education in the US and Puerto Rico.				
48b	Tyler	Cohen	Research Intern Gemini Observatory	Under the preferred Alternative 1 both the Administration building, which contains the offices of all of the scientific research staff, and the Scientific Offices Trailer, which typically functions as an office for REU students, would be deconstructed. As I witnessed during the Summer of 2015, these offices are already quite consolidated and I do not see how they could be consolidated further without significantly affecting the ability of students and research staff to work effectively. The scientific contribution of Arecibo Observatory has been, and continues to be tremendous.	Against Closure/ Reasons Why	Not Applicable	Email	12/13/2016
48c	Tyler	Cohen	Research Intern Gemini Observatory	Additionally, the opportunity for students from around the US to study at this world-class institution serves as motivation for students in STEM to pursue higher education and careers in the physical sciences. I hope the NSF will take my comments into consideration and continue to fund science operations at Arecibo Observatory.	Against Closure/ Reasons Why	Not Applicable	Email	12/13/2016
49a	Anne	Virkki		I wish to express a few comments concerning the draft Environmental Impact Statement (DEIS) for the Arecibo Observatory. Each comment is listed under the subtitle that the comment refers to in the executive summary but should be equally treated/corrected throughout the DEIS. All comments are fully personal opinions. ES.2 Purpose and Need The DEIS justifies the divestment need from Arecibo with the following citation from the AST Portfolio Review Committee (PRC): "With respect to the Arecibo Observatory, the PRC Report recommended that "AST should reevaluate its participation in Arecibo and SOAR later in the decade in light of the science opportunities and budget forecasts at that time" (NSF, 2012)" and the Senior Review Committee Report: "The Senior Review Committee Report also noted that "If Arecibo is kept operating beyond 2011, it is expected that this will only be a limited-term extension, pending the deliberations of the next decadal survey" (NSF, 2006)."	Against Closure/ Reasons Why	Not Applicable	Email	12/12/2016
49b	Anne	Virkki		Using this recommendation of the PRC solely is grossly misleading. This recommendation does not reflect the general message of the PRC for Arecibo, which in reality does strongly support continued investment on Arecibo: "The Arecibo capability is unique and is supported in all scenarios."	Against Closure/ Reasons Why	Not Applicable	Email	12/12/2016
49c	Anne	Virkki		"AST divestment from Arecibo might also cripple the radar characterization of small bodies in the Solar System, which was one of the most highly ranked V&V priorities for ground-based observations for the next decade."	Against Closure/ Reasons Why	Not Applicable	Email	12/12/2016

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49d	Anne	Virkki		<p>“AST must carefully consider its current portfolio in light of NWNH and V&V priorities and the anticipated budgets.”</p> <p>The budgetary forecasts are mentioned and it is correct that larger fraction of the AST budget should be allocated to the individual grants instead of facilities. However, the \$4M budget of Arecibo Observatory has nothing to do with the over \$20M overspending on other facilities as compared to the PRC recommendations</p>	Against Closure/Reasons Why	Not Applicable	Email	12/12/2016
49e	Anne	Virkki		Twisting this truth is not only disrespectful to the PRC and therefore to the whole scientific community but also violates the responsibility of NSF/AST for transparency in the decision-making processes.	Against Closure/Reasons Why	Not Applicable	Email	12/12/2016
49f	Anne	Virkki		The Senior Review Committee Report recommends the search for new partnerships, which were found (through NASA collaboration) but not mentioned in the DEIS after using the citation as part of justification. Further, the report only hands the decision power for the next decadal survey, which currently refers to the PRC.	Against Closure/Reasons Why	Not Applicable	Email	12/12/2016
49g	Anne	Virkki		<p>“The continued need for the NSF to respond to the PRC Report was reinforced in the annual report of the Congressionally chartered Astronomy and Astrophysics Advisory Committee (AAAC) in March 2016, which recommended that “[s]trong efforts by NSF for facility divestment should continue as fast as is possible” (NSF, 2016b). More recently, in August 2016, the National Academies of Sciences, Engineering, and Medicine (NAS) mid-decadal report, New Worlds, New Horizons, A Midterm Assessment, recommended: “The National Science Foundation (NSF) should proceed with divestment from ground-based facilities which have a lower scientific impact, implementing the recommendations of EXECUTIVE SUMMARY ES-3 the NSF Portfolio Review, that is essential to sustaining the scientific vitality of the U.S. ground-based astronomy program as new facilities come into operation” (NAS, 2016).</p> <p>The scientific community evaluations cited previously indicate that the scientific capability of the Arecibo Observatory is lower in priority than other scientific capabilities the NSF funds. In a funding-constrained environment, NSF needs to maintain a balanced research portfolio with the largest scientific return for the taxpayer dollar. Therefore, the purpose of this Proposed Action is to substantially reduce NSF’s contribution to the funding of the Arecibo Observatory”</p>	Against Closure/Reasons Why	Not Applicable	Email	12/12/2016
49h	Anne	Virkki		These scientific community evaluations do not specifically name Arecibo Observatory, but urge NSF to stronger actions on divesting from the facilities recommended by the PRC, that is, “Mayall, WIYN, and 2.1-meter telescope at Kitt Peak, the Robert C. Byrd Green Bank Telescope, the Very Long Baseline Array, and the McMath-Pierce solar telescope”. For Arecibo, the PRC recommends a new scientific committee evaluation on the scientific impact of the Arecibo Observatory in minimum. No such negative committee evaluation exists. Implying that the listed committees objectively and fully support the divestment from Arecibo and democratically reflect the will of the whole scientific community is, again, grossly misleading.	Against Closure/Reasons Why	Not Applicable	Email	12/12/2016
49i	Anne	Virkki		ES.4 Alternatives under constructionThe DEIS describes the Agency-preferred alternative 1 in the following way:Alternative 1 would involve collaborations with new stakeholder(s) who would use and maintain the Arecibo Observatory for continued science-focused operations. NSF would reduce its funding of the Observatory and the new stakeholder(s) would be responsible for future maintenance and upgrades. Alternative 1 would involve the least change to the current facility and would retain the 305-meter telescope and 12-meter telescope and supporting facilities for research. This proposed Alternative includes deconstruction activities that would remove 26 buildings from the site.”	Background	Not Applicable	Email	12/12/2016
49j	Anne	Virkki		In essence, NSF states that their preference is to select new stakeholder(s) that would not require any offices or the S-band on site, that is, shut out the collaboration with NASA. At the same time as the deconstruction of half of the buildings is proposed, this alternative is described as the one involving the least changes to the current facility? It should be evident that the least change would follow from the no-action alternative.	Against Closure/Reasons Why	Not Applicable	Email	12/12/2016
49k	Anne	Virkki		<p>In addition, EIS states that</p> <p>“Operations after deconstruction activities would be comparable to current operations.”</p> <p>If the offices and the S-band power supply are deconstructed, the idea of the operations continuing comparable to the current operations is ridiculous.</p>	Against Closure/Reasons Why	Not Applicable	Email	12/12/2016

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49l	Anne	Virkki		If the alternative 1 intends to cover several possible new collaborations, the different environmental impacts of each that cause any changes to the facility should be clearly distinguished from each other to avoid ambiguity. Again, I remind NSF for their responsibility of transparency and accountability of their decisions and processes. This DEIS does not fulfill that responsibility.	Against Closure/ Alternatives Considered	Alternatives	Email	12/12/2016
49m	Anne	Virkki		As for the alternative 2, the DEIS states: "Structures not needed to meet the anticipated operational goals would be safe-abandoned or deconstructed. The majority of residential housing and recreational facilities would not be retained under Alternative 2. Table ES-1 provides a detailed list of the 19 buildings and infrastructure that would remain and the 27 buildings and infrastructure that would be removed, which include the 26 items identified under Alternative 1 plus the operations building."	Against Closure/ Reasons Why	Not Applicable	Email	12/12/2016
49n	Anne	Virkki		"Operations after deconstruction would be comparable to current operations. It is anticipated that a staff comparable in size to current operations would work onsite under Alternative 2."	Against Closure/ Reasons Why	Background	Email	12/12/2016
49o	Anne	Virkki		However, NSF fails to consider the need of the science staff and instrumentation (including office space) for educational purposes. For example the REU program heavily relies on these assets.	Resource Considerations for Document Analysis	Socioeconomics	Email	12/12/2016
49p	Anne	Virkki		ES.7 Impact Summary The three points that in my opinion require revising are: 1. "Negligible, adverse, and long-term impacts to public safety could occur during operations, primarily resulting from the reduced capability to observe potentially hazardous nearEarth objects (PHOs)." The effect of the asteroid research in terms of public safety is treated in the DEIS (section 4.7.1.1.) in large part with misleading, naïve arguments. The Arecibo Observatory planetary radar system is a necessary asset for national and international security, both for tracking and the physical characterization of potentially hazardous objects and for validating impact mitigation technologies. The AST Portfolio review committee strongly encouraged NSF AST to continue to support the Arecibo planetary radar program. Several scientific boards and committees, including the decadal survey "Vision & Voyages for Planetary Science in the Decade 2013-2022," endorse the capabilities of the Arecibo planetary radar system as unmatched, essential, and unique. Even several national laws, policies, and mandates require the continued operation of the planetary radar at Arecibo Observatory. All this is omitted in the DEIS. Once more, the discussion concerning the planetary radar in the DEIS is grossly misleading, disrespectful for the whole scientific community, and against the national principles on planetary defense.	Resource Considerations for Document Analysis	Safety	Email	12/12/2016
49q	Anne	Virkki		2. "Deconstruction activities would result in negligible, adverse, short-term impacts to housing and minor, adverse, short-term impact to education and tourism in the Municipality of Arecibo. There would be negligible, short-term benefits to employment, income, and the economy. There would be no socioeconomic impacts during operations." This is untrue. The deconstruction of half of the buildings would inevitably lead to reduction of staff. The staff of the Arecibo Observatory is among the best-paid employees in the municipality of Arecibo. The dismissal would have a significant adverse effect on the tax income of the municipality of Arecibo, and thus, the population that is classified a minority as well as low income. The deconstruction of the buildings could lead to cancellation of the Arecibo Observatory Space Academy program that supports the Puerto Rican to higher education and eventually to better-paid jobs. This could also lead to long-term, adverse effects on the economy.	Resource Considerations for Document Analysis	Socioeconomics	Email	12/12/2016
49r	Anne	Virkki		3. "Minor, adverse, short-term impacts to traffic and transportation would be expected during deconstruction. No traffic impacts would be expected during operations." This is incorrect in terms of the durability of any roads leading to the Observatory without full reconstruction of the local road network to be used by the deconstruction trucks.	Resource Considerations for Document Analysis	Transportation	Email	12/12/2016
50	Leszek	Nowakowski	Professor Department of Physics University of Puerto Rico	The purpose of this letter is to express support for continued NSF investment for science-focused operations of the Arecibo Observatory. I really have mixed feelings writing this letter, because I'm quite sure that the decision about the fate of the Arecibo Observatory has been already taken a long time ago. Most likely nobody would even bother to read this letter but let's continue anyway. First - do we really want to believe that such a decision could be made or changed based on some public meetings, where	Against Closure/ Reasons Why	Not Applicable	Email	12/12/2016

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				<p>mostly incompetent members of the public would voice their opposition? Or some letters written by a similar group of people? If that is true, people who came up with such an idea should be immediately fired from whatever positions they hold, and should get urgent medical attention. I understand this is the procedure now, but I think such an important decision should be made based on scientific merit. Period. Second – do we really want to say that what could be discovered about the Universe, or in Physics, or in Mathematics, or any science - has already been discovered and nothing new will come out if we continue? It was a long time ago, but we have already had a similar situation in the history of our civilization and it would be rEReshing if we remind ourselves what was the result of this kind of attitude - a long period of stagnation in science, if not worse. Fortunately, there was a wake up and now we are where we are. Science was always struggling for funds and money was always a problem. Some areas are expensive because of the nature of research; some are expensive because the money is not spent wisely. Astronomy is not the cheapest and not every country is able or willing to invest money into something that will produce mostly publications in return and hardly anything useful for an average person. Discovering helium, or making an atom bomb? Already done. Understanding pulsars, magnetars, black holes, evolution of the Universe with or without dark matter or dark energy? Who cares – what is important is what we have here and now. First pulsar was discovered by accident in 1967. After many years of intense research, two Nobel prizes, and collecting a mountain of data – we are quite far away from answering even the basic questions about radio pulsars. Let’s have a look what some of them are (from the book by D. Lorimer and M. Kramer, published in 2005):</p>				
50 Cont.	Leszek	Nowakowski	Professor Department of Physics University of Puerto Rico	<ul style="list-style-type: none"> - How many pulsars are in the Galaxy and what is their birth rate? - How are isolated millisecond pulsars produced? - How many pulsars are in Globular clusters? - How many pulsar planetary systems exist? - Do the magnetic fields of isolated neutron star decay? - What are the minimum and maximum periods for radio pulsars? - What is the relationship between core collapse in supernovae and neutron star birth properties? - How many pulsar-black hole binaries exist? - Are all magnetized neutron stars radio pulsars? - How and where is the radio and high-energy emission produced? - What is the shape and structure of the radio beams? - What is the role of propagation effects in pulsar magnetospheres? - What is the composition of neutron star magnetospheres, and how do they interact with the strong magnetic fields? 	Against Closure/ Reasons Why	Not Applicable	Email	
50 Cont.	Leszek	Nowakowski	Professor Department of Physics University of Puerto Rico	<p>Astronomy is a lot bigger than just radio pulsars, and played a very important role at every stage of development of our civilization, and that also includes today. List of unanswered questions was always very long and it is not getting shorter, despite all the effort that we used to put into research. How far are we from being able to answer these questions? The US is one of the richest countries in the world and we used to be the leaders in scientific research. And that includes Arecibo Observatory and Green Bank. Arecibo is older than Green Bank but both contribute in a significant way to research that is important to all of us. Closing Arecibo and Green Bank would essentially mean shutting down a big part of Radio Astronomy in the US. And now we decide that that is the end of the story and other countries should take over? In my opinion it is way too early for that, even if we ever think that way. Looks like finally we have the answer to all possible questions – and the answer is: Who cares?</p>	Against Closure/ Reasons Why	Not Applicable	Email	12/12/2016
51a	Anthony P	Van Eyken	Deputy Director, Center for Geospace Studies	<p>Assuming that comments delivered verbally, at the two public DEIS meetings in Arecibo and San Juan, have been accurately recorded and entered into the formal record, I wish only to address some general points. The five scenarios considered in the draft EIS are each so unrealistic as to be valueless. There is little likelihood that any of these scenarios would be implemented in any recognizable form, and the DEIS therefore provides no valid guidance on the future.</p>	Against Closure/ Alternatives Considered	Alternatives	Email	12/12/2016
51b	Anthony P	Van Eyken	Deputy Director, Center for Geospace Studies	<p>At the Public meetings, NSF explained that these were ‘worst case’ scenarios and had been specified to ensure that all possible responses to the yet-to-be-released solicitation were covered and further stated that this was essential since any successful response to the solicitation would require a matching EIS to support NSF’s eventual Decision of Record. While we are not privy to all the responses that NSF received/ accepted, either within the deadline or subsequently, to its Fall 2015 DCL, we do know that the EIS was not asked to consider the option which the current management team has proposed, and reiterated in our DCL</p>	Against Closure/ Alternatives Considered	Alternatives	Email	12/12/2016

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				response, which includes a variety of upgrades and expansions to Observatory infrastructure and operations. As described by NSF, should any such proposal be submitted in response to the yet-to-be-released solicitation, it could not be considered without the completion of an additional, appropriate EIS. The management team provided formal, written, input to the EIS scoping process requesting that such options be considered, but NSF chose not to include them, and even stated during this round of meetings that such options had not been considered and that their impact was unknown. The considered scenarios were specified by NSF apparently in the full knowledge that they did not cover important, realistic, and practical possible outcomes for the future of AO and thereby precluded significant future options.				
51c	Anthony P	Van Eyken	Deputy Director, Center for Geospace Studies	Option 1, the stated Agency Preferred Option, involves the large-scale destruction of critical elements of the Observatory including essential elements of two of the three major radar systems at the facility – the very things that differentiate Arecibo from its competitors (besides its obvious overwhelming advantage in sensitivity).	Against Closure/ Alternatives Considered	Alternatives	Email	12/12/2016
51d	Anthony P	Van Eyken	Deputy Director, Center for Geospace Studies	Options 2 and 3 involve making the telescope “safe”, which is indicated to involve, inter alia, removal of the support cables from the towers. An inevitable consequence is that the platform can no longer be supported (unless the EIS team has been advised to assume the availability of anti-gravity devices – an advice that might be seen to be no less outrageous than the description of the scenarios themselves) and that the dish will be destroyed by activities related to its removal. Removal of the dish, the platform, and the support cables in not just making the telescope safe, it is completely and irrevocably destroying it.	Against Closure/ Alternatives Considered	Alternatives	Email	12/12/2016
51e	Anthony P	Van Eyken	Deputy Director, Center for Geospace Studies	The DEIS is disingenuous in suggesting that option 2 (conversion to an educational facility) is viable without the telescope itself and in suggesting that option 3 (mothballing) is in anyway practical; if the telescope is destroyed, there can be no un-mothballing. The impacts of both scenarios are obviously and dramatically different from those described in the DEIS.	Against Closure/ Alternatives Considered	Alternatives	Email	12/12/2016
51f	Anthony P	Van Eyken	Deputy Director, Center for Geospace Studies	Options 4 and 5, partial or total deconstruction, include estimates of times and costs which are dramatically at variance (only 20-25% of previous estimates with no explanations) from those contained in NSF’s own previous, very detailed, decommissioning studies. The estimates appear to more closely reflect NSF’s requirements than objective reality. The DEIS is rendered incomplete and insufficient through the omission of important, likely, outcomes, apparently as a result of quixotic definition of the considered scenarios by NSF. Worse, the exclusive consideration of unrealistic scenarios, as well as the lack of any explanation for the dramatically lower costs and time estimates of the destructive activities, serve to significantly reduce the likelihood of any successful outcome for the long-term future of the Observatory. The DEIS is not fit for purpose. It must be redone to address actual proposed, likely outcomes. Comprehensive Environment Impact Studies on realistic scenarios must be available before any proposals for future AO operations are solicited by NSF. A realistic and applicable DEIS is still urgently required.	Against Closure/ Alternatives Considered	Alternatives	Email	12/12/2016
52a	Patrick A.	Taylor	Space Rock Blaster, Planet Defender, Group Lead for Planetary Radar Arecibo Observatory	In the document, the agency-preferred option of collaboration with interested parties for continued science-focused operations includes deconstruction of buildings to “conform to the requirements of future collaborators.” Among these buildings are structures required for the operation of the Arecibo planetary radar system including the S-band High-Voltage Power Supply Building. Removal of this essential piece of hardware would eliminate the planetary radar capability of Arecibo and endanger the partnership with NASA, currently the only major outside financial contributor to Arecibo operations. As written, the document implies that NASA is not seen as a “future collaborator” if structures required for its continued partnership are considered obsolete and slated for demolition. This language and its implication should be amended if partnership with NASA and the continuation of the Arecibo planetary radar are part of the agency-preferred future of Arecibo Observatory.	Against Closure/ Alternatives Considered	Alternatives	Email. Commenter provided these comments at the 11-16-2016 6:15pm public meeting and the verbal comments are addressed with the written comments.	12/12/2016
52b	Patrick A.	Taylor	Space Rock Blaster, Planet Defender, Group Lead for Planetary Radar Arecibo Observatory	Beyond the S-band High-Voltage Power Supply Building, the agency-preferred option suggests deconstruction of the Administration Building, which houses the offices of the scientific staff. Planetary radar cannot be done remotely and requires staff on site to operate the transmitter and collect the data. Again, this will greatly hamper the ability of the Arecibo planetary radar to continue and should be amended in the document. Other buildings used for storage, including the Warehouse Building, and used by the maintenance staff are suggested for deconstruction, which would hamper the ability of the observatory to continue science-focused operations. These recommendations should be corrected to allow for science-focused operations if this is truly the agency-preferred alternative.	Against Closure/ Alternatives Considered	Alternatives	Email	12/12/2016

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52c	Patrick A.	Taylor	Space Rock Blaster, Planet Defender, Group Lead for Planetary Radar Arecibo Observatory	In Section 4.7.1.1, the document notes that Arecibo can only see roughly 30% of the sky. However, this limitation does not mean a minority of asteroids is visible from Arecibo. On the contrary, because asteroids are moving targets, they move in and out of Arecibo's field of view as they pass by Earth. In fact, an internal NASA study led by Dr. Jon D. Giorgini of the Jet Propulsion Laboratory submitted as a white paper to the Vision and Voyages planetary science decadal survey found that Arecibo could detect more than 80% of potentially hazardous asteroids before they impact Earth. The draft EIS document's implication that Arecibo is inefficient at detecting asteroids is false. The natural motion of asteroids combined with the unmatched sensitivity of the planetary radar system allows Arecibo to characterize dozens of potentially hazardous asteroids per year and dozens more that could cause destructive airbursts if they were to collide with Earth, e.g., the airburst over Chelyabinsk, Russia in 2013 that caused nearly 1500 injuries and damaged thousands of buildings. Removing the Arecibo planetary radar capability, leaving only the Goldstone Solar System Radar, would reduce the number of radar detected and characterized asteroids to roughly 30% of its current value. No facility can replace Arecibo in this respect.	Resource Considerations for Document Analysis	Safety	Email	12/12/2016
52d	Patrick A.	Taylor	Space Rock Blaster, Planet Defender, Group Lead for Planetary Radar Arecibo Observatory	Though mature impact mitigation technologies have not yet been demonstrated (the accuracy of the Arecibo planetary radar system will be vital for validating these technological demonstrations), this does not preclude identifying potential impact hazards, determining when and where they will impact, and characterizing their physical properties prior to impact, for all of which radar is a uniquely powerful technique. On the national level, NASA and the Federal Emergency Management Agency regularly play out mock impact scenarios and work to optimize disaster response, most recently on October 25 of this year: http://www.jpl.nasa.gov/news/news.php?feature=6669 . On the international level, the Space Missions Planning Advisory Group, Impact Disaster Planning Advisory Group, and the International Asteroid Warning Network, all sanctioned by the United Nations, consider such impact scenarios and are working to determine the appropriate response to an imminent threat. The risk to public safety from an asteroid impact is taken very seriously on a national and international level, while it is dismissed as "negligible" in this document. The fact that an impact cannot necessarily be prevented does not mean we should not do our best to determine as much as possible about the asteroid prior to an imminent impact to properly protect the safety of the public.	Against Closure/ Reasons Why	Not Applicable	Email	12/12/2016
52e	Patrick A.	Taylor	Space Rock Blaster, Planet Defender, Group Lead for Planetary Radar Arecibo Observatory	The document concentrates unnecessarily on an imminent, inevitable impact threat. Part of the Arecibo planetary radar system's power is to extend predictions of an asteroid's location decades or centuries into the future to determine potential long-term hazards to Earth such that there is ample time to plan necessary impact mitigation strategies (see the cases of asteroids 99942 Apophis and 101955 Bennu). The comparison of predicted impact frequencies to the lifetime of the observatory is irrelevant and misleading and should be removed.	Resource Considerations for Document Analysis	Safety	Email	12/12/2016
52f	Patrick A.	Taylor	Space Rock Blaster, Planet Defender, Group Lead for Planetary Radar Arecibo Observatory	I'm commenting on Section 4.7.1.1, "Operations under Alternative 1," the Agency-preferred Alternative. The proposed deconstruction of the power supply building would result on the loss of at least 4 million dollars, a potential support from NASA, and would be an absurd action to take as part of a science-focused future for the Observatory.	Against Closure/ Alternatives Considered	Alternatives	Commenter provided these comments at the 11-16-2016:15pm public meeting	11/16/2016
52g	Patrick A.	Taylor	Space Rock Blaster, Planet Defender, Group Lead for Planetary Radar Arecibo Observatory	Weighting the frequency of impacts against the lifetime of an observatory is completely irrelevant and only serves to obtain the desired result of a negligible effect on public.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016:15pm public meeting	11/16/2016
52h	Patrick A.	Taylor	Space Rock Blaster, Planet Defender, Group Lead for Planetary Radar Arecibo Observatory	Finally dismissing the threat of an asteroid impact because we lack an available deflection strategy is comparable to choosing to not study infectious disease because we do not have yet the vaccines. It's incredibly naïve and short-sighted	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016:15pm public meeting	11/16/2016
53	Raul	Rios		My name is Raul and I am writing to express my concern for the future of the Arecibo Observatory in the hopes that you will reconsider your funding distribution and help save this wonderful installation. I must admit that I have not seen the observatory in person or done any work there, but I had the privilege to learn about the Arecibo Observatory from a coworker who interned there in 2014. The enthusiasm she has regarding her experience at the observatory manifests itself in her eagerness to speak about her work and	Against Closure/ Reasons Why	Not Applicable	Email	12/12/2016

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				<p>the sheer awe that descriptions of the site inspires. After several engaging discussions and even listening to a formal presentation about the important science being done at Arecibo, I must say I am dismayed to hear there is a chance it may be shut down.</p> <p>The Arecibo Observatory provides an immeasurable opportunity for undergraduate students in furthering their research and career, allowing them to work with leading scientists at a location that hosts the largest single dish telescope, a unique environment that cannot be found elsewhere in the world. In addition to the educational opportunities, Arecibo Observatory also contributes greatly to three different areas of research: ionosphere research, radio astronomy research, and asteroid research. During my coworker's internship, the observatory detected pulsar stars for the very first time, an invaluable contribution to the scientific community. Furthermore, countless countries have used this single dish telescope; have come specifically to Arecibo Observatory to make use of its unique, one of a kind environment. Closing the observatory will be a terrible loss to the community at large. Please reconsider and help save Arecibo Observatory.</p>				
54a	Joanna	Rankin	ASAP Secretary	We are writing to address concerns regarding the draft Arecibo Observatory (AO) Environmental Impact Statement (EIS), considering three categories: socioeconomic and educational impacts, physical Earth environmental impacts, and impact on larger US scientific infrastructure network. Below, we address these three categories, with parenthetical references to their relevant EIS sections. In addition, we share an overarching question, given these concerns	Against Closure/ Reasons Why	Background	Letter	12/12/2016
54b	Joanna	Rankin	ASAP Secretary	Why was the no-action alternative (ES 4.6) not considered? How can this not be preferred from the point of view of minimizing environmental impact since other alternatives all come with negatives and few, if any, positives?	Resource Considerations for Document Analysis	Biological	Letter	12/12/2016
54c	Joanna	Rankin	ASAP Secretary	<p>Socioeconomic and Educational Impacts:</p> <ul style="list-style-type: none"> Broader impacts on education and other socioeconomic factors are highly understated in draft EIS, and neglect underserved communities on and off Puerto Rico that use the facility and are educated there. 	Against Closure/ Reasons Why	Not Applicable	Letter	12/12/2016
54d	Joanna	Rankin	ASAP Secretary	<p>Arecibo does excellent science and educational development in the United States, directly benefiting a large Hispanic population both in PR and in the continental US.</p> <ul style="list-style-type: none"> Impacts on students, postdocs, and young scientists (as well as more established scientists) in the rest of the US were not adequately addressed. Local socioeconomic impacts were considered, but not the impacts on the global community of astronomers and physicists that use AO. Changes in operation will have major adverse effects on users spread across the United States, many of whom are students and early career scientists who rely on AO for their scientific careers. 	Against Closure/ Reasons Why	Not Applicable	Letter	12/12/2016
54e	Joanna	Rankin	ASAP Secretary	<ul style="list-style-type: none"> Many AO users and students trained at the facility are members of URMs and/or study at MSIs, and the role of AO as a Hispanic-serving educational institution is completely neglected in the draft EIS. 	Against Closure/ Reasons Why	Environmental Justice	Letter	12/12/2016
54f	Joanna	Rankin	ASAP Secretary	<p>Environmental Impact:</p> <p>ES 4.6 (no-action alternative) seems to have the lowest environmental impact, yet seems not to be under serious consideration.</p> <ul style="list-style-type: none"> The Arecibo planetary radar is the most sensitive and accurate instrument for assessing impact hazards: ignorance regarding the orbits of potentially hazardous asteroids represent a primary human environmental safety concern, as evidenced by a US congressional mandate, and this is grossly understated in the draft EIS. 	Against Closure/ Reasons Why	Not Applicable	Letter	12/12/2016
54g	Joanna	Rankin	ASAP Secretary	<p>The environment under the AO dish is unique (as addressed in 3.1.1 regarding endangered, threatened, or vulnerable plant species) and deserves its own studies. It is different and distinct from that assessed in the Rio Abajo Commonwealth Forest ecosystem report. Though the draft states "The karst forest region harbors the richest biodiversity in Puerto Rico and includes more than 1,300 species of plants and animals," most of the environmental impact (3.1.1) is assessed via the Rio Abajo Commonwealth Forest ecosystem report, which is ten years old.</p> <ul style="list-style-type: none"> Revegetation is addressed in the draft, but not potential conflicts between existing native species that have adapted to the environment under the dish, and reintroduced species (ES 4.4) 	Against Closure/ Reasons Why	Not Applicable	Letter	12/12/2016

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54h	Joanna	Rankin	ASAP Secretary	The draft EIS fails to address the secondary environmental effects of the deconstruction process itself, with heavy truck traffic on narrow local roads, and the associated effects on air quality and road maintenance. (1.6) ES 4.1 should address the impact on public safety of the deconstruction of 26 buildings and the associated removal of heavy materials via small roads. Road bed and road surface testing is needed to see whether the roads can still withstand such heavy loads between site and landfill and whether this meets federal requirements for public safety.	Resource Considerations for Document Analysis	Safety	Letter	12/12/2016
54i	Joanna	Rankin	ASAP Secretary	<ul style="list-style-type: none"> Similarly, the impacts of the use of hazardous materials (explosives) in deconstruction are not adequately addressed with regard to water and vegetation. 	Against Closure/ Reasons Why	Hazardous Materials	Letter	12/12/2016
54j	Joanna	Rankin	ASAP Secretary	<p>Objections/Questions regarding the Draft Arecibo EIS 3</p> <p>Scientific Infrastructure Impact:</p> <p>A major oversight in the draft EIS is not addressing the congressional mandate to NASA to characterize hazardous near-Earth objects (NEOs). It is not scientifically justified to use the term negligible in the statement: "Negligible, adverse, and long-term impacts to public safety could occur during operations, primarily resulting from the reduced capability to observe potentially hazardous near- Earth objects (PHOs)."</p>	Resource Considerations for Document Analysis	Safety	Letter	12/12/2016
54k	Joanna	Rankin	ASAP Secretary	<p>Section 2.3.1 states "All infrastructure related to the 12-meter and 305-meter telescopes would be maintained," yet this is inconsistent with the targeting of several critical buildings, facilities, and systems for deconstruction. The draft EIS deconstruction plan is a serious mismatch with established scientific priorities of fundamental physics and the NASA NEO mandate.</p> <ul style="list-style-type: none"> NASA is still willing to support the near-Earth asteroid radar program as part of its mandate, but the deconstruction list includes the S-band high voltage power supply which means that the radar system would be inoperable. It also demolishes the Administration building which houses all the scientific staff and library. How can AO find partners for operation when this crucial capability is slated for removal? Where will staff work if the Administration building is removed? 	Against Closure/ Alternatives Considered	Alternatives	Letter	12/12/2016
54l	Joanna	Rankin	ASAP Secretary	The draft places AO among "facilities which have a lower scientific impact," though NSF reviews provide a conflicting picture of the impact on/of AO without explicitly evaluating this claim. Specifically, the 2012 Astronomical Sciences Portfolio Review prioritized Arecibo (Recommendation 10.3): Our recommended portfolio includes ALMA, ATST, VLA, Gemini, Blanco, DST, Arecibo, NISP, and SOAR."	Against Closure/ Reasons Why	Not Applicable	Letter	12/12/2016
54m	Joanna	Rankin	ASAP Secretary	<ul style="list-style-type: none"> Gravitational wave science and fundamental physics have been identified as areas of high priority by NSF and the astronomy and physics communities, and AO makes critical contributions in these areas. 	Against Closure/ Reasons Why	Not Applicable	Letter	12/12/2016
54n	Joanna	Rankin	ASAP Secretary	<ul style="list-style-type: none"> Potential impacts are not being evaluated in the larger context of the potential for NSF to alter operations at its other large single dish radio observatory — the Green Bank Telescope. Because AO and GBT are used in a complimentary fashion by a similar user community for high-impact science, changes in operation of one affect the other. These changes cannot be evaluated in isolation. 	Against Closure/ Reasons Why	Not Applicable	Letter	12/12/2016
55a	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	The Arecibo Observatory has been a critical scientific site for over 35 years, performing cutting edge research in the areas of radio astronomy, space and atmospheric sciences and planetary sciences. It currently plays a vital role in the study of potentially hazardous asteroids, studying space weather (solar flares) and enabling discoveries that help humanity better understand the Universe.	Against Closure/ Reasons Why	Not Applicable	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55b	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	It is also a key facility for science, technology, engineering and mathematics education; hosting over 90,000 visitors every year, the majority of which are minority students local to Puerto Rico.	Against Closure/ Reasons Why	Not Applicable	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55c	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	It has been clearly communicated by NSF that severe internal financial pressure is driving the agency to reduce funding for various large facilities, Arecibo being one of them. While we may disagree on the need to divest in Arecibo based on the uniqueness of the site and the remarkable scientific and educational accomplishments; we have been focused on helping NSF find suitable solutions that will provide long term financial stability for the Arecibo Site and today we reiterate our commitment in providing that support. In the published DEIS, NSF identified "	Against Closure/ Reasons Why	Not Applicable	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016

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55d	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	Alternative 1 – Collaboration with Interested Parties for Continued Science-focused Operations” as the Agency-preferred Alternative.	Background	Not Applicable	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55e	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	The AMT is optimistic about NSF wanting to continue science focused operations at the Arecibo Observatory, however, we are concerned by the details behind NSF’s proposed alternative, in particular the deconstruction of over 26 buildings at the site and the implied elimination of the planetary radar and the space and atmospheric science capabilities at Arecibo	Against Closure/ Alternatives Considered	Alternatives	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55f	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	The DEIS states and I quote that Alternative 1, “would meet the purpose and need of reducing the funding required from NSF”. However, nowhere in the document has this financial analysis been presented nor has it been clearly communicated why or how the deconstruction of critical elements of the observatory is of financial benefit to NSF. It certainly did not come from the AMT. A rationale for how and why these specific buildings were selected for deconstruction should also be included.	Against Closure/ Alternatives Considered	Alternatives	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55g	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	A thorough financial analysis outlining the exact maintenance and operational costs for each of the buildings also needs to be performed and included in the document as data	Resource Considerations for Document Analysis	Socioeconomics	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55h	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	It is also puzzling, that while NSF wants interested parties to collaborate and financially support the Arecibo Observatory, NSF proposes the elimination of the very elements that differentiate Arecibo from other sites around the World – the Radar and space weather capabilities. To provide an example: more than 10 million NSF dollars have been spent over the past 10 years in the development and commissioning of a heating facility in support of space and atmospheric sciences. Yet, under the DEIS, NSF recommends its deconstruction. The heating facility was explicitly requested by the scientific community, has potential to become revenue-generating and just commissioned less than 3 weeks ago. Similarly, approximately 1/3 of the current operating budget for Arecibo is provided by NASA, solely for the use of the planetary radar capabilities and the studies of Near Earth Objects. This is another unique equipment which is being deconstructed under alternative 1. The following quote talks about the role of studying NEO’S as a public health resource.	Against Closure/ Alternatives Considered	Alternatives	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55i	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	“This improved characterization and tracking has an impact on public safety only if there is a means of deflecting or disrupting objects on a collision course with Earth, which would be completely independent of Arecibo Observatory. The U.S. Government does not currently have such a capability.” This logic is similar to saying that the human race should stop studying the disease of cancer, because we have no way to cure it, that we should stop looking for other galaxies, because we have no way to reach them. It is the very essence or research to dive into the unknown, to accomplish what had never been accomplished before, in order to make our World a better one.	Resource Considerations for Document Analysis	Safety	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55j	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	We reiterate our support for all three scientific areas: planetary sciences, radio astronomy and space and atmospheric sciences to continue operations at the site.	Against Closure/ Reasons Why	Background	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55k	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	We believe these capabilities make Arecibo more marketable and better prepared for a future with reduced NSF funding. We will continue to collaborate with NSF as much as possible in an effort to ensure the future of the Arecibo Observatory and to maintain the prestige and recognition this institution has held for over 50 years.	Against Closure/ Reasons Why	Background	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016

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55l	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	<p>We also request the following:</p> <ul style="list-style-type: none"> A complete archeological site survey be performed as part of the official EIS process. This will ensure no critical historic archaeological artifacts are on the site (or in the general vicinity). No facts or data were provided to specify why this was omitted from the DEIS. Understand this is also a requirement of Section 106 of the National Historic Preservation Act. 	Resource Considerations for Document Analysis	Cultural Resources	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55m	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	<ul style="list-style-type: none"> We request a revision to the socioeconomic impact associated with alternatives 2-5 of the DEIS. We believe the number of jobs that would be lost are different than what is presented on the report. We request a revision to the socioeconomic impact associated with alternative 1 of the DEIS. As it is currently written, alternative 1 would result in significant reduction in scientific and maintenance staff as the number of staff required only to support radio astronomy observations ONLY, would be dramatically different from the current staff that also support radar and space weather activities. 	Resource Considerations for Document Analysis	Socioeconomics	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55n	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	<ul style="list-style-type: none"> A set of site upgrades should also be considered as part of the DEIS process, and not only deconstruction activities. The following are feasible upgrades that have been informally discussed with clients in the past: <ul style="list-style-type: none"> Expanding the size of the dish to add 30 ft in diameter to increase the effective area of the dish Expansion of at least 75 ft of the north east quadrant of the dish to enable geo belt surveys as well as to observe at the galactic center. 	Against Closure/ Alternatives Considered	Alternatives	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55o	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	<ul style="list-style-type: none"> We request a delay of the EIS process, until the National Academies of Sciences have completed their evaluation of the Portfolio Review. Until then, confirmation of the validity of the portfolio review is still in question, and the recommendations provided in that review should not be implemented or followed. 	Procedural	Procedural	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55p	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	<ul style="list-style-type: none"> We request a revision to the cost estimates associated with the deconstruction of the site to be performed by a different contractor than the one who provided the current set of estimates included in the DEIS. The deconstruction costs are radically different from those that have been presented in the past. We recommend multiple local construction companies familiar with the structure and the terrain to provide input for this. 	Resource Considerations for Document Analysis	Socioeconomics	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55q	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	<p>Comments associated with Section 106 – National Historic Preservation Act</p> <ul style="list-style-type: none"> Pursuant to Section 106 of the historic preservation act, we request that Arecibo be treated as a National Landmark, not just as a district within the national registry, since a submission for the Arecibo site has already been performed in 1989 for its consideration as a national landmark by Harry A. Butminsky of the National Park Services. A separate note to the Advisory Council on Historic Preservation Office of Federal Agency Programs will be sent making this request as well. 	Resource Considerations for Document Analysis	Cultural Resources	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55r	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	<ul style="list-style-type: none"> The current mothballing process as it has been detailed in the DEIS does not comply with the State Historic Preservation Office Mothballing guidelines. We request that this section be revised to ensure compliance. After reviewing the guidelines, we believe it to be highly unlikely for the Arecibo Observatory to comply with such guidelines, for which this option should be completely eliminated from the process, and a new DEIS issued taking into consideration only the appropriate viable alternatives. 	Resource Considerations for Document Analysis	Cultural Resources	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55s	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	<ul style="list-style-type: none"> In accordance with Section 106, ample notification to the public shall be given to ensure participation in these public meetings/events. As it was noted at the meeting held on Thursday November 17th, 2016, very little participation from the general public was present, mainly due to the lack of notification provided to the public by NSF. We request that new public meetings be performed with at least 8 weeks’ notice to be clearly advertised in both Spanish and English in 3 local newspapers to Puerto Rico (both printed and electronic) as well as 3 national newspapers (both printed and electronic) in the United States. We believe this is critical not only to alert the local residents of Puerto Rico but the broader community in the United States, as the Arecibo Observatory is an international entity. This process should include a clear communication plan that also includes social media and printed media (flyers to be handed out in shopping malls across Puerto Rico). We also request that one of these events should be held on a Saturday or Sunday, to allow working residents of the Island to attend without 	Resource Considerations for Document Analysis	Cultural Resources	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016

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				impacting their current job responsibilities. Note that this also applies to the notifications for the Environmental Impact Statement and NEPA processes.				
55t	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	<ul style="list-style-type: none"> Public notification when simultaneously performing the NEPA and Section 106 processes needs to be performed in accordance with Section 106 of the National Historic Preservation Act. We are not aware that public notification stating the combination of these 2 processes has been performed, thus violating Section 106 of the National Historic Preservation Act. 	Resource Considerations for Document Analysis	Cultural Resources	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55u	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	<ul style="list-style-type: none"> Impact Boundaries of the Arecibo Observatory have not been clearly defined within the Section 106 process. We believe, that as an international research facility, these impact boundaries need to be extended at least to include the entire the Continental U.S. 	Resource Considerations for Document Analysis	Cultural Resources	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55v	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	<ul style="list-style-type: none"> In accordance with Section 110 of the National Historic Preservation Act we request NSF to provide the preservation program for the Arecibo Observatory before continuing with either the EIS process under NEPA or any process associated with Section 106 or 110 of the National Historic Preservation Act. This program should be approved by SHPO and reviewed by the consulting parties before continuing with the Section 106 or Section 110 processes. Section 110(a)(2) requires that agency preservation programs be established "in consultation with the Secretary." Federal agencies seeking such consultation should contact the Associate Director, Cultural Resource Stewardship and Partnerships, National Park Service, Department of the Interior, 1201 Eye St., NW, Washington, D.C. 20005. 	Resource Considerations for Document Analysis	Cultural Resources	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55w	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	We request that based on the volume and impact of these discrepancies/ inconsistencies, the currently published DEIS needs to be rendered inadequate. We request a new DEIS to be completed and published appropriately.	Procedural	Procedural	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55x	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	We also request a new meeting in accordance with Section 106 of the National Historic Preservation Act.	Resource Considerations for Document Analysis	Cultural Resources	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
55y	Francisco	Córdova	Director – Arecibo Observatory National Astronomy and Ionosphere Center SRI International	We also request these procedural tasks to be completed before a new solicitation process is initiated for continued operations of the Arecibo Observatory (this solicitation process was announced in the Dear Colleague Letter issued on September 30, 2016).	Procedural	Procedural	Email. Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15 am public meetings and the verbal comments are addressed with the written comments.	12/12/2016
56a	Robert	Steele	Shareholder Baker, Donelson, Bearman, Caldwell & Berkowitz, P.C.	<p>1. Recognized Environmental Conditions ("REC's") A key component of NSF's analyses and conclusions in the DEIS is an Environmental Baseline Study ("EBS") prepared by CH2M and dated December 2015. The EBS was performed following the model and requirements of a Phase I Environmental Site Assessment using the definitive ASTM Standard E 1527-13. The EBS presents valuable information about the Observatory property and its many structures, functions, history, campus, surrounding area, and environmental risks. Included are references to a number of prior environmental studies done at this site over the years and several cleanup activities undertaken there, such as removal of a solid waste debris pile (2007, with soil testing), dry wells closure (2005 and 2007, with soil testing), and removal of three petroleum underground storage tanks (2011, with testing). The EBS concludes that there are no REC's found at the Observatory as of 2015 despite historical and current factors noted including de minimis oil staining on the warehouse floor and parking areas.</p> <p>While there is an element of judgment exercised by Environmental Professionals ("EP's") when undertaking such site assessments, we believe that the "no-REC's" conclusion is incorrect in this situation. This is because CH2M also describes two areas of concern and suspect conditions on the property as follows (from the EBS Executive Summary/Conclusions):</p>	Resource Considerations for Document Analysis	Background	Letter. Specific points of Mr. Steels letter have been incorporated in the matrix. Please see the full letter for additional details.	12/12/2016

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				<p>"A 55-gallon capacity oil-water separator is associated with the tank farm [above ground petroleum storage] containment area. Stormwater that collects within the containment area is pumped to the oil-water separator and then discharges to the ground surface. Inspection/maintenance records of the oil-water separator were not available. With the oil-water separator being 50 years old, a possibility exists that it may have failed and impacted surrounding soils."</p> <p>"The septic and leach field system serving the maintenance area has the potential for concern. No maintenance records were available and the system has served facilities where hazardous and petroleum products have been stored and used for over 50 years. No visual evidence of contamination was observed during the site reconnaissance."</p> <p>The referenced oil-water separator's location, function, age, and lack of associated environmental data should lead a careful EP to conclude that this feature is a REC meriting further investigation. Also, even if groundwater at the Observatory is very deep, the prevalence of karst geologic formations, sinkholes, and steep slopes there leads to risk that any resulting contamination may impact groundwater resources and not just present a case of simple impacted soil removal.</p> <p>Some of the 13 septic tanks located around the Observatory campus were previously found to be unpermitted and subsequently permitted with the appropriate local governmental agency. Like the separator, however, the existence of septic tanks and a leach field system serving buildings and areas used for maintenance and for storage and handling of petroleum products, wastes, and hazardous chemicals for 50 years should be an automatic REC "red flag." This is more than a case of only domestic sewage waste finding its way underground. Instead this situation would lead most, if not all, EP's to conclude that a REC exists and that further investigation is warranted and necessary.</p>				
56a Cont.	Robert	Steele	Shareholder Baker, Donelson, Bearman, Caldwell & Berkowitz, P.C.	<p>The DEIS states that as a mitigation measure for potential hazards, full site characterization and remediation of contamination will be completed prior to deconstruction activities. (Section ES.6). Regardless of which NSF project alternative is favored in the DEIS, however, even continued full operation of the Observatory requires that such basic delineation of site environmental conditions be completed now. This is necessary for the sake of Observatory workers and visitors as well as for potential new operating partners and the surrounding natural environment. Checking the potential impact of these REC's should not just be pushed ahead and left for future action by NSF or possible new investors or other parties. Instead it should be addressed now in the DEIS in accordance with best approaches under NEPA and principles of "All Applicable Inquiry."</p> <p>As stated in the EBS, a REC under ASTM Standard E 1527-13 is defined and can be described as "the presence or likely presence of a hazardous substance or petroleum product on the property under conditions that indicate an existing release, a past release, or material threat of a release of hazardous substances or petroleum products into the structures of the property or into the ground, groundwater, or surface water of the property. The term includes hazardous substances or petroleum products even under conditions in compliance with applicable laws. The term is not intended to include de minimis conditions that generally do not present a material risk of harm to public health or the environment and that generally would not be subject to enforcement action if brought to the attention of the appropriate government agencies." Another ASTM standard for assessing federal property, D6008-96(14), notes that for an EBS in "certain cases, additional data, including sampling and analysis, may be needed in the EBS to support the classification of the property.</p> <p>NEPA regulations state that an EIS should focus on significant issues for a project and site and not on every possible environmental topic. See 40 CFR § 1500.1. Clearly the aged waste-receiving septic tanks and system at the Observatory maintenance area and the ancient fuel tank farm oil-water separator are REC's requiring further action now and not later. They are "significant" for purposes of the DEIS. Disposal practices at a facility such as this in the years before modern environmental rules, sensibilities, and training make contaminant releases into the septic system likely to have taken place over time. A Phase II investigation may also implicate notification requirements, and this should be determined at this time. Thus, we recommend that, prior to finalizing the DEIS:</p>	Resource Considerations for Document Analysis	Background	Letter. Specific points of Mr. Steels letter have been incorporated in the matrix. Please see the full letter for additional details.	12/12/2016
56a Cont.	Robert	Steele	Shareholder Baker, Donelson, Bearman, Caldwell & Berkowitz, P.C.	<p>A. NSF cause CH2M to update and revise the EBS not only to make it more current, but also to reach a more accurate "REC's-found" conclusion; this work should appear in a new DEIS.</p> <p>B. NSF cause CH2M to carry out a Phase II Environmental Site Assessment, with that investigation to include soil and groundwater sampling and possibly soil gas/vapor intrusion testing, at both of these REC locations.</p>	Resource Considerations for Document Analysis	Hazardous Materials	Letter. Specific points of Mr. Steels letter have been incorporated in the matrix. Please see the full letter for additional details. NSF to advise whether the oil-water separator and septic tank with leach field	12/12/2016

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				<p>C. Depending upon the results of the Phase II work, regardless of the differences among future alternatives considered, NSF should carry out necessary environmental response actions now; these steps could include removal and/or replacement of failed equipment, treatment or removal of impacted soil as needed from these locations, and other appropriate measures.</p> <p>D. NSF use these actions and additional environmental information to strengthen and complete the EIS and resulting Record of Decision ("ROD") on which later NSF decision making will be based.</p>			<p>system should be considered RECs and if a Phase II investigation is necessary at this time.</p>	
56b	Robert	Steele	Shareholder Baker, Donelson, Bearman, Caldwell & Berkowitz, P.C.	<p>2. Asbestos and Lead-Based Paint. Many of the buildings and structures that make up the Observatory are of an age and construction that make them rife with asbestos-containing materials ("ACM") and other hazardous components. The EBS refers to a 2005 site study by a contractor that found ACM in buildings 1, 2, 3, 4, 6, and 17, and another 2007 study that found lead-based paint ("LBP") in many of the same and additional buildings and structures. Further details about ACM and LBP locations and descriptions appear in the EBS and DEIS. No records indicate any ACM or LBP abatement done in the past at the Observatory other than some area re-paintings. Also there appears to be no discussion in the DEIS of any ACM Operation and Maintenance ("O&M") plans existing there now to manage asbestos in place and protect human health from exposure to friable asbestos fibers. An O&M plan is required even when the law does not mandate removal of ACM from occupied structures. Every project alternative for the Observatory studied by NSF in the DEIS involves significant destruction and demolition of buildings, except for the No-Action option and to some degree the Alternative 3 Mothballing. In each case the DEIS notes that updated and specific ACM surveys must be done before deconstruction occurs at any building under any option selected. For ACM found and to be disturbed, abatement must be accomplished first in order to protect health and the environment and to comply with applicable laws and rules of the Environmental Protection Agency ("EPA"), the Occupational Safety and Health Administration ("OSHA"), and their Puerto Rican counterparts. See, e.g., 29 CFR § 1926.62. However, even for buildings that would remain on-site under mothballed conditions or in continued use under the 1, 2, and No-Action Alternatives, information is still needed as to current ACM and LBP conditions and ongoing potential exposures or releases. Thus, determination of friable material locations/deterioration/repairs/management should receive more attention in the impact assessment process now. Finally, disposal of ACM and LBP wastes is discussed in the DEIS by simply noting that Ponce Landfill - operated by Republic Services and located some 39 miles by road route from the Observatory - has the capacity to take all of the potential ACM/LBP waste generated by any alternative of this project. That permitted landfill is authorized to accept such special waste in addition to ordinary debris and solid waste, but the DEIS does not mention what waste analysis is required for disposal. Section 4.6 of the DEIS then presents estimates, based on those prior studies, of quantities of ACM and LBP waste to be generated by deconstruction under each of the analyzed alternatives. For example, metric tons of ACM abatement waste are thought to range from 0 under the Mothballing and No-Actions plans up to 260 for Alternatives 4 and 5 involving partial or complete destruction. Similarly, LBP waste produced could vary from 0 to 80 metric tons under these alternatives.</p>	Background	Hazardous Materials	<p>Letter. Specific points of Mr. Steels letter have been incorporated in the matrix. Please see the full letter for additional details.</p>	12/12/2016
56b Cont.	Robert	Steele	Shareholder Baker, Donelson, Bearman, Caldwell & Berkowitz, P.C.	<p>We believe, however, that the prior surveys were insufficient and incomplete and that true costs, amounts, and potential impacts from ACM and LBP at this facility should be adequately addressed in the DEIS now and not saved for later determination. As with certain other points, for the moment NSF postpones or "kicks down the road" the full investigation and delineation of ACM conditions until after the EIS process is completed and choices are made. Could the ACM work needed here be vastly more burdensome and costly than seems to be estimated now? Potential associated risks are also ignored or given short shrift in the DEIS when it comes to NSF's likely creation of huge quantities of construction and demolition waste, to include ACM and LBP, which are slated for off-site disposal. Such additional questions, beyond just managing expected short-term heavy truck traffic, include: are there ACM exposure risks to residents and others along the expected route of waste truck traffic from the Observatory to Ponce Landfill? Does Ponce Landfill require waste characterization first, and how may that change any work time estimates stated in the DEIS? What are the true expected costs attributable to ACM assessment and abatement to be incurred under all of the Alternatives for this project? What ACM exposure conditions do current and future workers at the Observatory face under the alternatives that allow for continued facility operation, including any friable ACM conditions seen now at specific locations and the existence and implementation (or not) of required O&M plans on-site? Asbestos being a defined "hazardous substance" under the federal Superfund law, 42 U.S.C. § 9601 et seq., what risks are posed to NSF (or a future partner) from becoming the "arranger for disposal" of large quantities of ACM to Ponce Landfill should that facility suffer releases and become a Superfund site - with NSF as one of the no-fault "potentially responsible parties" perhaps jointly and</p>	Background	Hazardous Materials	<p>Letter. Specific points of Mr. Steels letter have been incorporated in the matrix. Please see the full letter for additional details.</p>	12/12/2016

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				<p>severally liable for the entire site? What potential on-site releases of ACM and LBP may still occur in the future into the water and soil of the Observatory itself from the Mothballing/minimum maintenance alternative? One need only look to military base closings to realize the need for additional consideration now, up front in the DEIS, for many of these potential ACM-related risks, costs, and impacts. Thus, we recommend that, prior to finalizing the DEIS:</p> <p>A. NSF cause CH2M or another qualified contractor to perform an updated thorough asbestos assessment and survey now of all buildings at the Observatory, whether they may remain or may be removed later, with no gaps for inaccessible units; this would include a discussion of current potential human exposure conditions and protective measures that are regularly taken, if any; this work should appear in a new draft DEIS.</p> <p>B. NSF prepare revised estimates of quantities and costs attributable to ACM presence and abatement under the Alternatives considered, create and implement any missing current O&M plans, and address the environmental risk from leaving ACM and LBP in place throughout much of the facility under minimal maintenance in the Mothballing scenario.</p> <p>C. NSF prepare an analysis of Superfund liability risk to itself and others resulting from all of the scenarios that involve any deconstruction and off-site ACM waste disposal, including the status, history, and financial assurance situation at Ponce Landfill.</p>				
56c	Robert	Steele	ShareholderBaker, Donelson, Bearman, Caldwell & Berkowitz, P.C.	<p>3. Site Demolition and Removal CostClosing the Observatory would be a devastating blow to the people of Arecibo and of Puerto Rico as a whole, as well as to scientific communities and interests in many places around the world. These points are detailed in numerous comments submitted before and during this DEIS process. The various project alternatives will also have other environmental impacts such as those analyzed in the DEIS and beyond. But the full deconstruction and site restoration alternative could also have a major effect on the NSF budget as we believe that the total cost thereof stated in the DEIS at Section 49 and elsewhere has been badly underestimated. Certain associated time estimates, such as for revegetation of the entire site after deconstruction, also appear to be inaccurate as now stated in the DEIS. While neither partial nor complete deconstruction is a favored or chosen alternative of NSF under the DEIS, it is still important for the DEIS to be accurate when looking toward both its finalization and the important decisions to be made thereafter by NSF based on this document. We will not recount all of the steps and components for planning and field work and their aftermath under the deconstruction alternatives considered. However, the total cost that the DEIS presents for the Complete Destruction and Site Restoration Alternative appears to be \$18.7 million. A footnote records how this number assumes the use of explosives for demolition of the towers and rim wall during the removal of all improvements, and other methods would be substantially greater in cost. However, even with explosives use, the deconstruction cost is likely to be much greater than estimated in the DEIS. This view and our concern are based upon the existence of a prior Decommissioning Study undertaken for NSF by ECCi, dated January 2008 (not just the EBS done by ECCi in 2008). In that report the near-complete or complete demolition options detailed were estimated to cost \$79 million to \$89 million projected ahead to 2012. Those totals would now be even greater for 2017 and beyond. The alternative at that time, when use of explosives was included, produced a reduced cost estimate of approximately \$21 million looking ahead to 2012. That option also excluded the rim wall and supports, which are included now in the DEIS as perhaps the only structures on which explosives will be used. While the new DEIS cost estimates may seek to update the earlier study, it seems clear that the current 2017 removal project option should cost far greater than \$18.7 million. We believe that NSF did not sufficiently consider the existence, content, and conclusions of this prior work when analyzing the cost of full Observatory demolition and removal in the DEIS. More accurate discussion and quantification need to be added to the DEIS on this topic at this time to further support the conclusions reached, choices considered, and actions to be taken. Thus, we recommend that, prior to finalizing the DEIS: A. NSF revisit the demolition/removal/restoration cost estimation process and result, including reference to and consideration of the prior Decommissioning Study and any other essential or relevant current information and past data; this work should appear in a new DEIS. B. NSF should revise and update all such cost references to better support the alternatives that do not call for major or complete deconstruction, and to further disfavor those that do.</p>	Resource Considerations for Document Analysis	Socioeconomics	Letter. Specific points of Mr. Steels letter have been incorporated in the matrix. Please see the full letter for additional details.	12/12/2016

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56d	Robert	Steele	Shareholder Baker, Donelson, Bearman, Caldwell & Berkowitz, P.C.	<p>4. Endangered Species</p> <p>The DEIS contains information about federally listed endangered and threatened species that are possibly found in the area of the Observatory. Several confirmed species of interest present - including the local boa snake, the nests of several hawk species, and possibly certain ferns living in the shade of the radio dish - are discussed, and limited practices and mitigation plans are set out for addressing possible impacts to them from the alternatives studied. At points throughout the DEIS, NSF states that it is consulting with, continues to consult with, or plans in the future to consult with the United States Fish & Wildlife Service ("FWS") on species and impact issues raised by the Observatory alternatives.</p> <p>Despite the consultations and analysis to date, we believe the approach on species by NSF in the DEIS is flawed. The DEIS relies initially and heavily in Section 3.1.5 (Threatened and Endangered Species) and Section 3.16 (Migratory Birds) on the IPaC Trust Resources Report for identifying potential species and wildlife of concern in this region. This screening level report, however, is described by FWS as being for information purposes only and not to be used for analyzing project-level impacts. For projects that require FWS review or concurrence, a party is supposed to request an official species list from FWS either through the Regulatory Documents page of its website or directly otherwise.</p> <p>In this case, it appears that NSF has not requested an official species list from FWS. Thus NSF may be over-relying on a general starting point screening tool, after which normally a study, official list, and/or biological opinion would follow. The IPaC Trust Resources Report itself states that it is not to be used alone for planning for or analyzing specific project effects on species. Aside from the other referenced consultations described generally in the DEIS (along with information on several known/confirmed/observed forms of protected flora and fauna, for which certain mitigation techniques and measures are outlined), what else has NSF specifically done now to assure that no other such endangered species are actually to be encountered and impacted at Arecibo? What additional plans need to be made up front, instead of putting them off "down the road" into the future, in order to have fully analyzed this important area of environmental impact before selecting a chosen EIS alternative and then a ROD based thereon?</p> <p>A full biological assessment and biological opinion should take place now rather than later just before field work is undertaken in one way or another, to better understand site conditions and issues today and strengthen the NEPA process and NSF result. See 50 CFR Part 401.</p>	Resource Considerations for Document Analysis	Biological	Letter. Specific points of Mr. Steels letter have been incorporated in the matrix. Please see the full letter for additional details.	12/12/2016
56d Cont.	Robert	Steele	Shareholder Baker, Donelson, Bearman, Caldwell & Berkowitz, P.C.	<p>"A biological assessment shall evaluate the potential effects of the action on listed and proposed species and designated and proposed critical habitat and determine whether any such species or habitat is likely to be adversely affected by the action, and is used in determining whether formal consultation or a conference is necessary. ... The procedures of this section are required for Federal actions that are "major construction activities".... The biological assessment shall be completed before any contract for construction is entered into and before construction is begun. Id. at § 402.12.</p> <p>Almost all of the alternatives proposed and considered by NSF in the DEIS involve site actions with potential, or yet-unknown, species impacts. (The current plan also does not seem to call for a full-time biologist to be present on-site later during work, much less fill such gaps now.) Therefore, more needs to be done up front to assess these potential impacts and plan for their avoidance and/or mitigation in agency decision-making to come, and not to put off those next steps. Thus, we recommend that, prior to finalizing the DEIS:</p> <p>A. NSF request an official species list from FWS, if not done already, for more knowledge and assurance as to potentially impacted species in Arecibo (and possibly other parts of Puerto Rico as may be affected by off-site activities under these project alternatives); this work should appear in a new DEIS.</p> <p>B. NSF prepare or have prepared additional species assessments or biological opinions, under the consultation procedures of Section 7 of the Federal Endangered Species Act of 1973, 16 U.S.C. § 1536, or otherwise, including study in the unique environment beneath the 50+ year old radio dish; NSF should meet all other requirements and best practices in this area !!!!!. in order to better inform the overall process and results. See 40 CFR § 1508.27(9).</p>	Resource Considerations for Document Analysis	Biological	Letter. Specific points of Mr. Steels letter have been incorporated in the matrix. Please see the full letter for additional details.	
56e	Robert	Steele	Shareholder Baker, Donelson, Bearman, Caldwell & Berkowitz, P.C.	<p>5. Climate Change</p> <p>One of the most important environmental issues facing the world today is climate change. Much has been written on this topic in general and will not be repeated in this comment letter. However, in addition to excluding air quality, the DEIS excludes consideration of climate change because it is an area that does not have the potential for noticeable or measureable impacts under any of the considered alternatives</p>	Resource Considerations for Document Analysis	Climate Change	Letter. Specific points of Mr. Steels letter have been incorporated in the matrix. Please see the full letter for additional details.	12/12/2016

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				<p>(Sections ES.5 and 1.6). This threshold conclusion is based on the fact that the facility as currently operated produces few greenhouse gas emissions. Various alternatives will involve either short-term or long-term increases or decreases of diesel generator and vehicle uses and are considered to be relatively insignificant from an overall climate change perspective. Also as stated in the DEIS, despite the presence of manufacturing and utility operations in Puerto Rico, the location of the Observatory is relatively remote from an air pollution perspective. Moreover, its inland elevated setting "is such that impacts from climate change would not affect operations," as with a coastal facility having to adapt to rising sea levels, or changing atmospheric or temperature conditions interfering with the functioning of the Observatory.</p> <p>By contrast, we submit that a mere site-specific judgment by NSF in the DEIS as to the "insignificance" of the climate change issue is inadequate. Instead climate change must also be analyzed for the proposed NSF actions "in several contexts such as society as a whole (human, national)" as well as the "degree to which the effects on the quality of the human environment are likely to be highly controversial." See 40 § CFR 1508.27. Numerous challenges to projects, agencies, and EIS work are underway around the country demanding that a broader view be taken of potential indirect impacts of proposed actions on climate change (even if sometimes an agency may not have jurisdiction in a particular program when preparing an EIS for a private project receiving a federal permit). See "Enviros Fight DOE Approval of LNG Exports at DC Circ.," Law 360, December 1, 2016 (export terminal analyses arguably should have included climate change impact of new natural gas production enabled by new terminals if built); "Fish Hatchery Enviro Review Missing Climate Change Impact," Law 360, November 22, 2016 (environmental review by National Marine Fisheries Service held arbitrary and capricious for not considering effects of climate change on water use given best available regional science).</p> <p>The Arecibo DEIS falls short in this regard because NSF fails to investigate and analyze the role of the Observatory in ongoing climate research and study. How would the loss of this facility impact that work, and potentially human health and the environment, moving into the future? Certain comments on this topic received by NSF during the scoping process are not even minimally addressed in the DEIS.</p>				
56e Cont.	Robert	Steele	Shareholder Baker, Donelson, Bearman, Caldwell & Berkowitz, P.C.	<p>Even though the DEIS favors the option of some level of partnering and continued science operation of the Observatory, NSF still fails to take the long view of potential climate change impact. Instead, based solely on the local view, the DEIS excludes climate change as an insignificant issue in this case. The DEIS notes that many scientists will lose important work capabilities if the Observatory goes away; but in this respect, the loss of important climate change study capabilities could contribute to climate impacts on human health, safety, and the environment going forward. Future climate change preventative actions could be based upon work done at the Observatory along with, and even considering the existence of, numerous other methods, facilities, and scientists working to assess and document climate change. Finally, while the newly elected President of the United States is expected to cut back on certain climate actions and national commitments undertaken recently, most across the political spectrum should agree that more climate research and data are necessary to resolve remaining scientific uncertainties, refine models, and inform choices on the "hot button" topic of climate change. As stated before by another party, Arecibo is an irreplaceable national jewel with unique capabilities for studying the atmosphere and ionosphere.</p> <p>Even if this omission from the DEIS primarily relates to the multiple science-ending project alternatives not chosen by the DEIS, those options remain possible for selection in the ROD and in NSF actions thereafter which will be based upon many factors. If "a draft statement is so inadequate as to preclude meaningful analysis, the agency shall prepare and circulate a revised draft of the appropriate portion." 40 CFR § 1502.9(a). Thus, we recommend that, prior to finalizing the DEIS:</p> <p>A. NSF review, revise, and supplement the DEIS to address the issue of climate change and the potential impact from loss of this science facility and its atmospheric research capabilities on human health and the environment, beyond the limited view of only boilers, bulldozers, and trucks; this work should appear in a new DEIS.</p>	Resource Considerations for Document Analysis	Climate Change	Letter. Specific points of Mr. Steeles letter have been incorporated in the matrix. Please see the full letter for additional details.	12/12/2016
56f	Robert	Steele	Shareholder Baker, Donelson, Bearman, Caldwell & Berkowitz, P.C.	<p>6. Environmental Justice</p> <p>Another important issue, both substantively and as a "hot button" topic of the day, is "Environmental Justice." Executive Order 19898 and various authorities and policies giving rise to the need to consider Environmental Justice in federal actions are well-documented and discussed in the DEIS and elsewhere. Included in the DEIS is use of the EJ Screen tool appearing at Appendix 4.12-A. (Once again, this is a screening tool leading to additional consideration, analysis, and outreach rather than forming a basis for decision-making.) Considerable further information appears at Sections 4.9 and 4.12 of the DEIS among</p>	Resource Considerations for Document Analysis	Environmental Justice	Letter. Specific points of Mr. Steels letter have been incorporated in the matrix. Please see the full letter for additional details.	12/12/2016

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				<p>other segments. However, the conclusion reached by NSF in the DEIS is that there are no Environmental Justice concerns associated with any of the proposed actions and alternatives. This position essentially is based on the fact that since nearly all of the population of Arecibo (100%) and of Puerto Rico (99%) is minority (Hispanic), as well as low-income people forming a strong majority of the population both in Arecibo and in Puerto Rico, then there is no Environmental Justice issue because the proposed actions do not produce disproportionately high and adverse impacts to any minority and low-income populations. See DEIS sections ES.5 and 4.12.</p> <p>Once again we believe that NSF is taking too narrow a view of this issue because of its setting in Puerto Rico as an island Commonwealth of the United States. We believe that NSF should and must take a broader view and recognize the critical importance of Environmental Justice in this case. Otherwise almost no activity anywhere in Puerto Rico could ever be seen as arousing these concerns. (This advice is especially true given past disregard for the interests of Puerto Ricans by certain major federal actions taken and their cumulative impacts, such as abrupt accelerated closure of Roosevelt Roads Naval Station and Department of Defense activities with respect to Ramey Air Force Base and Vieques Island.) The Observatory is a cultural icon of Puerto Rico, a source of great local, ethnic, and territorial pride as well as a significant driver of employment, spending, tourism, income, and education there. Yet NSF states in the DEIS that there is no Environmental Justice impact, even upon facility closure, on cultural resources or socioeconomic resources because the impact will be borne equally among demographic groups and not disproportionately or solely by minority or low-income populations - even if those most negatively impacted are minorities in the larger sense and are already economically depressed.</p> <p>While localized environmental impacts may only reach a local population, the DEIS process includes many factors of a broader nature. There is substantial comment, testimony, and analysis already on the impact that loss of the Observatory would have on education including encouragement of Hispanics and children, not just confined to Puerto Rico. Hispanic students and teachers from elsewhere have taken part in the internship programs offered by this facility, producing more Hispanic physics graduates and inspiring Hispanic women in the field. As stated by one of many prior commenters: "The community of science in the U.S. needs programs like this reaching out to minorities, reaching out to women" (Appendix 58, p. 29). In addition, scientists and others all over the nation and the world, including non-minorities and non-low income persons and communities, are knowledgeable about and use this facility and will be impacted by NSF decisions on Arecibo even if not within physical range of local environmental factors except upon their visitation to the Observatory. This is especially true for all project options other than a preferred "keep-operating" alternative. But the disproportionate negatives of any action there will fall more greatly on minority and low-income persons than on everyone because the health and human impact area to be assessed overall should extend beyond just Arecibo and Puerto Rico.</p>				
56f Cont.	Robert	Steele	Shareholder Baker, Donelson, Bearman, Caldwell & Berkowitz, P.C.	<p>If the Observatory were instead located within downtown Detroit, or in the middle of the Navajo Nation, in both cases surrounded for many miles by minority and low-income populations being impacted by a proposed major federal facility deconstruction or closure, would this same Environmental Justice conclusion be reached by an agency in a DEIS? Would not the existence of non-minorities and higher income persons utilizing the facility from farther away be influential? Are the impacts to be considered solely environmental in nature if the DEIS process by rule extends beyond just environmental factors? Does the broader (including climate-related) human health risk created by the loss of this facility's research functions expand the affected populations beyond those only within a limited mileage radius of the Observatory, the local community, the trucking zones, and the waste disposal locations? Thus would not the extreme local impacts, even if primarily cultural and socioeconomic, be looked upon as further overburdening existing minority and low-income communities compared to all others impacted? Should NSF not favor or even err on the side of inclusion in this case? See, e.g., "FERC Ignored Pipeline's Impact on Minorities, DC Circ. Told," Law 360, December 9, 2016.</p> <p>In performing Environmental Justice analyses under NEPA, Federal agencies including NSF "should recognize the interrelated cultural, social, occupational, historical, or economic factors that may amplify the natural and physical environmental effects of the proposed agency action." Environmental Justice: Guidance Under the National Environmental Policy Act, Council on Environmental Quality, December 10, 1997 (p. 9). Assessors should not be locked into rigid formulas for determining affected communities and may exercise appropriate and reasonable judgment in considering appropriate comparison groups. See references to "disproportionately high and adverse human health effects" and other key determinations, id. at Appendix A; see also Technical Guidance for Assessing Environmental Justice in Regulatory Analysis, EPA,</p>	Resource Considerations for Document Analysis	Environmental Justice	Letter. Specific points of Mr. Steele's letter have been incorporated in the matrix. Please see the full letter for additional details.	12/12/2016

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				June 2016. While current guidance may recognize that regular uniform distribution of impacts may not indicate potential for disproportionate adverse impact, defining the affected environment under NEPA is also flexible and reasonably subjective and may vary for each resource topic analyzed in a DEIS. As stated by EPA also in 2016: "After considering unique conditions (e.g., ecological, aesthetic, historic, cultural, economic, social, or health) of the potentially affected minority populations and low-income populations, Agencies may wish to consider that the extent of the affected environment may also not be contiguous" (emphasis added). Promising Practices for EJ Methodologies in NEPA Reviews, EPA, March 2016 (p. 15).				
56f Cont.	Robert	Steele	Shareholder Baker, Donelson, Bearman, Caldwell & Berkowitz, P.C.	Furthermore, for Environmental Justice analyses, "agencies can benefit by being sensitive to situations where a large percentage of the residents is comprised of minority individuals.... A larger scale reference community (e.g., municipal, state, or regional) may be required under this circumstance to obtain results that accurately reflect the existence of a minority population in the geographic unit of analysis...." Id. at p. 21. We believe that social impacts, and indirect effects over time and farther removed in distance, may enter into the picture in cases such as this. Extraordinary circumstances and unique situations may also be considered. (Climate change, for example, may constitute a project issue that also disproportionately affects poor people's lives when looked at on a larger geographic scale.) Finally, EPA notes again that agencies "may wish to recognize that in instances where an impact from the proposed action initially appears to be identical to both the affected general population and the affected low-income populations, there may be inter-related ecological, aesthetic, historic, cultural, economic, social, or health factors that amplify the impact.... After consideration of factors that can amplify an impact to minority populations and low-income populations in the affected environment, an agency may determine the impact to be disproportionately high and adverse." Id. at p. 39.	Resource Considerations for Document Analysis	Environmental Justice	Letter. Specific points of Mr. Steels letter have been incorporated in the matrix. Please see the full letter for additional details.	
56f Cont.	Robert	Steele	Shareholder Baker, Donelson, Bearman, Caldwell & Berkowitz, P.C.	Additionally, aside from age and functional differences of NSF astronomic facilities, what are the demographics of people living near and impacted by the other similar NSF facilities that are competing with the Observatory for shrinking budget dollars and future priority status? How can this facility located in an "all-minority" and "nearly all poor" area of the United States be the one facing possible closure without Environmental Justice concerns found? A finding of Environmental Justice impacts in an EIS does not preclude a proposed Federal action from going forward. Nor does it necessarily compel a conclusion that a proposed action is environmentally unsatisfactory. However, it is critical for the DEIS to have fairly weighed all applicable considerations, and to propose measures to address them in light of the alternatives analyzed, since the ROD and final NSF decision-making will be based on the final EIS in large part. All alternatives other than the No-Action option and the favored Alternative 1 may well have greater detrimental permanent impacts, including health effects, on the local population and community, the larger Hispanic Commonwealth, Puerto Ricans living elsewhere in the United States, and Hispanics in general as compared to the populations living near other NSF facilities and the overall impacted American population and international scientific commw1ities. Others are affected by this matter, including non-Hispanics and non-poor, but to a lesser degree in comparison to the disproportionate minority and low-income human impacts. (Native Hawaiian group reactions to Mauna Kea facility plans may provide further tangential lessons in this regard.) Thus, we recommend that, prior to finalizing the DEIS: A. NSF revisit and revise/supplement its Environmental Justice analysis in this DEIS and exercise available flexibility to recognize unique circumstances that show that cessation or closure Alternatives here present significant Environmental Justice concerns; this should be addressed and this work should appear now in a new DEIS, and later it should be fully taken into account in final agency decision-making on the future of the Observatory.	Resource Considerations for Document Analysis	Environmental Justice	Letter. Specific points of Mr. Steels letter have been incorporated in the matrix. Please see the full letter for additional details.	12/12/2016
57	Robert	Minchin		It is clear that many of the mitigation measures mentioned in ES6 have the potential to substantially increase the cost and timescale of deconstruction. In order to properly inform decision making, the geophysical survey work would need to be undertaken before a final decision is made on deconstruction, not after deconstruction has been decided upon, and would need to be capable of identifying hidden karst features. The full EIS should include such a survey.	Resource Considerations for Document Analysis	Geology	Email	12/12/2016
58	Robert	Minchin		Section ES 4.2, discussing Alternative 2, states that "Operations after deconstruction would be comparable to current operations." As this alternative includes safe-abandoning the 305-m telescope, this is clearly untrue. The section goes on to state that "Deconstruction activities that could interfere with the experimental use of the 12-meter telescope and data collection would be coordinated with Observatory	Against Closure/ Alternatives Considered	Alternatives	Email	12/12/2016

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				staff to minimize the potential for disrupting scientific work.” As the scientific work for which the 12-m was funded is as a phase-reference antenna when doing VLBI observations with the 305-m telescope, this statement is completely incompatible with the idea of safe-abandoning the 305-m. This alternative also includes demolishing the Operations Building, which is needed for the operation and maintenance of the 12-m telescope. The analysis of Alternative 2 also includes the concept that 16 scientific researchers will continue to be employed at the Observatory, despite the demolition of their offices and the removal of the ability to do science with the 305-m telescope. This seems somewhat farfetched. The analysis of Alternative 2 should be re-visited, taking into account the above points.				
59	Robert	Minchin		If demolition is carried out on-site of buildings, such as Building 2, that have been identified in the Environmental Baseline Study as containing hazardous substances such as lead and asbestos, it will be necessary not only to engage in runoff control to prevent erosion but to trap water that may be contaminated with hazardous substances until it can be treated.	Resource Considerations for Document Analysis	Hazardous Materials	Email	12/12/2016
60	Barbara	Cohen	Private Citizen	I am writing to comment on the NSF EIS for Arecibo. I work as a Planetary Scientist but I am writing as a private citizen. I urge the NSF to choose to keep the Arecibo facility open and running. Arecibo is an important asset in its unique ability to image and determine trajectories of potentially threatening asteroids. This makes Arecibo the best tool for investigating Near Earth Objects and warning the world about possible asteroid threats. In addition, ionospheric radio wave propagation studies conducted at Arecibo form an important component of space technologies, from communications satellites to the Global Positioning System (GPS). I hope NSF will consider keeping Arecibo open. Thank you.	Against Closure/ Reasons Why	Not Applicable	Email	12/12/2016
61a	Robert	Minchin		The Executive Summary states, with respect to Alternative 1, that "Operations after deconstruction activities would be comparable to current operations". This is not compatible with the demolition proposed as a possibility in this Alternative. The buildings to be demolished include the S-band High Voltage Power Supply (necessary for S-band operations) and the HF Transmitter Building (necessary for HF operations), and other buildings essential for current operations as well as the Warehouse, which is essential for maintenance of the telescope. In this scenario (which I understand is the worst-case environmental impact within Alternative 1), operations after deconstruction activities would not be comparable to current operations. It should also be noted that the buildings used for the REU program and the scientific offices used by REU mentors are removed, so in this scenario there is a loss of this educational program. This is also not included in the 'worst case' analysis.	Against Closure/ Alternatives Considered	Alternatives	Email	12/12/2016
61b	Robert	Minchin		It should also be noted that the buildings used for the REU program and the scientific offices used by REU mentors are removed, so in this scenario there is a loss of this educational program. This is also not included in the 'worst case' analysis.	Resource Considerations for Document Analysis	Socioeconomics	Email	12/12/2016
61c	Robert	Minchin		Overall, the analysis of Alternative 1 fails to properly take into account the knock-on effects of the possible demolition of the buildings, and thus does not present the actual worst-case environmental impact for this Alternative. This analysis needs to be re-visited, taking into account the use of the various buildings proposed for demolition	Against Closure/ Alternatives Considered	Alternatives	Email	12/12/2016
61d	Robert	Minchin		what effect their removal would have on operations at the telescope, and the socio-economic impacts that therefore follow from the removal of these buildings.	Against Closure/ Reasons Why	Not Applicable	Email	12/12/2016
62a	Michael	Nolan	University of Arizona	The Draft Environmental Impact Statement seems to choose the structures to remain and to be deconstructed arbitrarily, possibly considering structure age but not use. It assumes removal of the "S-Band high Voltage Power Supply Building", which is needed for any work by NASA (which currently provides about 1/3 of the Observatory's funding), yet it retains the "750-kilowatt Emergency Generator Building" that is contains only a decommissioned Diesel generator. It removes the "Administration building", which provides all of the office space, without which "collaboration with interested parties" would be nearly impossible.	Against Closure/ Alternatives Considered	Alternatives	Email	12/12/2016
62b	Michael	Nolan	University of Arizona	The Draft Environmental Impact Statement states that explosives could cause damage to the karst terrain in a way such that "Impacts to underlying geology would be moderate, adverse, and long-term". As the karst system is protected under Puerto Rican law, such damage would be unacceptable. The large concrete structures on site are, by design and construction, well-coupled to the underlying terrain, so that it would be impossible to restrict explosive shocks to the structures without affecting the underlying karst terrain.	Resource Considerations for Document Analysis	Geology	Email	12/12/2016

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62c	Michael	Nolan	University of Arizona	The concept of converting the facility to an educational based facility is unrealistic. There might be some residual tourism for historical interest, but the facility is in a remote location, and access would only become more difficult. Educational activities are tied to the use of the 305-m telescope as a functioning scientific and engineering enterprise, in order to inspire young future scientists and engineers. There is no future and no inspiration in a non-operating facility.	Against Closure/ Reasons Why	Not Applicable	Email	12/12/2016
63	Robert	Minchin		The draft EIS states that "Minor, adverse, short-term impacts to traffic and transportation would be expected during deconstruction." However, the proposed route makes use of roads that are already falling away due to subsidence and which the local council does not have the money to repair. Unless the cost of making good the local roads during and after deconstruction is covered by the NSF, there are likely to be major, adverse, long-term impacts to transportation in the local area. This should be included in the cost analysis.	Resource Considerations for Document Analysis	Transportation	Email	12/12/2016
64	Eric	Briggs		For the second time in 30 days I am writing to ask NSF to help maintain continued operations at one of the United States' major radio observatories. I previously asked, "How often should we have to rebuild the previous generation's largest telescopes?" The obvious response is, "not often." Although I have not visited NAIC, I have visited Green Bank, and I am pretty clear on the challenges that had to be overcome to build both facilities. The new Chinese radio observatory seems larger than Arecibo, but I understand its spheroidal construction restricts its field of view at any one time to the same size as Arecibo. Arecibo is also closer to the equator and can scan a wider swath of sky. Most importantly, Arecibo is located inside the United States, in a part of the country that really needs the investment to be maintained. The radio observatory is the most interesting part of Puerto Rico for me. Please don't take that away. Please continue to fund Arecibo, or if you must, similar to the GBT, generate a new PPP that provides a sound independent funding rationale. It is imperative that all participants be comfortable in working as a coalition. The alternative is for American researchers studying potentially hazardous asteroids, pulsars, etc. to participate in the Chinese FAST telescope. Just this morning there was a glitch in the Vela Pulsar observed from a radio observatory in Australia, that probably indicates an enormous mass shift that would make a 10th magnitude earthquake look miniscule. That kind of study should be possible at an American observatory that is already built and paid for, and should not require future generations to reinvent the wheel. (http://www.astronomerstelegam.org/?read=9847)	Against Closure/ Reasons Why	Not Applicable	Email	12/12/2016
65a	Steve	Kraemer	Catholic University of America	In January 2016, I led a team of partner institutions that prepared a response to the NSF Dear Colleague Letter (NSF 16-005) inviting concepts for future operation of the Arecibo Observatory. An important element of our approach is to pursue opportunities to generate revenue for the Observatory in a broad-brush way that takes advantage of all existing resources and infrastructure.	Against Closure/ Alternatives Considered	Alternatives	Letter	12/12/2016
65b	Steve	Kraemer	Catholic University of America	Our team has reviewed the recent Draft Environmental Impact Statement (DEIS), which, alarmingly, makes specific recommendations about the disposition of buildings and other infrastructure at the observatory. It is our firm belief that those who are selected to manage and operate the site be allowed to make decisions on which buildings (if any) are to be removed. Our team is fully committed to helping the Observatory and NSF find viable solutions to the deficit in funding for facility management and operations.	Against Closure/ Alternatives Considered	Alternatives	Letter	12/12/2016
65c	Steve	Kraemer	Catholic University of America	However, we need to know that our proposed approach will be carefully and objectively considered by NSF should a solicitation be issued based on the DEIS. As of this date, we've received no feedback from NSF regarding our response to the DCL. Thus, we are wondering whether the approach described in our plan was considered in the development of the alternatives presented in the DEIS. I hope that you can provide guidance on this as our team continues to develop strategies to mitigate the impending reductions to Arecibo's budget.	Against Closure/ Alternatives Considered	Alternatives	Letter	12/12/2016
66	Ricardo Rey	Correa	Public Relations and Communications Officer	Attached in email is 72 written comment cards.	Against Closure/ Reasons Why	Not Applicable	Email	12/12/2016
67a	Agata	Rozek	School of Physical Science, University of Kent	As a user of the Arecibo Observatory I would like to express my concern about the possible decommissioning of the Planetary Radar at the Arecibo Observatory. The only alternative included in the Draft Environmental Impact Statement (DEIS) that allows continued operation of the facility is the No-Action Alternative. Closure of the Arecibo Planetary Radar would be a great loss for the scientific community worldwide and in long-term it might impair the planetary defence. I have used the Arecibo Observatory observations performed in January 2015 and January 2016 to construct a physical model of the asteroid 1999 JV6 (proposals R2959 and R3036). I have visited the	Against Closure/ Reasons Why	Not Applicable	Email	12/11/2016

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				<p>observatory for six weeks in January 2015 to cooperate on the detailed modelling of my object. The visit was an unique opportunity for me as a young researcher and helped me greatly to develop my PhD. I was impressed by the facilities, that included housing and office space in the proximity of the instrument, and felt incredibly lucky to be able to incorporate radar data into my project. The results of my work were presented at the Binaries in the Solar System workshop in Prague in June 2016</p> <p>A. Rozek, S. C. Lowry, M. C. Nolan, E. S. Howell, P.A. Taylor, L.A. M. Benner, A. Fitzsimmons, S. R. Duddy, T. Zegmott, P.R. Weissman, W. D. Smythe, M. D. Hicks, S. F. Green, B. Rozitis, C. Snodgrass, S. D. Wolters, J. E. Richardson, E. Rivera-Valentin, L. A. Rodriguez-Ford, L. F. Zanibrano Marin, M. Brozovic, S. P. Naidu, J. D. Giorgini, L. G. Snedeker, J. S. Jao, F. D. Ghigo</p> <p>Shape and spin-state modelling of the NEA (85990) 1999 JV6 from radar and optical observations (https://www.asu.cas.cz/-binaries/contents/abstracts/pdf/abstracts_0024.pdf)</p> <p>The physical modelling of 1999 JV6 also constitutes an important chapter of my PhD thesis and is intended for publication in a refereed journal. The asteroid investigated is one of the Potentially Hazardous Asteroids (PHA).</p>				
67b	Agata	Rozek	School of Physical Science, University of Kent	I strongly disagree with the statement put forward in the DEIS that the decommissioning of Planetary Radar would have a negligible long-term impact on public safety as there are no deflection mechanisms currently available. Detailed physical characterisation of PHAs, such as the subject of my study, is motivated partly by the purely scientific drive to understand the workings of the Solar System. However, it is also helpful in planning future spacecraft missions, for both research (understanding the space environment of Earth) and commercial (asteroid mining) purposes. Lastly, it is crucial in development of asteroid deflection mechanisms. It is impossible to plan and test out strategies to prevent asteroid impact with Earth without an in-depth knowledge about their properties that can be deduced by from astronomical observations. The extent of such characterization is seriously limited without radar data.	Against Closure/ Reasons Why	Not Applicable	Email	12/11/2016
67c	Agata	Rozek	School of Physical Science, University of Kent	The precise radar astrometry (measurement of orbital parameters) of 1999 JV6 was used by J. Giorgini et al to calculate that there is a force, other than gravity, acting on this body. A measurement that would not be possible without the radar data, even though this object had been regularly monitored with optical astrometry for over 16 years. (http://www.cbat.eps.harvard.edu/iau/cbet/004200/CBET004279.txt)	Against Closure/ Reasons Why	Background	Email	12/11/2016
67d	Agata	Rozek	School of Physical Science, University of Kent	Without radar astrometry it is essentially impossible to constrain the orbits of PHA to detect subtle forces (that have to be taken into account in planning asteroid deflection) or guarantee no impact risk for newly discovered objects. The Arecibo Observatory is one of only two facilities currently providing radar astrometry of PHA on regular basis (the second observatory, NASA JPL Goldstone Solar System Radar is a complementary facility rather than an alternative).	Against Closure/ Reasons Why	Not Applicable	Email	12/11/2016
67e	Agata	Rozek	School of Physical Science, University of Kent	I hope a solution can be found where the Arecibo Observatory observations would continue and include the important work done with the Planetary Radar. Appreciating the unique capabilities of the Radar, I have planned to include the observations it performs in my future research.	Against Closure/ Reasons Why	Not Applicable	Email	12/11/2016
68a	Leonid	Gurvits	Head of Space Science, Senior Astronomer, JIVE - Joint Institute for VLBI	It is hard to offer any original arguments in support to the Arecibo Observatory, different from those already expressed in known to me corporate and individual letters of support. Nevertheless, I would like to stress that in my opinion the fate of the Arecibo Observatory as reflected in the publicly available DEIS document of October 2016 does not represent the true value of the unique and fully operational scientific facility in Puerto Rico. Leaving aside the science legacy of the 305-m radio telescope of the past decades, I would like to refer to just two very recent (2012- 2016) top level achievements in Very Long Baseline Interferometry (VLBI) that have become feasible only due to the unbeatable sensitivity of the Arecibo radio telescope. One is the discovery of extremely high brightness temperature in the core of the quasar 3C 273 made on the Earth-Space interferometric baseline Arecibo RadioAstron that poses serious questions to the conventional models of radio emission of active galactic nuclei (Kovalev et al. 2016, ApJ 820 L9, Johnson et al. 2016, ApJ 820 L10). The other one, dealing with the first astrometric VLBI identification of a Fast Radio Burst event will be published in the most prestigious science journal in January 2017. These outstanding results have been achieved not least due to the dedication of the Arecibo-based staff. And it is this staff who will be denied very modest working conditions if the leading option of the DEIS document involving destruction of the observatory buildings is implemented. I note that the advent in 2016 of the Chinese Arecibo-like but larger radio telescope FAST only amplifies the future potential role of Arecibo in studies of	Against Closure/ Reasons Why	Not Applicable	Letter	12/11/2016

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				transient and fast radio burst phenomena: the two largest antennas in the world perfectly well complement each other helping to provide a larger sky coverage.				
68b	Leonid	Gurvits	Head of Space Science, Senior Astronomer, JIVE - Joint Institute for VLBI	As a staff member of the Arecibo Observatory in 1992-94, I am familiar with the site. Its infrastructure is simple and functional. It is hard to see how an external funding source would be attracted by the prospect of demolition of crucial site buildings, including, for example, the scientific and administrative staff offices.	Against Closure/ Alternatives Considered	Alternatives	Letter	12/11/2016
68c	Leonid	Gurvits	Head of Space Science, Senior Astronomer, JIVE - Joint Institute for VLBI	I do understand that the US national science budget is not limitless. Nevertheless, its optimization by means of drastic measures toward a highly efficient and fully functional world-class science facility will send a very wrong message to the young people locally in Puerto Rico as well as elsewhere in the US and beyond. I do not believe the scientific community and public at large are prepared to endorse this highly detrimental effect with generation-long consequences.	Against Closure/ Reasons Why	Not Applicable	Letter	12/11/2016
69	Teresa	Symons	Physics graduate student at Univeristy of Kansaa	I am a physics graduate student at the University of Kansas, and I am writing on behalf of Arecibo Observatory, to urge the National Science Foundation not to restrict funding or shut down any part of the site. Arecibo has played a large role in my education as a young scientist, and I would hate to see others denied the wonderful opportunity that I had. I grew up seeing Arecibo Observatory in the movie Contact and idolizing the scientists who worked there. While pursuing my B.S. in Space Physics, I was selected to participate in Arecibo's Research Experience for Undergraduates program. It was like a dream come true to get to do research at Arecibo. I even had the pleasure of visiting the platform and learning to operate the receiver. However, it was my research training at Arecibo that has been the greatest gift. My work at Arecibo was the first real chance I had to engage in an independent research project. Under the guidance of my mentors there, I learned how to analyze data and create a model. I even got to attend the CEDAR workshop while at my REU, and later presented my research at a major conference. It would be doing Arecibo Observatory a disservice to describe my experience as anything less than transformative. I realized that I could have a future as a research scientist, and have since become a graduate student about to defend my master's thesis. I am dismayed and alarmed that future generations of students may not have the opportunity that I did to learn to become a researcher in a truly unique environment. I felt honored to be able to learn in a place where so much important and groundbreaking work had been done. Now I fear that the department that I worked for may be shut down, my mentors may lose careers they have spent their lives on, or the entire site and all its significance as a historical and cultural icon may be closed to visitors and scientists alike. I urge the NSF to please consider all that stands to be lost by defunding or dismantling any portion of Arecibo Observatory, and all the future scientists that would lose the opportunity to be inspired, educated, and transformed by Arecibo as I was.	Against Closure/ Reasons Why	Not Applicable	Letter	12/14/2016
70a	Colin	Mussman		I am writing you just two weeks before my graduation ceremonies at Virginia Polytechnic Institute and State University (Virginia Tech), where I will graduate with a Bachelor of Science degree in Electrical Engineering. Because of my accomplishments and the unique educational opportunities I had over the last four years, especially the undergraduate research I did at the Arecibo Observatory, I have received and will accept an employment offer from the Naval Research Laboratory (NRL) in Washington, D.C. There I will continue and expand upon the work I completed this past summer with the Advanced Space Positioning, Navigation, and Timing group. At NRL, I will apply my education to applications of radio-frequency engineering and electromagnetics, to tackle the challenges presented by the development and implementation of a robust global navigation system. I also have plans to apply for graduate school next fall and work towards a Ph.D. in Electrical Engineering. My goal is to further my focus in the area of applied electromagnetics so that I may contribute to the extraordinary scientific achievements that are being made in astronomy, atmospheric science, and physics. None of this would be possible without the Research Experience for Undergraduates (REU) that I participated in at the Arecibo Observatory during the summer of 2015. Dana Whitlow, the observatory's microwave receiver specialist and my advisor - who would become a great mentor and friend - accepted me to the REU program. Dana wanted me to work with him on the design of a satellite ground station for the exclusive purpose of collecting data from passing small satellites. The ground station project presented numerous challenges, which I learned from, but in addition to those lessons Dana took the time to teach me about other engineering applications that one can really only learn "in the field," rather than in a classroom. Dana included me in a significant way on several of his projects that did not involve the ground station, and through this I gained much more knowledge about my chosen career field and education path than I would have gained merely through homework assignments. I'm sure that my friends who participated in the REU experience that same summer at the observatory can say the same about their own advisors and knowledge gained.	Against Closure/ Reasons Why	Not Applicable	Letter	12/1/2016

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70b	Colin	Mussman		In addition to gaining educational experience, I benefitted immeasurably in developing global connections and cultural experiences. Including myself, there were ten students participating in the REU, and aside from the two from Puerto Rico, not one of us was from the same place. This alone provided exposure to different ideas and ways of thinking about the scientific world. The opportunity to experience Puerto Rico with them during available free times was truly the opportunity of a lifetime. Together we experienced a different way of life, and were exposed to a culture that we rarely have the chance to engage with in the United States. First as citizens and secondly as scientists, I and the other REU participants certainly have been changed for the better by our REU experience.	Against Closure/ Reasons Why	Not Applicable		12/1/2016
70c	Colin	Mussman		Ms. Pentecost, I urge the National Science Foundation to not further cut funding or totally defund the Arecibo Observatory. My time there was short, but it had a life-changing effect on me and presented me with educational and career opportunities I could not have received otherwise. I would not be who I am today if it were not for the scientists and students I met, the lessons learned from the steady hands of a seasoned engineer, the experience of being immersed in a diverse Caribbean island culture, and simply the awe-inspiring sight of young future-scientists excitedly reading about the cosmos in the observatory's visitor center. I would not have had the confidence and experience to apply to a research position at one of our nation's top research laboratories. I would not be planning to pursue education beyond perhaps even a Bachelor's degree. I would be woefully ignorant of the science and people that have made the Arecibo Observatory so important over the last 53 years. I hope that, if anything, my small testimony will help convince you that if this facility can change one person's life in such a huge way, it surely has and will change the lives of many others	Against Closure/ Reasons Why	Not Applicable		12/1/2016
71a	Kristina	Kaldon		<p>I was fortunate enough to be selected for the summer 2014 Arecibo Observatory REU (Research Experience for Undergraduates) program. It was a life changing experience in which I really discovered what it meant to be a scientist. The employees and scientists at Arecibo Observatory are the most welcoming, intelligent, and passionate people I have ever met. They moved their lives to rural Puerto Rico for this telescope and the scientific advancements it promises. My current position at MIT Lincoln Laboratory is due largely to the work I did at Arecibo Observatory. I have never felt so tangibly close to the cosmos and future of astronomy and planetary science. It truly saddens me to think the future funding of Arecibo Observatory is even up for question. My dream career, ever since my first day at the observatory, is to end up working there. My experience, and the experiences of the others in the program, has led us all to more passionately and aggressively follow our hearts and reach for what we once thought was unreachable, especially in a scientific and educational sense. After working with concrete data and hardware, we take things seriously now knowing first-hand there is a future for all science. To think that future students, scientists, and the general public will not be able to visit and see the great things that come from this telescope is a national disgrace.</p> <p>The structure of classes and the way we learn at most universities is broken. Undergraduates need to gain hands-on experience and see how things work.</p> <p>We learn how to analyze but not where data come from or how it is collected or processed. At Arecibo Observatory, I learned how data are collected, how radars work, how signals are generated and received, how environmental aspects play a factor, why fast Fourier transforms matter, how one has to process signals, the equipment and manpower needed to process the signals and run the hardware, the preciseness of measurements and clocks, the cooling mechanisms needed for the machinery to work, how images are produced, how to code programs, how to break signals into different data streams, and so much more. Before my time at Arecibo Observatory, I only saw data in the form someone else had uploaded it, had one way to process it, and analyzed what I saw. After working at Arecibo Observatory, I see the beauty in how everything comes together to work; I realize how science is so much greater when you learn the engineering and hands-on aspects of data collection and when you can first-hand see how much work goes into collecting data. It means a lot to learn it in person; there are images in my head of the observatory that I will never forget. When I learn from doing, I remember so much more vividly than in a classroom. The fact the USA owns this masterpiece of science and could possibly let it go to waste is a silly idea that needs to be forgotten. This place is everything STEM in America needs to be and how to make our students the best. I have personally benefitted, watched other students benefit, watched Puerto Rican citizens smile and revel at the size of the dish at the visitors center, read blog posts of visiting scientists and how much they loved their time at the observatory, and personally boasted every chance I got. I have not spoken with one person who would say bad things about this observatory and the scientists and faculty that work there.</p>	Against Closure/ Reasons Why	Not Applicable	Letter	12/25/2016

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71b	Kristina	Kaldon		As a committee chair for the Hispanic Latino Network at work (a position I received as a non-Hispanic because of my general love of Puerto Rico due to my time there), I find Arecibo Observatory a great asset for Hispanic minority expansion in STEM. Puerto Ricans can come to the visitor center and see first-hand how groundbreaking science is happening in their backyards. This tangibility, along with the space academy program and REU, allows them to develop a passion for science and astronomy. This is so important because we see a lack of interest in STEM among minorities. I hope you all realize the severe impact this would have on continental US students, Puerto Rican students, scientists around the world, personal lives, and how we are viewed by the scientific community.	Against Closure/ Reasons Why	Not Applicable	Letter	12/25/2016
71c	Kristina	Kaldon		Research needs to mean more. We need more people exposed to it and we need to take a stand and find permanent methods of funding for this amazing observatory that I am proud to have called home	Against Closure/ Reasons Why	Not Applicable	Letter	12/25/2016
71d	Kristina	Kaldon		I strongly advocate for option one, where the observatory stays running the way it is and science-focused operations continue as before. This is the best option and allows all to benefit. In terms of future funding, issues may come up frequently again and I would not enjoy having to express how ridiculous it is that funding is an issue every year so I understand how this option might not be viable.	Against Closure/ Reasons Why	Not Applicable	Letter	12/25/2016
71e	Kristina	Kaldon		Option two is possibly realistic but should target Federally Funded Research and Development Centers (FFRDCs). I suggest checking with FFRDCs such as MIT Lincoln Laboratory as a potential source of funding. Line funding is used for internal research and development, which often involves outside collaborations. FFRDCs normally have funding like this available for science expansion programs, to which Arecibo Observatory sounds like a perfect candidate. Also, from a national security standpoint, I cannot see how we would even consider letting China have the capabilities of Arecibo Observatory while we decommission ours.	Against Closure/ Alternatives Considered	Alternatives	Letter	12/25/2016
71f	Kristina	Kaldon		The third option, transitioning to education-focused operations over research operations, is a horrible idea. The entirety of the observatory's status and educational value lies in the research. To cease research, everything I've already mentioned goes to hell: the experiences of students would be terrible and the experiences for scientists would be nonexistent.	Against Closure/ Alternatives Considered	Alternatives	Letter	12/25/2016
71g	Kristina	Kaldon		The fourth option, temporary suspension of operations, is a clear cop out. When can we foresee the scientific community getting so much extra funding that the observatory would be up and running again in a non-set time period? There would still be significant maintenance costs and if you chose to not maintain the dish, it would be useless in a few months. I don't see this as a feasible option at all: high costs with no return.	Against Closure/ Alternatives Considered	Alternatives	Letter	12/25/2016
71h	Kristina	Kaldon		Option five, is the most sickening but hopefully the least likely. Deconstruction would be expensive and stupid. Think of all the amazing things that have been discovered using this dish. Think of the life, both plants and animals, that has grown and lived here and how that destruction would affect the environment and ecosystem. Think of all the raw and organic side effects, all the science and education the observatory offers, the diversity, the wildlife, and the coquis!	Against Closure/ Alternatives Considered	Alternatives	Letter	12/25/2016
71i	Kristina	Kaldon		The observatory has brought so much knowledge, happiness, diversity, and biology over the years. We need to find a viable option to keep it running with the science and education it now offers. Please do not change my old home for the worse; I want to remain as proud as I am today. Please feel free to contact me for any more information or clarification. I have specific people I can also refer to if need be.	Background	Not Applicable	Letter	12/25/2016
72a	Judy-Ann	Mitchell	EPA	In accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, the U.S. Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement (DEIS) prepared for the National Science Foundation (NSF) to evaluate the potential environmental effects of proposed operational changes due to funding constraints for the Arecibo Observatory in Arecibo, Puerto Rico (CEQ#20160252). The Arecibo Observatory is located in the western portion of the Island of Puerto Rico, approximately 10 miles (16 kilometers) south of the City of Arecibo at the southern terminus of Puerto Rico Highway 625 (PR-625). A key component of the Arecibo Observatory is a 305-meter-diameter, fixed, spherical reflector. The Arecibo Observatory infrastructure includes instrumentation for radio and radar astronomy and ionospheric physics, office and laboratory buildings, a visitor and education facility, and lodging facilities for visiting scientists. The Observatory employs 128 persons, including approximately 16 scientific staff. The	Against Closure/ Reasons Why	Not Applicable	Letter	12/13/2016

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				<p>remainder of the employees work in support roles, including food service, software, maintenance, and as telescope operators (NAIC, 2016a; SRI International, 2016). The Angel Ramos Foundation Science and Visitor Center receives over 90,000 visitors per year. Approximately 30 percent of these visitors are schoolchildren.</p> <p>The Agency-preferred Alternative includes deconstruction activities that would remove 26 buildings from the site. Most onsite housing, recreation facilities, and other buildings determined to be obsolete would be deconstructed. Paved roads serving areas that would no longer be used would be removed. Site restoration would include reestablishing landscaping in areas where buildings were deconstructed and may involve transporting soil to the site to support landscaping in areas where building foundations or excavated bedrock would prevent vegetation establishment. According to the DEIS the Agency preferred Alternative would produce no cumulative impacts.</p>				
72b	Judy-Ann	Mitchell	EPA	The DEIS addresses hazardous and solid waste management practices properly, however there is very limited discussion of any potential sustainability, recycling and re-use practices that could apply during deconstruction activities for the Agency preferred Alternative. You may wish to add or consider the following information to sections 4.5 and/or 4.6 where applicable.	Resource Considerations for Document Analysis	Hazardous Materials	Letter	12/13/2016
72c	Judy-Ann	Mitchell	EPA	<ul style="list-style-type: none"> Recycling and/or reuse of construction and demolition (C&D) material can lessen the impacts of increasing disposal at solid waste facilities. The project should incorporate recycling, reuse and disposal options for C&D waste associated with deconstruction/demolition as appropriate. You may find more detailed information about recycling of C&D waste at: http://www.epa.gov/osw/conservation/imr/cdm/recycle.htm. 	Resource Considerations for Document Analysis	Non-Hazardous Materials	Letter	12/13/2016
72d	Judy-Ann	Mitchell	EPA	<ul style="list-style-type: none"> As there may be potential for landscaping after removal of structures on site, EPA's GreenScapes program provides cost-efficient and environmentally friendly solutions for landscaping. For additional information, please see: http://www.epa.gov/wastes/conservation/tools/greenscapes/index.htm 	Resource Considerations for Document Analysis	Biological	Letter	12/13/2016
72e	Judy-Ann	Mitchell	EPA	Use of diesel equipment will be required during project activities. Clean diesel options should be considered. For new equipment contract specifications requiring advanced pollution controls and clean fuels please see: http://www.northeastdiesel.org/pdf/NEDC-Construction-Contract-Spec.pdf and http://www.epa.gov/cleandiesel/technologies/index.htm	Resource Considerations for Document Analysis	Air Quality	Letter	12/13/2016
72f	Judy-Ann	Mitchell	EPA	<ul style="list-style-type: none"> Consider implementing diesel controls, cleaner fuel, and cleaner construction practices for on road and off-road equipment used for transportation, soil movement, or other construction activities, including: Strategies and technologies that reduce unnecessary idling, including auxiliary power units, the use of electric equipment, and strict enforcement of idling limits; and Use of clean diesel through add-on control technologies like diesel particulate filters and diesel oxidation catalysts, repowers, or newer, cleaner equipment. <p>For more information on diesel emission controls in construction projects, please see: http://www.northeastdiesel.org/pdf/NEDC-Construction-Contract-Spec.pdf</p>	Resource Considerations for Document Analysis	Air Quality	Letter	12/13/2016
72g	Judy-Ann	Mitchell	EPA	<p>Thank you for the opportunity to comment on the DEIS for the potential environmental effects of proposed operational changes due to funding constraints for the Arecibo Observatory in Arecibo, Puerto. EPA rates the DEIS as LO or "Lack of Objections" in accordance with EPA's national rating system.</p> <p>Our comments on the DEIS contained in this letter are intended to help provide useful information that will ultimately inform local, state and federal decision-making and review related to land and water resource use and impacts. Should you have any questions regarding the comments and concerns detailed in this letter, please feel free to contact Michael Poetzsch of my staff at 212-637-4147.</p>	Against Closure/ Reasons Why	Not Applicable	Letter	12/13/2016
73a	John	Kelly	Arecibo Observatory Principle Investigator	The first and most important point is that the Draft EIS does not cover the specific scenario of operational changes that we describe in our response to the NSF's Dear Colleague Letter. That scenario is one that we consider the most desirable, the most practical, and the most likely to be successful. That's the scenario we first described to NSF Four years ago. It's entirely viable; it addresses NSF's needs; it is well known throughout the community and at NSF. And as we've already said, that specifically excludes the current management's vision.	Against Closure/ Alternatives Considered	Alternatives	Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15am public meetings.	11/16/2016

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73b	John	Kelly	Arecibo Observatory Principle Investigator	Instead, the Draft EIS considers, and NSF has adopted as the Agency-preferred Alternative, a scenario so unlikely as to render the whole result irrelevant.	Procedural	Procedural	Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15am public meetings.	11/16/2016
73c	John	Kelly	Arecibo Observatory Principle Investigator	You already heard about the NASA issue. The NASA requirement I already mentioned absolutely requires the continuation of the Observatory's globally unique planetary radar. Every scenario should be submitted and that should be considered for the future assumes that the NASA involvement continues.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15am public meetings.	11/16/2016
73d	John	Kelly	Arecibo Observatory Principle Investigator	Yet the Agency-preferred Option includes the demolition of the radar's power supply, without which there would be no planetary radar, which brings me to the second point.	Against Closure/ Alternatives Considered	Alternatives	Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15am public meetings.	11/16/2016
73e	John	Kelly	Arecibo Observatory Principle Investigator	The NSF has announced in a further Dear Colleague Letter its intention to solicit proposals for the future operation of the Arecibo Observatory and to require those inputs before the Final EIS is published and before deciding and publishing its Record of Decisions. This improper order of events suggests that potential solicitation will require proposers to bid on an unknown. Formal requirements for a record of decision require that an EIS has been prepared for all considered alternatives. So clearly there is something unsuitable with the time order here. Either the Record of Decision should precede the solicitation so that proposers know what they are proposing for or the proposal should have been collected before the EIS was undertaken. As it is, only the scenarios in today's EIS appear to be qualified.	Procedural	Procedural	Commenter provided these comments at the 11-16-2016 6:15pm and 11-17-2016 10:15am public meetings.	11/16/2016
74a	Ryan	Lynch	Member of the North American Nanohertz Observatory for Gravitational Waves	I have some additional comments to read after what I already said last night. Section 3.2 and 3.9 of the Draft EIS define the reach of influence for cultural, employment, economic and income impacts too narrowly.	Resource Considerations for Document Analysis	Socioeconomics	Commenter provided these comments at the 11-17-2016 10:15am public meeting.	11/17/2016
74b	Ryan	Lynch	Member of the North American Nanohertz Observatory for Gravitational Waves	Astronomers across the U.S and the world depend on open skies access to Arecibo for their research careers. Any scenario that reduces the amount of time available for scientific research negatively impacts the incoming employment of the user group and diminishes the scientific and cultural landscape of the U.S as a whole. So I ask that this be considered in the Final EIS.	Resource Considerations for Document Analysis	Socioeconomics	Commenter provided these comments at the 11-17-2016 10:15am public meeting.	11/17/2016
74c	Ryan	Lynch	Member of the North American Nanohertz Observatory for Gravitational Waves	Also, Sections 3.9.3 and 4.9 reference students and researchers at colleges and universities when assessing educational impacts. The assumptions that this group would not be negatively impacted under Scenario 1 are erroneous. Any reduction in open-sky time will impact students who use the telescope for research, unless they can come with their own funding. So I also ask that this be considered	Resource Considerations for Document Analysis	Socioeconomics	Commenter provided these comments at the 11-17-2016 10:15am public meeting.	11/17/2016
74d	Ryan	Lynch	Member of the North American Nanohertz Observatory for Gravitational Waves	I would also like to echo the call to include broader impacts in the Final EIS. Arecibo is an incredible resource for underrepresented students, particularly Hispanic students. An example of this is the Arecibo Remote Command Center, which was started at the University of Texas Brownsville, and it's now expanding nationwide. NSF rightly requires the use of funds to address the broader impacts of their work and the EIS should do the same.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-17-2016 10:15am public meeting.	11/17/2016
74e	Ryan	Lynch	Member of the North American Nanohertz Observatory for Gravitational Waves	Finally, I would like to say that we understand the challenges that NSF faces with its budget and NANOGrav wants to support Arecibo as much as they can. But finding a long term funding stream takes time and potential donors would grow uncertainty regarding the capabilities and the resources that are available. Expecting a multimillion-dollar committee when systems like the radar and the administration buildings are slated for removal, even if it is only a preliminary proposal, is still and official document in the public record.	Against Closure/ Alternatives Considered	Alternatives	Commenter provided these comments at the 11-17-2016 10:15am public meeting.	11/17/2016
74f	Ryan	Lynch	Member of the North American Nanohertz Observatory for Gravitational Waves	Expecting donors to come forth in this situation is unrealistic, and I ask that the deadline for proposal per new operations be delayed until after the EIS is finalized. This solicitation should also make clear that these buildings may not ultimately be removed.	Procedural	Alternatives	Commenter provided these comments at the 11-17-2016 10:15am public meeting.	11/17/2016
74g	Ryan	Lynch	Member of the North American Nanohertz Observatory for Gravitational Waves	Arecibo is absolutely critical to our efforts to detect low frequency gravitational waves, and we strongly support its continuous science operations. I would like to raise a few points, specifically with regards to the Draft EIS.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
74h	Ryan	Lynch	Member of the North American Nanohertz	As it's already been mentioned the Portfolio Review Committee recommended, and I quote, "The AST should reevaluate participation in the Arecibo later in the decade, in light of the science opportunities and budget forecasts at the time." The Draft EIS did not directly include a current scientific impact-scenario	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016

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			Observatory for Gravitational Waves	study. So I ask the Final EIS either include scientific impact-scenario study or that NSF conduct a separate process to address current scientific impact. Otherwise, references in the Portfolio Review and other studies are out of date.				
74i	Ryan	Lynch	Member of the North American Nanohertz Observatory for Gravitational Waves	Along those lines, the Draft EIS referenced decadal and mid-decadal report has evidenced Arecibo lower scientific priority. But this is not justified by the communities and NSF's decision to award, for example, NANOGrav with a Physics Frontier Center grant totaling 14 and a half million dollars over five years. Also, a multi-messenger astronomy has been highlighted as one off five big ideas to be pursued by NSF foundation-wide over the next several years. Gravitational-waves astronomy is an example of multi-messenger astronomy.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
74j	Ryan	Lynch	Member of the North American Nanohertz Observatory for Gravitational Waves	The assertion that Arecibo is of lower scientific priority is simply not justified in the current scientific environment. In addition to the Physics Frontier Center grant that I just mentioned -- well, NSF funds the NANOGrav through. NANOGrav also uses 800 hours of open sky in Arecibo, valued at approximately 1.6 million dollars per year. By comparison, the LIGO gravitational waves detector costs 1 billion dollars to build and has an operational budget of 30 million dollars per year. The proposed LISA space gravitational waves detector will also be over 1 billion dollars total. I won't say that these are not incredibly worthy and scientifically valuable projects, but NANOGrav can open a unique part of the gravitational waves spectrum for a fraction of this cost.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
74k	Ryan	Lynch	Member of the North American Nanohertz Observatory for Gravitational Waves	Also, international facilities, most notably the FAST telescope under construction in China, have been cited as potential replacements for the unique capabilities of Arecibo. If FAST operates as planned, it would be a wonderful scientific instrument, and I look forward to that. However, it is very much an open question as to whether FAST will actually achieve these ambitious performance goals, and right now Arecibo remains the most sensitive, single-dish radio telescope in the world and may very well remain so for a foreseeable future.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
75a	Brett	Isham	Inter American University	I'm disappointed that NSF did not plan the meeting better. It started 25 minutes late and now you're pressuring people to hurry up their comments and cutting off people who probably still would want to comment. I think this is representative of the entire process.	Procedural	Procedural	Commenter provided these comments at the 11-17-2016 10:15am public meeting.	11/17/2016
75b	Brett	Isham	Inter American University	It seems to me to be so much wrong in the Draft EIS. I echo the comment from last night that if you read it yourself -- it's hardly a first draft. And it can even be interpreted as a deliverable attempt to sabotage the Arecibo Observatory. NSF is cherry-picking comments from the various reports that is citing. It's ignoring the recommendations of the 2012 Astronomy Portfolio Review to reevaluate the science later in the decade. And how can it include the science from the 2015 AGS review when that's not finished yet?	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-17-2016 10:15am public meeting.	11/17/2016
75c	Brett	Isham	Inter American University	There have been many comments about astronomy, including NANOGrav, the planetary radar, and I can't go into details. But the atmosphere radar is by 100 times the most sensitive in the world. Anyone who has visited similar atmosphere radars around the world knows first-hand that the radar at Arecibo is the most flexible and hands-on atmosphere radar laboratory in the world. NSF appears to be ignoring its own guidelines to consider equally intellectual merit and broader impact.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-17-2016 10:15am public meeting.	11/17/2016
75d	Brett	Isham	Inter American University	One thing I said last night is that what better, broader impact than an observatory in the United States, especially when there is 22 thousand students visiting every year, 99 percent of whom are Hispanic.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-17-2016 10:15am public meeting.	11/17/2016
75e	Brett	Isham	Inter American University	NSF wants to promote the study of science.	Background	Not Applicable	Commenter provided these comments at the 11-17-2016 10:15am public meeting.	11/17/2016
75f	Brett	Isham	Inter American University	It is a disappointment to me that all these types of comment must be in the context of an environmental impact statement. In summary, it is my feeling that all of this has little do with scientific merit or broader impact but has to do with political inside the NSF.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-17-2016 10:15am public meeting.	11/17/2016
75g	Brett	Isham	Inter American University	In regard to the 2012 Astronomy Portfolio Review, it called for a science reevaluation as well as a budget reevaluation later in the decade. I do not think a DCL is a new placement for the science reevaluation for the community. Besides the planetary radar -- I hope there would be someone here from NANOGrav. But also, in regard the 2015 AGS Portfolio Review, which is -- I guess the final results aren't in yet. But there were some serious errors. For example, there was a two-time error on the factor of two in the power of the planetary radar to its detriment.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016

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75h	Brett	Isham	Inter American University	Besides the science which speaks to the intellectual merit criteria of NSF, there is another criterion which NSF appears to weigh just as heavily, which is broader impact. I think the broader impact is mostly missing from the DEIS. So what better broader impact than an observatory located in the United States as opposed to one, for example, in the Andes.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
75i	Brett	Isham	Inter American University	In the case of Arecibo, 100 thousand visitors come per year to the Visitor Center, including 22 thousand students. I think it might be fair, I could be wrong, that the Visitor Center is the best science museum in Puerto Rico, and 22 thousand students experience that each year. What would be the message to children and people in Puerto Rico if we leave a dish as a monument to science abandoned? The message will be that science has abandoned Puerto Rico, that science is not a valuable tool. So the Arecibo Observatory has other broader impact activities, such as the Saturday Academy, the Space Academy, teacher training, and several things like that. What I would hope or wish for is that rather than new science badly argue for closing the Arecibo Observatory to use it well as an argument for finding solutions. Perhaps even within NSF some sharing of funding could be founded in Physics, which is spending 30 million a year on LIGO to search for gravitational waves, which can also be a project at Arecibo.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
75j	Brett	Isham	Inter American University	I would hope that NSF put its efforts in a more positive direction, looking for solutions rather than trying to close the Arecibo Observatory. Perhaps, for example, sharing some funding with Physics, which is paying 30 million a year looking for gravitational waves, which Arecibo also has the possibility to observe.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
75k	Brett	Isham	Inter American University	One final comment, Arecibo has the possibility of looking at the lower atmosphere, which has been historically underexploited in part because of the lack of interest of the lower atmosphere vision. But I believe that science is good. That's another thing NSF could potentially look at internally	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
76a	Edgard	Rivera-Valentin	Staff Scientist at the Arecibo Observatory	The Draft Environmental Impact Statement, as released, suggests that buildings and infrastructure specifically related to planetary radar operations at the Arecibo Observatory will face demolition in NSF's favorite option. At the same time, the mothballing option would suggest that demolition of such buildings is not required, as the option exists to leave them as is	Against Closure/ Alternatives Considered	Alternatives	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
76b	Edgard	Rivera-Valentin	Staff Scientist at the Arecibo Observatory	I would like to remind the National Science Foundation of the various congressional and executive policies, acts and mandates related to the national capabilities for planetary defense. For example, the NASA Authorization Act of 2008, which specifically calls for funding Arecibo and continue its operations, pending review by the National Research Council, which actually released a statement the following year affirming the vital role Arecibo plays in planetary defense. The Space Act Public Law 11-314 in 2010 also specifically affirms the value of planetary radar on Section 71104. The National Space Policy of 2010, and in fact the NSF Act of 1950 Public Law 81-507, which sets forth the NSF mission, requests to secure the national defense. There is sufficient public policy on this.	Background	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
76c	Edgard	Rivera-Valentin	Staff Scientist at the Arecibo Observatory	By the NSF choosing to pursue deconstruction of the planetary radar capabilities of Arecibo Observatory rather than considering mothballing at worse, this act of choice by the NSF, which is the steward of Arecibo Observatory, can be construed as the NSF interfering in public policy that mandates the upkeep and operation of the planetary radar and the national abilities to precisely track asteroids	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
76d	Edgard	Rivera-Valentin	Staff Scientist at the Arecibo Observatory	I would strongly suggest the NSF to reconsider its demonstrated plans in the DEIS of deconstructing infrastructure related to the Arecibo Observatory capabilities so that it maintains rather than interferes with public policy that has received historically bipartisan support.	Against Closure/ Alternatives Considered	Alternatives	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
77a	Gerrit	Verschuur		All the traffic and transportation statements in the DEIS include this rather disingenuous claim: "Minor, adverse, short-term impacts to traffic and transportation would be expected during deconstruction." Only someone who has never driven on the local roads would claim that only minor impacts would be experienced. Having hundreds of debris-laden trucks navigating local roads, for instance taking shortcuts across to Highway 10, will cause enormous damage and pose traffic hazards all day, every day. Will the city of Arecibo be willing to repay this minor damage?	Resource Considerations for Document Analysis	Transportation	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
77b	Gerrit	Verschuur		This EIS statement is yet another example of why the present draft is ill-considered and needs to be rewritten. The EIS states that in a funding constrained environment NSF needs to maintain a balanced research portfolio with largest scientific return for the taxpayer. The projected shortfall in NSF's budget by 2023 is, in a flat budget, around 60 million dollars. The net worth savings from divestment of Arecibo it's about 4 million dollars. This is insignificant in terms of the overall budget shortfall. To meet its budget, NSF	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016

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				needs to go back to draw a realistic long-term plan before it does permanent damage to the U.S. scientific infrastructure for virtually no return.				
78a	Joan	Schmelz	Deputy Director of Arecibo Observatory	<p>According to the Space Studies Board of the National Research Council 2010 report called "Defending Planet Earth" immediate action is required to ensure the continued operation of the Arecibo Observatory. NASA and the NSF should support a vigorous program of radar observations of near-Earth objects for orbital determination and the characterization of physical properties.</p> <p>The huge variation of the properties of asteroids makes it impossible to develop a comprehensive inventory by sending spacecraft to each potentially dangerous asteroid individually. The cost would be astronomical. For example, the cost of NASA's OSIRIS-REx mission, the first U.S. spacecraft to visit an asteroid and return a sample to Earth, is almost 1 billion dollars. Compare that to the annual budget of the Arecibo Observatory Planetary Radar Program, just 4 million.</p> <p>The Planetary Radar Program at Arecibo Observatory can study orders of magnitude more asteroids at orders magnitude less cost than dedicated spacecraft missions. In fact, NASA has stated that it will not send a mission to an asteroid that had not been studied first with radar.</p> <p>The spacecraft reconnaissance mission makes sense only if NASA knows with near certainty that an asteroid will hit the Earth. Such Mission would be feasible if there was sufficient time to develop, build, and launch a spacecraft that could deflect the asteroid and ensure that it does not collide with Earth. The vital ground-based observation of Arecibo is a small price to pay for the possible preservation of civilization itself.</p> <p>The misinformation in the Draft EIS should be corrected to accurately describe the role of the Planetary Radar Program as a national priority</p>	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
78b	Joan	Schmelz	Deputy Director of Arecibo Observatory	Unconscious bias permeates our culture and our science. We all undervalue the scientific contributions of women. Over the past five years almost 50% of the Arecibo astronomy telescope time went to women principal investigations. May I suggest that Arecibo science is underappreciated because these contributions from women are undervalued? The Draft EIS does not consider the socioeconomic impact of this pervasive bias. A study needs to be conducted to evaluate the impact of this bias.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-17-2016 10:15am public meeting.	11/17/2016
79a	Justine	Gonzalez-Velez	Member of the Arecibo Observatory Space Academy	Since I started at the Arecibo Observatory Academy at the age of 16 it provided me with the scientific education and the tools necessary to conduct a successful scientific research. That's the place that saw me take my first steps into scientific research, and it saw me grow as a student and as a person.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
79b	Justine	Gonzalez-Velez	Member of the Arecibo Observatory Space Academy	What I want to say with this is that Puerto Rico does not have many places that can foster scientific research by young people and that can foster the interest of young people in the sciences and research. If the youth of Puerto Rico has these tools that the Arecibo Observatory provides for free, with no cost, we should take advantage of it.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
79c	Justine	Gonzalez-Velez	Member of the Arecibo Observatory Space Academy	We are all gathered here with one purpose and that purpose is to discuss issues related to science. The future generation is just coming up, and that's the reason why we are here in support of the Arecibo Academy and of the Arecibo Observatory. And the analogy that I want to make is that if I'm a bread-maker and I don't have any flour, what am I going to make the bread with?	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
79d	Justine	Gonzalez-Velez	Member of the Arecibo Observatory Space Academy	By the same token, if I do not have the tools necessary for continuing science research and I don't have within my reach those things that are necessary for my to continue studying sciences, how am I going to have a future as a professional in the sciences?	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
79e	Justine	Gonzalez-Velez	Member of the Arecibo Observatory Space Academy	Therefore, we should highlight the wonderful characteristics of the Arecibo Observatory and prioritize those programs that interest youth in the field of sciences. With this, I want to wish a long life to the Arecibo Observatory so that it can create the future leaders that will follow the path of the sciences, the arts, math, and all other related fields.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
80	Kristen	Jones		<p>Let's talk about broader impacts. In the NSF issue statement, one of the priority goals that it has is -- let me read: "Improve the nation's capacity in data science by investing in the development of human capital and infrastructure."</p> <p>In choosing the content of this goal, the acknowledgement of the success of the NSF and the success of science and technology depends on fostering and mentoring minority groups, such as people of color and women in the field of science, acknowledging that they are untapped but expanding portion of the</p>	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016

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				<p>country's potential intellectual capital. This is represented throughout NSF as a concept of broader impacts.</p> <p>My concern with Draft Environmental Impact Statement is that broader impacts do not appear to be addressed at all. If they had been addressed, the deliberate connections between Arecibo Observatory and minority students such as the one who just spoke, sorry I didn't catch your name, would have become apparent. Arecibo Observatory hosts one of the longest running REU programs, reaching over 400 REU students who are minorities, often minorities and women of science. It has the AOSA Program, and I could go on and list.</p> <p>So my concern is that the DEIS does not address the broader impact and how Arecibo Observatory reaches out to minority groups, such as students of color and women, in the science field. More than that, it sort of completely ignores the injustice and perpetuates the problems of both sexism and racism in the field in the manner in which it assesses the Observatory as -- um. What is the exact phrase? Of lower scientific impact.</p> <p>There are numerous references about how assessing institutions that are primarily minority-serving and predominantly helpful towards women are grounded in implicit bias. I recommend Harvard's project Implicit, for example.</p> <p>At the very least, this broader impact of Arecibo on minorities and women in science needs to be studied and included in the EIS. This is a broader environment rather than the more specific local environments we've talked about. Not addressing these concerns is not the act of remaining neutral. Either you are fighting injustice, trying to take steps to address your bias, or through inaction you are condoning and supporting that bias, thus allowing it to continue.</p>				
81a	Robert	Minchin	Group lead for Radio Astronomy	I have read through this document and it is my personal opinion it is a tapestry of obfuscation, omissions, and outright lies. Let me illustrate. The NSF's preferred option, Alternative 1, involves the demolition of the Administration Building as obsolete. The fact that this is the house of the scientific staff is not mentioned. But we must assume that this option, therefore, means running the Observatory without any scientific staff. This would limit the available options for partners and make this alternative, at least in this form, nonviable.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
81b	Robert	Minchin	Group lead for Radio Astronomy	Just last week, I was working with some of our most experienced observers, the ALFALFA Team from Cornell University, troubleshooting problems with their observations. It cannot be over emphasized that without an onsite radio astronomy staff working closely with the technical staff you do not have a radio astronomy program. But that is not all the scientific staff do.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
81c	Robert	Minchin	Group lead for Radio Astronomy	As I pointed out in the last meeting, and which was apparently completely ignored, the Observatory would be in the top 10 universities in the U.S. by the number of Hispanic physics undergraduates it educates on our intern program. We also run a space academy for local high school students. We are working with professors at Puerto Rican universities to establish astronomy and space science programs, and we run a biannual radio astronomy school for graduate students. All of this schooling to PhD pipeline relies on the Observatory scientific staff, a fact the Draft omits to mention.	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
81d	Robert	Minchin	Group lead for Radio Astronomy	Removal of the scientific staff would massively set back efforts to bring Puerto Ricans into astronomy and space sciences and send messages to Hispanics and other minorities that the NSF doesn't care. Yet the Draft report makes the claim that there would be no disproportionate impact on low income or minority populations. That is an outright lie.	Resource Considerations for Document Analysis	Environmental Justice	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
82a	Anne	Virkki		I understood that the Alternative 1 includes all potential collaboration plans. How can the reader know which impacts belong to which plan? If this is the recommended option, it should be also the most accurately defined. Now, it's the most ambiguous one.	Against Closure/ Alternatives Considered	Alternatives	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
82b	Anne	Virkki		In spite of the choice of the collaboration plan, this will change the Final Environmental Impact Statement from the draft version drastically and, as such, will not give the public the possibility to comment on all aspects	Procedural	Procedural	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
82c	Anne	Virkki		As stated in the NSF website, as a public agency, NSF is responsible for building and sustaining the public trust through the transparency of our processes and accountability of our organization.	Procedural	Procedural	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
83a	Topasi	Gosh	Scientist at Arecibo Observatory	In the listed options presented by the NSF at the June EIS scoping meeting, reference to the demolishing of any structure was included only in the last option of deconstruction and site restoration. However, the DEIS, as many of us here have pointed out, now considers various lists of entities to be destroyed, even for	Procedural	Procedural	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016

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				<p>the favored option number one, "Collaboration with Interested Parties for Continued Science-focused Operations."</p> <p>I argue that with the addition of the demolition of 26 vital working areas the favored option is internally inconsistent with it. It is presupposed a mode of operation which might make collaboration with interested parties limited and, hence, makes the goal of the very option itself difficult to achieve.</p>				
83b	Topasi	Gosh	Scientist at Arecibo Observatory	<p>I also argue that the general public was denied of any opportunity to provide any feedback on the scientific, social, and commercial impact of the stated Alternative 1 with partial removal of infrastructure. Any comments raised now should be included in a second draft and should be brought to public for further comments before finalizing the report</p>	Procedural	Procedural	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
84a	Chris	Salter	Scientist at Arecibo Observatory	<p>This is a personal statement; and it's a statement involving the cultural environment of what the Observatory represents, not only for the whole of the U.S.A. but especially for its impact in the local community of Puerto Rico.</p> <p>I thought tonight I'd illustrate this for a field marked out of its importance by the 2010 Decadal Report, mainly time domain astronomy.</p> <p>Recently, Arecibo Observatory has discovered a unique source of repeating radio bursts, studied their properties, and is key to determining the position of the source in the sky of the order of thousands of a second of arc; and a second of the second of arc, let me make clear, is a quarter observed from Washington. As held up in Europe, it's tiny.</p> <p>We now know that this mystery source, and it stays a mystery, is some three billion light years away from us. It's situated not in our Milky Way Galaxy but in a very, very distant galaxy indeed.</p> <p>Given this sort of discovery, is it any surprise that the Observatory is a unique source of pride to our local community and an inspiration to our young people to study and make their own researches in STEM fields, where Puerto Rico has been so sadly underrepresented over the years? I think this aspect does not come through in the Draft Environmental Study.</p>	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	Not NEPA
85	Luisa	Zambrano		<p>You know Arecibo. You receive annual reports of our work. You publish; you know. How can you publish a document that states "Minor or negligible impact to public safety by ceasing operations of the Radar Program"? Your office knows the system's capabilities and its annual asteroids detections.</p> <p>Arecibo has participated in multiple asteroid and comet missions, such as Dawn Mission, NEAR-Shoemaker, EPOXI, JAXA, Hayabusa, and the recently launched OSIRIS-REx Mission, and helped recover the SOHO satellite. It will also help future deflection missions, including the ESA NASA Asteroid Impact and Deflection Assessment AIDA and the Asteroid Retrieval Mission.</p> <p>Arecibo currently provides support to the Lunar Reconnaissance Orbiter and supports tracking of the commissioned lunar satellites. The company hired to do the Environmental Impact Statement should look at the value implications of space missions, support, and participation.</p>	Resource Considerations for Document Analysis	Safety	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
86a	Ramon	Lugo	AOSA	<p>I am part of the Observatory's Pre-college Research Academy known as AOSA. We the alumni of the Academy have been following this process since back to its beginnings in May. We are concerned about what impacts the outcomes could have on the continuation of AOSA.</p> <p>Even though AOSA is funded by the NASA SERVIR Program and thus is not affected by budget cuts of the NSF, it will truly be affected by the deconstruction of certain parts of the site which are used by the students as part of their research. Students use the real telescope itself and even the soil and water of the flora of the site in order to study it.</p> <p>Where else could high school students in Puerto Rico be mentored by specialized scientist at one of Earth's most important scientific facilities? It's true. You may think that there are other research programs in this island, but none offer the technology and instruments we have in Arecibo.</p>	Background	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
86b	Ramon	Lugo	AOSA	<p>Now, considering the five alternatives that the NSF has developed and published, I can partially agree with them that Alternative 1 should be the one to take since it seems to affect less the continuation of operations of the whole site. However, and in accordance to what I've said before, I have my reservations as to the deconstruction of buildings that are used for researched and other scientific and technological endeavors.</p> <p>I understand that a few might be obsolete and should be acknowledged in order to cut expenses and such. But let's consider other options. Since these are scattered around the Observatory's ground, why not think</p>	Against Closure/ Alternatives Considered	Alternatives	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016

SUMMARY TABLE OF ALL COMMENTS RECEIVED ON DEIS -APPENDIX 5H

New Comment Number	First Name	Last Name	Affiliation	Comment	Category	Key Topic as Presented in the Following Response Documents	Comment Source	Date Comment Received
				of relocating all possible offices of operations to centralized areas, giving feasible conditions and resources. This way you will be taking out a minimum of the capacity and would also be saving the work of dozens of employees whose families depend on them.				
86c	Ramon	Lugo	AOSA	I urge you to ponder upon all the alternatives and ideas exposed today and to be incisive in looking for partnerships with other interest parties. It is important to remember how essential the Arecibo Observatory is to us as students, to scientists, to workers, to young children inspired by space and the magnitude of the Observatory when they visit the Visitor Center, to tourism, economy, and to the cultural identity of Puerto Rico.	Against Closure/ Alternatives Considered	Alternatives	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
86d	Ramon	Lugo	AOSA	Most importantly it is important to the advancement of the STEM fields and our scientific knowledge and to the safeguarding of our planet from the asteroids and other celestial threats.	Background	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
87a	Pablo	Llarandi	Professor at the Department of Physical Sciences of the University of Puerto Rico in Río Piedras and a geologist	I'll begin by saying that my main purpose in speaking here tonight is related to what the fellow who spoke before me mentioned before. I'm a scientist in part because the Arecibo Observatory is in my town. When I was a child I had the opportunity to visit the Observatory on multiple occasions. In my family I have an uncle who was an attorney and who worked at the Observatory, and that was my door of entry into the Control Room. So you can imagine a little kid, like me, interested in everything having to do with sciences and with the space listen for the first time to a true-life scientist explaining everything having to do with scientific research.	Background	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
87b	Pablo	Llarandi	Professor at the Department of Physical Sciences of the University of Puerto Rico in Río Piedras and a geologist	So I urge the NSF to take into account all of the aspects of the broader impact that this has on scientific education in Puerto Rico, for kids in Puerto Rico and for any person interested in learning about science, and also to take into account the role that the Arecibo Observatory has played in such a manner that has sparked our interest in maintaining this facility for posterity. I only have a couple of more commentaries and I will soon close	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
87c	Pablo	Llarandi	Professor at the Department of Physical Sciences of the University of Puerto Rico in Río Piedras and a geologist	The National Science Foundation talks about national priority of closing operations gradually at the Observatory. But I strongly urge you to take into consideration the Puerto Rican priority of maintaining such a facility for the interest of Puerto Rico and for the international community that visits it. Are there any representatives from the municipality of Arecibo? Anybody? Or from the Government of Puerto Rico? I would like for you to consider contributing to these alliances, either with funds or otherwise, to the continuation of the Arecibo Observatory because this is ours and we cannot let it go.	Background	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
88a	Carmen	Pantoja	professor of Physics at the University of Puerto Rico	I want to comment on the Alternative 1. It says that NSF will reduce its funding, and under Alternative 1 the future stakeholders are responsible for maintenance and upgrades. But that alternative is not clear. What is the amount that NSF will provide and for how long? It is not clear in that alternative either for those stakeholders -- are they responsible for future deconstruction and site restoration under Alternative 1? And if so, it needs to address specifically how much would that deconstruction and site restoration cost in 2016.	Resource Considerations for Document Analysis	Socioeconomics	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
88b	Carmen	Pantoja	professor of Physics at the University of Puerto Rico	In regard to Alternative 2, which is the education alternative, it mentions entities interested, or the Government of Puerto Rico, or entities in Puerto Rico. But what are those entities that is considering, other than the Government of Puerto Rico, to take the facility for education and have the Observatory but without the telescope? That is another comment for that alternative.	Against Closure/ Alternatives Considered	Alternatives	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
88c	Carmen	Pantoja	professor of Physics at the University of Puerto Rico	The third, Arecibo Observatory is a historic property that is included in the National Register of Historic Places. There is no way to minimize or avoid or mitigate the adverse effects of deconstruction of a historical site of worldwide recognition and importance. The U.S. would lose an important historical place and the world will lose a historical place. That needs to be addressed.	Resource Considerations for Document Analysis	Cultural Resources	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
88d	Carmen	Pantoja	professor of Physics at the University of Puerto Rico	The other thing, the Observatory, its purpose is the future generations. The purpose of the NSF is the future generations. This draft does not address clearly how many graduate students in astrophysics -- because that is the pull from which we will have the future scientists: the graduate students. From there we'll have the pull for the future. How many graduate students use Arecibo versus the future instruments that are so expensive that we are replacing -- because if we close all the radio observatories, where are the U.S. graduate students going to train?	Against Closure/ Reasons Why	Not Applicable	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016

SUMMARY TABLE OF ALL COMMENTS RECEIVED ON DEIS -APPENDIX 5H

New Comment Number	First Name	Last Name	Affiliation	Comment	Category	Key Topic as Presented in the Following Response Documents	Comment Source	Date Comment Received
88e	Carmen	Pantoja	professor of Physics at the University of Puerto Rico	Arecibo will never be a small telescope. It is a place for graduate students to study, to train to be radio-astronomers. If we close all the radio telescopes, those sophisticated instruments will be oversubscribed, and that is not addressed either. How the oversubscription will affect the graduate students that come from smaller universities? How will they train? Only the big institutions will be able to easily get access to the big facilities. So that needs also to be addressed.	Against Closure/ Reasons Why	Environmental Justice	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016
88f	Carmen	Pantoja	professor of Physics at the University of Puerto Rico	And the other point is the minorities. How many minority-graduate students are using Arecibo to train, and how that will be affected adversely? I am a professor of physics at the Department of Physics at the UPR. I am the only woman in the Department of Physics and I did my graduate studies at the Arecibo Observatory. So I know this would have an adverse effect.	Resource Considerations for Document Analysis	Environmental Justice	Commenter provided these comments at the 11-16-2016 6:15pm public meeting.	11/16/2016

RESPONSE MATRIX FOR SUBSTANTIVE COMMENTS GROUPED BY TOPIC

Procedural					
2.	Received from: Robert Steele, 11-28-16	74.	Ryan Lynch, 11-16-16	82.	Anne Virkki, 11-12-16
55.	Francisco Córdova, 12-12-16	75.	Brett Isham, 11-17-16	83.	Topasi Gosh, 11-16-16
73.	John Kelly, 11-16-16				
Comments:					
2.	<p>We are emailing you today... officially to request that NSF extend the public comment period on the Draft Environmental Impact Statement (DEIS) for the proposed Arecibo Observatory project in Puerto Rico for an additional period of time beyond the current stated comment submission deadline of December 12, 2016. At this time we would request the ability to submit relevant comments to NSF on this DEIS by January 11, 2017, an extension of 30 days (although a longer time would be acceptable as well).</p> <p>We have clients that have only recently gained a more heightened awareness and understanding of this very important matter. They need more time in order to review the lengthy, complex, and detailed document that has been produced and made available to the public, along with the previous work product elements cited throughout the DEIS. ... Finally, I would note that your regulations at 45 CFR 640.5(a) ... refer to DEIS comments being accepted for a "minimum" of 45 days after DEIS publication, but the rules should not preclude a somewhat longer period being allowed when necessary or appropriate.</p> <p>Please consider this request and let us know as soon as possible if an extension of the public comment period may be granted in this case. If there is NSF counsel or other official with whom we should speak about this in addition to yourself, such as my contacting you or others by telephone tomorrow (November 29) if needed, then please so advise. Thank you very much for your consideration and best regards.</p>				
55o.	<p>We request a delay of the EIS process, until the National Academies of Sciences have completed their evaluation of the Portfolio Review. Until then, confirmation of the validity of the portfolio review is still in question, and the recommendations provided in that review should not be implemented or followed.</p>				
55w.	<p>We request that based on the volume and impact of these discrepancies/ inconsistencies, the currently published DEIS needs to be rendered inadequate. We request a new DEIS to be completed and published appropriately.</p>				
55y.	<p>We also request these procedural tasks to be completed before a new solicitation process is initiated for continued operations of the Arecibo Observatory (this solicitation process was announced in the Dear Colleague Letter issued on September 30, 2016).</p>				
73b.	<p>Instead, the Draft EIS considers, and NSF has adopted as the Agency-preferred Alternative, a scenario so unlikely as to render the whole result irrelevant.</p>				
73e.	<p>The NSF has announced in a further Dear Colleague Letter its intention to solicit proposals for the future operation of the Arecibo Observatory and to require those inputs before the Final EIS is published and before deciding and publishing its Record of Decisions. This improper order of events suggests that potential solicitation will require proposers to bid on an unknown. Formal requirements for a record of decision require that an EIS has been prepared for all considered alternatives. So clearly there is something unsuitable with the time order here. Either the Record of Decision should precede the solicitation so that proposers know what they are proposing for or the proposal should have been collected before the EIS was undertaken. As it is, only the scenarios in today's EIS appear to be qualified.</p>				

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- 74f. Expecting donors to come forth in this situation is unrealistic, and I ask that the deadline for proposal per new operations be delayed until after the EIS is finalized. This solicitation should also make clear that these buildings may not ultimately be removed.
- 75a. I'm disappointed that NSF did not plan the meeting better. It started 25 minutes late and now you're pressuring people to hurry up their comments and cutting off people who probably still would want to comment. I think this is representative of the entire process.
- 82b. In spite of the choice of the collaboration plan, this will change the Final Environmental Impact Statement from the draft version drastically and, as such, will not give the public the possibility to comment on all aspects.
- 82c. As stated in the NSF website, as a public agency, NSF is responsible for building and sustaining the public trust through the transparency of our processes and accountability of our organization.
- 83a. In the listed options presented by the NSF at the June EIS scoping meeting, reference to the demolishing of any structure was included only in the last option of deconstruction and site restoration. However, the DEIS, as many of us here have pointed out, now considers various lists of entities to be destroyed, even for the favored option number one, "Collaboration with Interested Parties for Continued Science-focused Operations."
- I argue that with the addition of the demolition of 26 vital working areas the favored option is internally inconsistent with it. It is presupposed a mode of operation which might make collaboration with interested parties limited and, hence, makes the goal of the very option itself difficult to achieve.
- 83b. I also argue that the general public was denied of any opportunity to provide any feedback on the scientific, social, and commercial impact of the stated Alternative 1 with partial removal of infrastructure. Any comments raised now should be included in a second draft and should be brought to public for further comments before finalizing the report

Responses:

2. The public comment period was open for 45 days and interested parties were directly notified as soon as the DEIS was published. The DEIS public meetings were designed to provide clarity to attendees. Therefore, in light of these factors and others, the comment period was not extended.
50. A large number of comments protest the closure of the Arecibo Observatory because of the value of the facility to science and education. NSF agrees that valuable science and education activities are being conducted at the Arecibo Observatory, as evidenced by decades of significant funding of both the facility and research grants. However, the purpose of the current proposal is to reduce NSF funding in light of a constrained budgetary environment. Neither the merits of science and education activities at Arecibo Observatory nor NSF's budgetary decisions are the focus of this review. As explained in the DEIS and during public meetings, NSF relies on the scientific community, via decadal surveys and senior-level reviews, to provide input on priorities, and this community has repeatedly recommended divestment from the Arecibo Observatory, as well as from other observatories currently under similar review. These recommendations are summarized in this document only to explain the need for the current proposal. In accordance with NEPA, the DEIS and this FEIS analyze the potential environmental impacts of a range of Alternatives to meet the objective of reduced NSF funding for the Arecibo Observatory. Comments on environmental impacts are addressed throughout this document where appropriate and as noted in Section 5. NSF will not delay the NEPA process.
- 55w.y. Comment has been considered. NSF reviewed our documentation and process and has determined that a new DEIS is not warranted. No changes to the document have been made as a result of this comment.
- 73b. The Agency-Preferred Alternative is sufficiently broad to allow NSF to complete the analysis without regard to the specifics of a future collaboration. Because the specifics of a future collaboration cannot be known. Alternatives 1 and 2 are defined by the reduction of NSF funding and the continuance of science-focused (under Alternative 1) or education-focused (under Alternative 2) operations, not the disposition of any one facility or structure. Use or demolition of any particular building or instrument cannot be determined unless or until a viable collaboration option is under consideration. Because reduction of NSF funding may require the safe-abandonment, mothballing, or demolition of facilities, the proposed Alternatives are described under the most conservative (highest environmental impact) scenario in terms of NSF's analysis of potential changes to facilities, so that the EIS may

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be inclusive of the full range of potential environmental impacts. The analysis approach is consistent with NEPA guidance and is sufficiently broad to allow NSF to complete the analysis during planning and without regard to the specifics of a future collaboration. Table 2.3-1 provides a detailed list of facilities identified for potential retention, demolition, safe-abandonment, or mothballing under the proposed Alternatives for the purpose of NSF's environmental review. However, it must be emphasized that a collaboration may not require the full extent of activities analyzed and could involve none or only a subset of the activities listed in Table 2.3-1. NSF's Record of Decision would contain an explanation of which components of any selected Alternative would be implemented. In any case, the Agency-Preferred Alternative does not include, and the EIS does not *mandate*, the demolition/removal of specific buildings and infrastructure, even if specific buildings are identified in the proposed Alternatives. Because of this, the EIS would not preclude a proposed activity or use of infrastructure.

Text has been added to Section 2.3 of the document to clarify that the identified buildings are the maximum number that could be demolished under a given Alternative, but the specifics of the collaboration will determine the final suite of buildings that would be demolished.

73e. The NEPA process is separate and distinct from the solicitation of collaborators. NEPA is a procedural statute that requires federal agencies to analyze the environmental impacts of a proposed action so that analysis can be factored into a final agency decision. The NEPA process does not constitute the decision; rather, it is a process that factors into decisions. The Alternatives analyzed in NSF's NEPA process for proposed changes to operations at Arecibo Observatory are sufficiently broad to encompass activities likely to be submitted in response to a solicitation and, therefore, provide reasonable scenarios for NSF to conduct its analysis of environmental impacts. If NSF were to select Alternative 1 in its Record of Decision, NSF's NEPA analysis is anticipated to cover environmental impacts associated with any proposal selected. If that ultimately is not the case, then NSF would supplement its NEPA analysis accordingly. While NSF's NEPA and solicitation processes are being conducted largely in parallel, a specific collaboration cannot be selected prior to the conclusion of the NEPA process. It is for this reason that the sequence of events (i.e., completion of NSF's NEPA process before a proposal for a collaboration – if any – is selected) is both lawful and appropriate. No changes to the document have been made as a result of this comment.

74f. As explained in response to several comments, the scenario described under Alternative 1 is simply a possible, but not mandatory, scenario and it does not, in any way bind NSF to selecting only a proposed collaborator that would demolish all of the buildings identified under Alternative 1 for demolition. Therefore, a proposed collaborator is not bound by the letter of the scenarios presented in the Alternatives and analyzed in NSF's NEPA process.

No changes to the document have been made as a result of this comment.

75a. As explained at the outset of the public meeting, the delayed start time of the meeting was outside of NSF's control; the court reporter was delayed in transit. Due to that delay and to accommodate the number of commenters, NSF voluntarily extended the meeting time beyond the originally planned time to accommodate as many commenters as possible. Due to time constraints on the availability of the facility, the meeting could not be extended further. (NSF also extended the meeting time for the meeting in Arecibo beyond the timeframe originally allotted to accommodate all of the commenters present at the meeting.) Commenters unable to provide verbal comments at the San Juan meeting were told that they could submit their comments in writing up to and including the date that the public comment period closed. No changes to the document have been made as a result of this comment.

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- 82b. The NEPA process is distinct and separate from the solicitation of collaborators. While the two processes are being conducted largely in parallel, a specific collaboration cannot be selected prior to the conclusion of the NEPA process. The public has been able to comment on the scope of the NEPA analysis and on the specific analysis of the proposed Alternatives that allow NSF to evaluate multiple collaboration submittals. Alternatives 1 and 2 are sufficiently broad to allow appropriate consideration of potential environmental impacts of a broad range of solicitations. The selected collaboration could include additional measures not evaluated in this EIS, including potential measures that might expand onsite infrastructure. If additional measures in the selected collaboration result in greater or unevaluated environmental impacts than those considered in the EIS, NSF would implement additional NEPA analysis and agency coordination as appropriate for the magnitude of the unevaluated impacts. As this would be an additional NEPA analysis, there would be additional opportunities for the public to comment. No changes to the document have been made as a result of this comment.
- 82c. Throughout this NEPA process, NSF has engaged in a transparent process that has included the public. The public scoping period, which included scoping meetings, and the public comment period on the DEIS, which included public meetings, provided significant opportunities for the public to participate. NSF agrees that transparency is important and provided opportunities for public participation. No changes to the document have been made as a result of this comment.
- 83a. The Agency-Preferred Alternative is sufficiently broad to allow NSF to complete the analysis without regard to the specifics of a future collaboration. Because the specifics of a future collaboration cannot be known. Alternatives 1 and 2 are defined by the reduction of NSF funding and the continuance of science-focused (under Alternative 1) or education-focused (under Alternative 2) operations, not the disposition of any one facility or structure. Use or demolition of any particular building or instrument cannot be determined unless or until a viable collaboration option is under consideration. Because reduction of NSF funding may require the safe-abandonment, mothballing, or demolition of facilities, the proposed Alternatives are described under the most conservative (highest environmental impact) scenario in terms of NSF's analysis of potential changes to facilities, so that the EIS may be inclusive of the full range of potential environmental impacts. The analysis approach is consistent with NEPA guidance and is sufficiently broad to allow NSF to complete the analysis during planning and without regard to the specifics of a future collaboration. Table 2.3-1 provides a detailed list of facilities identified for potential retention, demolition, safe-abandonment, or mothballing under the proposed Alternatives for the purpose of NSF's environmental review. However, it must be emphasized that a collaboration may not require the full extent of activities analyzed and could involve none or only a subset of the activities listed in Table 2.3-1. NSF's Record of Decision would contain an explanation of which components of any selected Alternative would be implemented. In any case, the Agency-Preferred Alternative does not include, and the EIS does not *mandate*, the demolition/removal of specific buildings and infrastructure, even if specific buildings are identified in the proposed Alternatives. Because of this, the EIS would not preclude a proposed activity or use of infrastructure.
- Text has been added to Section 2.3 of the document to clarify that the identified buildings are the maximum number that could be demolished under a given Alternative, but the specifics of the collaboration will determine the final suite of buildings that would be demolished.
- 83b. The interested public was not denied the opportunity to provide feedback on the scientific, social, and commercial impacts of the stated Alternative 1 with partial removal of infrastructure. There were 30 days remaining in the comment period following the public meetings and comments specific to the partial removal of infrastructure could have been submitted. The specifics of any partial removal option would not be known until after solicitations were received, and these specifics are not necessary for the analysis to support an informed decision.

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RESPONSE MATRIX FOR SUBSTANTIVE COMMENTS GROUPED BY TOPIC

Alternatives					
	Received from:				
5.	Carlos Bibiloni, 11-17-16	51.	Anthony P. Van Eyken, 12-12-16	68.	Lenoid Gurvits, 12-11-16
17.	Andrew Seymour, 11-21-16	52.	Patrick A. Taylor, 12-12-16	71.	Kristina Kaldon, 12-25-16
18.	Nicholas White 11-16-16	54.	Joanna Rankin, 12-12-16	73.	John Kelly, 11-16-16
19.	Andrew Seymour, 11-21-16	55.	Francisco Córdova, 12-12-16	74.	Ryan Lynch, 11-17-16
23.	Donald Campbell, 11-16-16	58.	Robert Minchin, 12-12-16	76.	Edgard Rivera-Valentin, 11-16-16
27.	Rhys Taylor, 12-9-16	61.	Robert Minchin, 12-12-16	82.	Anne Virkki, 11-16-16
47.	Xavier Siemens, 12-13-16	62.	Michael Nolan, 12-12-16	86.	Ramon Lugo, 11-16-16
49.	Anne Virkki, 12-12-16	65.	Steve Kraemer, 12-12-16	88.	Carmen Pantojas, 11-16-16
Comments:					
5i. The Agency-preferred Alternative will most likely negatively impact the possibilities of obtaining funds from the private sector and from other federal agencies, such as NASA.					
17. In section 2.3.1 of the DEIS it states, “Alternative 1 would involve the least change to the current facility” wouldn’t Alternative 6 “No Change” be the least change? The draft should be we worded such that all options are equally considered since "no decision has been made" of the future of the Arecibo Observatory.					
18b. We suggest that an option be included that continues operation of the facility with the prime purpose to support the NASA funded Planetary Radar.					
19. In the abstract of DEIS there is no mention of the option of "no change of funding from NSF" seen in ES.4.6. Please make sure that all options are listed in this abstract.					
23f. The buildings listed for deconstruction include:					
a) Deconstructing the S---band high voltage power supply; NASA has indicated that, given the correct conditions, it intends to continue its support of the S--band planetary radar program, especially the near---Earth research component, at a level close to \$4M per year. Deconstructing the high voltage power supply would end any S---band radar observations.					
b) Deconstructing the HF transmitter building will end the ionospheric modification program in atmospheric sciences.					
c) Deconstructing the Administration building would eliminate all the scientific staff offices and the library yet the Alternative 1 plan includes retaining the scientific staff.					
d) Deconstructing the warehouse eliminates storage for the myriad spare parts needed to keep the telescope operational.					
e) Deconstructing the Bachelor (B) and Family (F) visiting scientist housing units would remove the only quarters that have kitchens. Since the cafeteria is currently closed on evenings and weekends this means that visitors would need to make frequent 10 mile trips to Arecibo to eat. Newly hired non---local staff with families would have nowhere convenient to stay until they could find permanent housing.					

Final Environmental Impact Statement — NSF Arecibo

- 27a. Regarding the recent draft Environmental Impact Statement on the future of Arecibo Observatory, while the stated NSF support for the continuing operations at AO is commendable, the details of the DEIS are, to put it mildly, completely mad. The proposed demolition of 26 buildings will not make any financial savings; on the contrary, it would cause irrevocable damage to the Observatory. Removing the buildings necessary for the planetary radar would eliminate the possibility of the Observatory continuing to secure the millions of dollars of NASA funding it currently receives as one of only two facilities in the world capable of Solar System radar studies. Removal of the scientific offices and Visiting Scientists Quarters would effectively kill Arecibo as a scientific facility - it will not merely cease to support scientific staff for their own operations, but fail to provide observing support for external scientists. This is madness. The buildings are not obsolete, they are essential. Consequently, any institute wishing to invest in Arecibo would inevitably face the added cost of having to rebuild the lost facilities. This is unnecessary and stupid.
- 47i. Finally, the report states that NSF prefers to find partners for continued science-focused operations of Arecibo. However, all the scenarios studied in detail in the DEIS involve the deconstruction of some buildings on the site. These include critical infrastructure for operating the S-Band radar system, administrative and office space for observatory staff, and quarters for visiting scientists. No justification is given for deconstructing these particular facilities, but they are important to a viable continued operation of the observatory, and to finding new partners. The S-Band radar system in particular may be one of the most attractive elements for potential partners, and losing this infrastructure would cripple our ability to track near earth objects. The impact resulting from such a loss could be disastrous. The administrative building, where observatory staff work, also appears to be considered for deconstruction and the impact seems to not be explored in the DEIS. We request that the final EIS 1) justify which, if any, buildings are to be deconstructed under all scenarios, and 2) fully accounts for the impacts that any building deconstruction would have on the operational capabilities of the observatory.
- 49i. If the alternative 1 intends to cover several possible new collaborations, the different environmental impacts of each that cause any changes to the facility should be clearly distinguished from each other to avoid ambiguity. Again, I remind NSF for their responsibility of transparency and accountability of their decisions and processes. This DEIS does not fulfill that responsibility.
- 51a. Assuming that comments delivered verbally, at the two public DEIS meetings in Arecibo and San Juan, have been accurately recorded and entered into the formal record, I wish only to address some general points. The five scenarios considered in the draft EIS are each so unrealistic as to be valueless. There is little likelihood that any of these scenarios would be implemented in any recognizable form, and the DEIS therefore provides no valid guidance on the future.
- 51b. the EIS was not asked to consider the option which the current management team has proposed, and reiterated in our DCL response, which includes a variety of upgrades and expansions to Observatory infrastructure and operations. As described by NSF, should any such proposal be submitted in response to the yet-to-be-released solicitation, it could not be considered without the completion of an additional, appropriate EIS. The management team provided formal, written, input to the EIS scoping process requesting that such options be considered, but NSF chose not to include them, and even stated during this round of meetings that such options had not been considered and that their impact was unknown. The considered scenarios were specified by NSF apparently in the full knowledge that they did not cover important, realistic, and practical possible outcomes for the future of AO and thereby precluded significant future options.
- 51c. Option 1, the stated Agency Preferred Option, involves the large-scale destruction of critical elements of the Observatory including essential elements of two of the three major radar systems at the facility – the very things that differentiate Arecibo from its competitors (besides its obvious overwhelming advantage in sensitivity).
- 51d. Options 2 and 3 involve making the telescope “safe”, which is indicated to involve, inter alia, removal of the support cables from the towers. An inevitable consequence is that the platform can no longer be supported (unless the EIS team has been advised to assume the availability of anti-gravity devices – an advice that might be seen to be no less outrageous than the description of the scenarios themselves) and that the dish will be destroyed by activities related to its removal. Removal of the dish, the platform, and the support cables in not just making the telescope safe, it is completely and irrevocably destroying it.

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- 51e. The DEIS is disingenuous in suggesting that option 2 (conversion to an educational facility) is viable without the telescope itself and in suggesting that option 3 (mothballing) is in anyway practical; if the telescope is destroyed, there can be no un-mothballing. The impacts of both scenarios are obviously and dramatically different from those described in the DEIS.
- 51f. Options 4 and 5, partial or total deconstruction, include estimates of times and costs which are dramatically at variance (only 20-25% of previous estimates with no explanations) from those contained in NSF's own previous, very detailed, decommissioning studies. The estimates appear to more closely reflect NSF's requirements than objective reality.
- The DEIS is rendered incomplete and insufficient through the omission of important, likely, outcomes, apparently as a result of quixotic definition of the considered scenarios by NSF. Worse, the exclusive consideration of unrealistic scenarios, as well as the lack of any explanation for the dramatically lower costs and time estimates of the destructive activities, serve to significantly reduce the likelihood of any successful outcome for the long-term future of the Observatory. The DEIS is not fit for purpose. It must be redone to address actual proposed, likely outcomes. Comprehensive Environment Impact Studies on realistic scenarios must be available before any proposals for future AO operations are solicited by NSF. A realistic and applicable DEIS is still urgently required.
- 52a. In the document, the agency-preferred option of collaboration with interested parties for continued science-focused operations includes deconstruction of buildings to "conform to the requirements of future collaborators." Among these buildings are structures required for the operation of the Arecibo planetary radar system including the S-band High-Voltage Power Supply Building. Removal of this essential piece of hardware would eliminate the planetary radar capability of Arecibo and endanger the partnership with NASA, currently the only major outside financial contributor to Arecibo operations. As written, the document implies that NASA is not seen as a "future collaborator" if structures required for its continued partnership are considered obsolete and slated for demolition. This language and its implication should be amended if partnership with NASA and the continuation of the Arecibo planetary radar are part of the agency-preferred future of Arecibo Observatory.
- 52b. Beyond the S-band High-Voltage Power Supply Building, the agency-preferred option suggests deconstruction of the Administration Building, which houses the offices of the scientific staff. Planetary radar cannot be done remotely and requires staff on site to operate the transmitter and collect the data. Again, this will greatly hamper the ability of the Arecibo planetary radar to continue and should be amended in the document. Other buildings used for storage, including the Warehouse Building, and used by the maintenance staff are suggested for deconstruction, which would hamper the ability of the observatory to continue science-focused operations. These recommendations should be corrected to allow for science-focused operations if this is truly the agency-preferred alternative.
- 52f. I'm commenting on Section 4.7.1.1, "Operations under Alternative 1," the Agency-preferred Alternative. The proposed deconstruction of the power supply building would result on the loss of at least 4 million dollars, a potential support from NASA, and would be an absurd action to take as part of a science-focused future for the Observatory.
- 54k. Section 2.3.1 states "All infrastructure related to the 12-meter and 305-meter telescopes would be maintained," yet this is inconsistent with the targeting of several critical buildings, facilities, and systems for deconstruction. The draft EIS deconstruction plan is a serious mismatch with established scientific priorities of fundamental physics and the NASA NEO mandate.
- NASA is still willing to support the near-Earth asteroid radar program as part of its mandate, but the deconstruction list includes the S-band high voltage power supply which means that the radar system would be inoperable. It also demolishes the Administration building which houses all the scientific staff and library. How can AO find partners for operation when this crucial capability is slated for removal? Where will staff work if the Administration building is removed?
- 55e. The AMT is optimistic about NSF wanting to continue science focused operations at the Arecibo Observatory, however, we are concerned by the details behind NSF's proposed alternative, in particular the deconstruction of over 26 buildings at the site and the implied elimination of the planetary radar and the space and atmospheric science capabilities at Arecibo.

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55f. The DEIS states and I quote that Alternative 1, “would meet the purpose and need of reducing the funding required from NSF”. However, nowhere in the document has this financial analysis been presented nor has it been clearly communicated why or how the deconstruction of critical elements of the observatory is of financial benefit to NSF. It certainly did not come from the AMT. A rationale for how and why these specific buildings were selected for deconstruction should also be included.

To provide an example: more than 10 million NSF dollars have been spent over the past 10 years in the development and commissioning of a heating facility in support of space and atmospheric sciences. Yet, under the DEIS, NSF recommends its deconstruction. The heating facility was explicitly requested by the scientific community, has potential to become revenue-generating and just commissioned less than 3 weeks ago.

Similarly, approximately 1/3 of the current operating budget for Arecibo is provided by NASA, solely for the use of the planetary radar capabilities and the studies of Near Earth Objects. This is another unique equipment which is being deconstructed under alternative 1. The following quote talks about the role of studying NEO’S as a public health resource.

55h. It is also puzzling, that while NSF wants interested parties to collaborate and financially support the Arecibo Observatory, NSF proposes the elimination of the very elements that differentiate Arecibo from other sites around the World – the Radar and space weather capabilities.

55n. A set of site upgrades should also be considered as part of the DEIS process, and not only deconstruction activities. The following are feasible upgrades that have been informally discussed with clients in the past:

Expanding the size of the dish to add 30 ft in diameter to increase the effective area of the dish

Expansion of at least 75 ft of the north east quadrant of the dish to enable geo belt surveys as well as to observe at the galactic center.

58. Section ES 4.2, discussing Alternative 2, states that “Operations after deconstruction would be comparable to current operations.” As this alternative includes safe-abandoning the 305-m telescope, this is clearly untrue. The section goes on to state that “Deconstruction activities that could interfere with the experimental use of the 12-meter telescope and data collection would be coordinated with Observatory staff to minimize the potential for disrupting scientific work.” As the scientific work for which the 12-m was funded is as a phase-reference antenna when doing VLBI observations with the 305-m telescope, this statement is completely incompatible with the idea of safe-abandoning the 305-m. This alternative also includes demolishing the Operations Building, which is needed for the operation and maintenance of the 12-m telescope. The analysis of Alternative 2 also includes the concept that 16 scientific researchers will continue to be employed at the Observatory, despite the demolition of their offices and the removal of the ability to do science with the 305-m telescope. This seems somewhat farfetched. The analysis of Alternative 2 should be re-visited, taking into account the above points.

61a. The Executive Summary states, with respect to Alternative 1, that "Operations after deconstruction activities would be comparable to current operations". This is not compatible with the demolition proposed as a possibility in this Alternative. The buildings to be demolished include the S-band High Voltage Power Supply (necessary for S-band operations) and the HF Transmitter Building (necessary for HF operations), and other buildings essential for current operations as well as the Warehouse, which is essential for maintenance of the telescope. In this scenario (which I understand is the worst-case environmental impact within Alternative 1), operations after deconstruction activities would not be comparable to current operations. It should also be noted that the buildings used for the REU program and the scientific offices used by REU mentors are removed, so in this scenario there is a loss of this educational program. This is also not included in the 'worst case' analysis.

61c. Overall, the analysis of Alternative 1 fails to properly take into account the knock-on effects of the possible demolition of the buildings, and thus does not present the actual worst-case environmental impact for this Alternative. This analysis needs to be re-visited, taking into account the use of the various buildings proposed for demolition.

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- 62a. The Draft Environmental Impact Statement seems to choose the structures to remain and to be deconstructed arbitrarily, possibly considering structure age but not use. It assumes removal of the "S-Band high Voltage Power Supply Building", which is needed for any work by NASA (which currently provides about 1/3 of the Observatory's funding), yet it retains the "750-kilowatt Emergency Generator Building" that contains only a decommissioned Diesel generator. It removes the "Administration building", which provides all of the office space, without which "collaboration with interested parties" would be nearly impossible.
- 65a. In January 2016, I led a team of partner institutions that prepared a response to the NSF Dear Colleague Letter (NSF 16-005) inviting concepts for future operation of the Arecibo Observatory. An important element of our approach is to pursue opportunities to generate revenue for the Observatory in a broad-brush way that takes advantage of all existing resources and infrastructure.
- 65b. Our team has reviewed the recent Draft Environmental Impact Statement (DEIS), which, alarmingly, makes specific recommendations about the disposition of buildings and other infrastructure at the observatory. It is our firm belief that those who are selected to manage and operate the site be allowed to make decisions on which buildings (if any) are to be removed. Our team is fully committed to helping the Observatory and NSF find viable solutions to the deficit in funding for facility management and operations.
- 65c. However, we need to know that our proposed approach will be carefully and objectively considered by NSF should a solicitation be issued based on the DEIS. As of this date, we've received no feedback from NSF regarding our response to the DCL. Thus, we are wondering whether the approach described in our plan was considered in the development of the alternatives presented in the DEIS. I hope that you can provide guidance on this as our team continues to develop strategies to mitigate the impending reductions to Arecibo's budget.
- 68b. As a staff member of the Arecibo Observatory in 1992-94, I am familiar with the site. Its infrastructure is simple and functional. It is hard to see how an external funding source would be attracted by the prospect of demolition of crucial site buildings, including, for example, the scientific and administrative staff offices.
- 71e. Option two is possibly realistic but should target Federally Funded Research and Development Centers (FFRDCs). I suggest checking with FFRDCs such as MIT Lincoln Laboratory as a potential source of funding. Line funding is used for internal research and development, which often involves outside collaborations. FFRDCs normally have funding like this available for science expansion programs, to which Arecibo Observatory sounds like a perfect candidate. Also, from a national security standpoint, I cannot see how we would even consider letting China have the capabilities of Arecibo Observatory while we decommission ours.
- 71f. The third option, transitioning to education-focused operations over research operations, is a horrible idea. The entirety of the observatory's status and educational value lies in the research. To cease research, everything I've already mentioned goes to hell: the experiences of students would be terrible and the experiences for scientists would be nonexistent.
- 71g. The fourth option, temporary suspension of operations, is a clear cop out. When can we foresee the scientific community getting so much extra funding that the observatory would be up and running again in a non-set time period? There would still be significant maintenance costs and if you chose to not maintain the dish, it would be useless in a few months. I don't see this as a feasible option at all: high costs with no return.
- 71h. Option five, is the most sickening but hopefully the least likely. Deconstruction would be expensive and stupid. Think of all the amazing things that have been discovered using this dish. Think of the life, both plants and animals, that has grown and lived here and how that destruction would affect the environment and ecosystem. Think of all the raw and organic side effects, all the science and education the observatory offers, the diversity, the wildlife, and the coquis!
- 73a. The first and most important point is that the Draft EIS does not cover the specific scenario of operational changes that we describe in our response to the NSF's Dear Colleague Letter. That scenario is one that we consider the most desirable, the most practical, and the most likely to be successful. That's the scenario we first described to NSF Four years ago. It's entirely viable; it addresses NSF's needs; it is well known throughout the community and at NSF.

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And as we've already said, that specifically excludes the current management's vision.

- 73d. Yet the Agency-preferred Option includes the demolition of the radar's power supply, without which there would be no planetary radar, which brings me to the second point.
- 74e. Finally, I would like to say that we understand the challenges that NSF faces with its budget and NANOGrav wants to support Arecibo as much as they can. But finding a long-term funding stream takes time and potential donors would grow uncertainty regarding the capabilities and the resources that are available. Expecting a multimillion-dollar committee when systems like the radar and the administration buildings are slated for removal, even if it is only a preliminary proposal, is still an official document in the public record.
- 76a. The Draft Environmental Impact Statement, as released, suggests that buildings and infrastructure specifically related to planetary radar operations at the Arecibo Observatory will face demolition in NSF's favorite option. At the same time, the mothballing option would suggest that demolition of such buildings is not required, as the option exists to leave them as is.
- 76d. I would strongly suggest the NSF to reconsider its demonstrated plans in the DEIS of deconstructing infrastructure related to the Arecibo Observatory capabilities so that it maintains rather than interferes with public policy that has received historically bipartisan support.
- 82a. I understood that the Alternative 1 includes all potential collaboration plans. How can the reader know which impacts belong to which plan? If this is the recommended option, it should be also the most accurately defined. Now, it's the most ambiguous one. 86b. Now, considering the five alternatives that the NSF has developed and published, I can partially agree with them that Alternative 1 should be the one to take since it seems to affect less the continuation of operations of the whole site. However, and in accordance to what I've said before, I have my reservations as to the deconstruction of buildings that are used for researched and other scientific and technological endeavors.
- I understand that a few might be obsolete and should be acknowledged in order to cut expenses and such. But let's consider other options. Since these are scattered around the Observatory's ground, why not think of relocating all possible offices of operations to centralized areas, giving feasible conditions and resources. This way you will be taking out a minimum of the capacity and would also be saving the work of dozens of employees whose families depend on them.
- 86c. I urge you to ponder upon all the alternatives and ideas exposed today and to be incisive in looking for partnerships with other interest parties. It is important to remember how essential the Arecibo Observatory is to us as students, to scientists, to workers, to young children inspired by space and the magnitude of the Observatory when they visit the Visitor Center, to tourism, economy, and to the cultural identity of Puerto Rico.
- 88b. In regard to Alternative 2, which is the education alternative, it mentions entities interested, or the Government of Puerto Rico, or entities in Puerto Rico. But what are those entities that is considering, other than the Government of Puerto Rico, to take the facility for education and have the Observatory but without the telescope? That is another comment for that alternative.

Responses:

- 5i. Alternatives 1 and 2 are defined by the reduction of NSF funding and the continuance of science-focused (under Alternative 1) or education-focused (under Alternative 2) operations, not the disposition of any one facility or structure. Use or demolition of any particular building or instrument cannot be determined unless or until a viable collaboration option is under consideration. Because reduction of NSF funding may require the safe-abandonment, mothballing, or demolition of facilities, the proposed Alternatives are described under the most conservative (highest environmental impact) scenario in terms of NSF's analysis of potential changes to facilities, so that the EIS may be inclusive of the full range of potential environmental impacts. This analysis approach is consistent with NEPA guidance and is sufficiently broad to allow NSF to complete the analysis during planning and without regard to the specifics of a future collaboration. Table 2.3-1 provides a detailed list of facilities identified for potential retention, demolition, safe-abandonment, or mothballing under the proposed Alternatives for the purpose of NSF's environmental review. However, it must be emphasized that a collaboration may not require the full extent of activities analyzed and could involve none or only a subset of the activities listed in Table 2.3-1. NSF's Record of Decision would contain an explanation of which components of any selected Alternative would be implemented. In any case, the Agency-Preferred

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Alternative does not include, and the EIS does not *mandate*, the destruction/removal of specific buildings and infrastructure, even if specific buildings are identified in the proposed Alternatives. Because of this, the EIS would not preclude a proposed activity or use of infrastructure.

Text has been added to Section 2.3 of the document to clarify that the identified buildings are the maximum number that could be demolished under a given Alternative, but the specifics of the collaboration would determine the final suite of buildings that would be demolished.

17. The No-Action Alternative does not meet the purpose and need for the action because it would not result in reduction of costs by NSF. Therefore, the No-Action Alternative is not considered a feasible Alternative. Of the considered feasible Alternatives, Alternative 1 would, as the document correctly states, involve the least change to the current facility.

No changes to the document have been made as a result of this comment.

- 18b. The recommended alternative is consistent with considered Alternative 1. A potential collaboration with this focus could be submitted.

No changes to the document have been made as a result of this comment.

19. The abstract identifies the proposed Action Alternatives considered in the DEIS, and the option of no change to funding is not one of the proposed Action Alternatives; that option would be the No-Action Alternative. No change to the abstract has been made based on this comment.

- 23f, 27a, and 62a. Because the specifics of a future collaboration cannot be known, Alternatives 1 and 2 are defined by the reduction of NSF funding and the continuance of science-focused (under Alternative 1) or education-focused (under Alternative 2) operations, not the disposition of any one facility or structure. Use or demolition of any particular building or instrument cannot be determined unless or until a viable collaboration option is under consideration. Because reduction of NSF funding may require the safe-abandonment, mothballing, or demolition of facilities, the proposed Alternatives are described under the most conservative (highest environmental impact) scenario in terms of NSF's analysis of potential changes to facilities, so that the EIS may be inclusive of the full range of potential environmental impacts. This analysis approach is consistent with NEPA guidance and is sufficiently broad to allow NSF to complete the analysis during planning and without regard to the specifics of a future collaboration. Table 2.3-1 provides a detailed list of facilities identified for potential retention, demolition, safe-abandonment, or mothballing under the proposed Alternatives for the purpose of NSF's environmental review. Because no structures that would be used under the collaboration effort would be demolished, it is not expected that the demolished structures would adversely affect operations or staff use. (27a.) Because no structures that would be used under the collaboration effort would be demolished, it is not expected that there would be any rebuilding of demolished structures. (62a.) Because the identified buildings are not tied to any specific proposal and because any selected collaborator would determine whether some, all, or none of those buildings would be demolished, there would be no negative impact on the solicitation process.

Text has been added to Section 2.3 of the document to clarify that the identified buildings are the maximum number that could be demolished under a given Alternative, but the specifics of the collaboration would determine the final suite of buildings that would be demolished.

- 47i. and 49l. NEPA does not require this level of detail because the specifics of a future collaboration cannot be known and any effort to parse the myriad of possibilities would be speculative. Instead, the analysis identifies a set of buildings that may be demolished based on user community input. The buildings identified represent the maximum amount of demolition that could occur, which is the bounding factor for analysis of environmental and economic impacts. Any specific collaboration could result in some, all, or none of those identified structures being demolished. If a lesser number of buildings is selected for demolition under the collaboration selected, then the corresponding impacts would be less than what was analyzed.

No changes to the document have been made as a result of this comment.

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51a. Because the specifics of a future collaboration cannot be known and any effort to parse the myriad of possibilities would be speculative, the analysis identifies a suite of general alternatives with a projected worst-case scenario of infrastructure that could be demolished. The infrastructure identified for potential demolition was based on user community input.

The analysis uses these worst-case alternatives to bound the impacts to the natural and human environment. A specific collaboration could result in fewer impacts than those that analyzed. This approach allows NSF to complete the NEPA analysis prior to making a decision, which is a requirement of NEPA, while retaining the flexibility to accommodate multiple potential solicitation responses.

No changes to the document have been made as a result of this comment.

51b. Alternatives 1 and 2 are sufficiently broad to allow appropriate consideration of potential environmental impacts of a broad range of solicitations. It is possible that the selected collaboration would include additional measures not evaluated in this EIS, including potential measures that might expand onsite infrastructure. If additional measures in the selected collaboration result in greater or unevaluated environmental impacts than those considered in the EIS, NSF would implement additional NEPA analysis and agency coordination as appropriate for the magnitude of the unevaluated impacts.

No changes to the document have been made as a result of this comment.

51c, 52b, 54k, 55e, 55f, 61a, 61c, 62a, 65b, and 68b. Alternatives 1 and 2 are defined by the reduction of NSF funding and the continuance of science-focused (under Alternative 1) or education-focused (under Alternative 2) operations, not the disposition of any one facility or structure. Use or demolition of any particular building or instrument cannot be determined unless or until a viable collaboration option is under consideration. Because reduction of NSF funding may require the safe-abandonment, mothballing, or demolition of facilities, the proposed Alternatives are described under the most conservative (highest environmental impact) scenario in terms of NSF's analysis of potential changes to facilities, so that the EIS may be inclusive of the full range of potential environmental impacts. This analysis approach is consistent with NEPA guidance and is sufficiently broad to allow NSF to complete the analysis during planning and without regard to the specifics of a future collaboration. Table 2.3-1 provides a detailed list of facilities identified for potential retention, demolition, safe-abandonment, or mothballing under the proposed Alternatives for the purpose of NSF's environmental review. No structures that would be used under the collaboration effort would be demolished.

Text has been added to Section 2.3 of the document to clarify that the identified buildings are the maximum number that could be demolished under a given Alternative, but the specifics of the collaboration would determine the final suite of buildings that would be demolished.

51d. The condition of the 305-meter-diameter telescope under safe-abandonment (Alternative 2) and mothballing (Alternative 3) would not be the same. Under mothballing, the dome and support cables would be retained and maintained during the mothball period so that the telescope could resume operations; under safe-abandonment, the dome and support cables would be removed.

Removal of the dome and cables would not destroy the reflector dish. The dome was constructed and raised above the reflector dish without harming the reflector dish; likewise, the dome can be lowered and removed without destroying the reflector dish.

No changes have been made to the document as a result of this comment.

51e. The DEIS does not state or imply that all current educational activities at the Arecibo Observatory would continue. Certain aspects of the current educational activities could not continue in the absence of a working 305-meter-diameter telescope, but that does not preclude the use of the facility for educational purposes. Certain STEM and non-STEM educational activities can be implemented without the telescope.

Mothballing would not destroy the 305-meter-diameter telescope but would maintain it in a manner that would allow for the future resumption of operations. NSF has analyzed the impacts associated with Alternative 2 and has determined that those impacts are consistent with the analysis provided in the DEIS".

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No changes to the document have been made with regard to this comment.

- 51f. Cost estimates associated with implementation of proposed alternatives are not within the scope of a NEPA analysis. The action Alternatives, as discussed earlier in the DEIS, are based on the likely scenarios for meeting the purpose and need of the Proposed Action. NSF respectfully disagrees that the EIS is insufficient.

No changes to the document have been made with regard to this comment.

- 52a and 52f. Alternative 1 is defined by the reduction of NSF funding and the continuance of science, not the disposition of any one facility or structure. Use or demolition of any particular building or instrument cannot be determined unless or until a viable collaboration option is under consideration. Because reduction of NSF funding may require the safe-abandonment, mothballing, or demolition of facilities, the proposed Alternatives are described under the most conservative (highest environmental impact) scenario in terms of NSF's analysis of potential changes to facilities, so that the EIS may be inclusive of the full range of potential environmental impacts. This analysis approach is consistent with NEPA guidance and is sufficiently broad to allow NSF to complete the analysis during planning and without regard to the specifics of a future collaboration. Table 2.3-1 provides a detailed list of facilities identified for potential retention, demolition, safe-abandonment, or mothballing under the proposed Alternatives for the purpose of NSF's environmental review. Because no structures that would be used under the collaboration effort would be demolished, including those that NASA would continue to support if part of the collaboration, it is not expected that the demolished structures would adversely affect any potential collaboration efforts.

Text has been added to Section 2.3 of the document to clarify that the identified buildings are the maximum number that could be demolished under a given Alternative, but the specifics of the collaboration would determine the final suite of buildings that would be demolished.

- 55h. Alternatives 1 and 2 are defined by the reduction of NSF funding and the continuance of science-focused (under Alternative 1) or education-focused (under Alternative 2) operations, not the disposition of any one facility or structure. Use of any particular building or instrument cannot be determined unless or until a viable collaboration option is under consideration. Because reduction of NSF funding may require the safe-abandonment, mothballing, or demolition of facilities, the proposed Alternatives are described under the most conservative (highest environmental impact) scenario in terms of NSF's analysis of potential changes to facilities, so that it may be inclusive of the full range of potential environmental impacts. Table 2.3-1 provides a detailed list of facilities identified for potential retention, demolition, safe-abandonment, or mothballing under this Alternative, for the purpose of NSF's environmental review. However, it must be emphasized that a collaboration may not require the full extent of activities analyzed, and could involve none of the activities listed in Table 2-1, or a subset of the activities. NSF's Record of Decision would contain an explanation of which components of any selected alternative would be implemented.

Additionally, the EIS does not mandate the destruction/removal of a building (even if specific buildings are identified in the various alternatives). Because of this, the EIS would not preclude a proposed activity or use of infrastructure.

No changes to the document have been made as a result of this comment.

- 55n. The site upgrades would require additional expenditures. As such, inclusion of the proposed site upgrades would not meet the purpose and need for the action, which is to reduce costs. Therefore, this potential alternative does not meet the purpose or need of the Proposed Action. However, Alternatives 1 and 2 are sufficiently broad to allow appropriate consideration of potential environmental impacts of a broad range of solicitations. It is possible that the selected collaboration would include additional measures not evaluated in this EIS, including potential measures that might expand onsite infrastructure. If additional measures in the selected collaboration result in greater or unevaluated environmental impacts than those considered in the EIS, NSF would implement additional NEPA analysis and agency coordination as appropriate for the magnitude of the unevaluated impacts.

No changes to the document have been made as a result of this comment.

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58. The operations referenced in the text are day-to-day activities that could affect the natural environment, such as people commuting and grounds and facility maintenance. There was no intent to imply that the specific scientific research would be the same, as the specific research does not affect the natural environment to any appreciable degree.

The text in Section 2.3.1 has been modified to provide clarity.

65a and 65c. Alternatives 1 and 2 are sufficiently broad to allow appropriate consideration of potential environmental impacts of a broad range of solicitations. It is possible that the selected collaboration would include additional measures not evaluated in this EIS, including potential measures that might expand onsite infrastructure. If additional measures in the selected collaboration result in greater or unevaluated environmental impacts than those considered in the EIS, NSF would implement additional NEPA analysis and agency coordination as appropriate for the magnitude of the unevaluated impacts.

No changes to the document have been made as a result of these comments.

71e, 71f, and 71g. NSF appreciates the public's feedback. We acknowledge your concerns and are giving them consideration; however, no change is required in the document as result of this comment.

71h. The proposed Alternative is considered in detail in the document. Comment noted.

73a. Alternatives 1 and 2 are sufficiently broad to allow appropriate consideration of potential environmental impacts of a broad range of solicitations. It is possible that the selected collaboration would include additional measures not evaluated in this EIS, including potential measures that might expand onsite infrastructure. If additional measures in the selected collaboration result in greater or unevaluated environmental impacts than those considered in the EIS, NSF would implement additional NEPA analysis and agency coordination as appropriate for the magnitude of the unevaluated impacts.

No changes to the document have been made as a result of this comment.

73d. The Agency-Preferred Alternative does not require demolition of the planetary radar power supply, but only allows for the demolition of the power supply. Alternative 1 is defined by the reduction of NSF funding and the continuance of science-focused operations, not the disposition of any one facility or structure. Use or demolition of any particular building or instrument cannot be determined unless or until a viable collaboration option is under consideration. Because reduction of NSF funding may require the safe-abandonment, mothballing, or demolition of facilities, the proposed Alternatives are described under the most conservative (highest environmental impact) scenario in terms of NSF's analysis of potential changes to facilities, so that the EIS may be inclusive of the full range of potential environmental impacts. This analysis approach is consistent with NEPA guidance and is sufficiently broad to allow NSF to complete the analysis during planning and without regard to the specifics of a future collaboration. Table 2.3-1 provides a detailed list of facilities identified for potential retention, demolition, safe-abandonment, or mothballing under the proposed Alternatives for the purpose of NSF's environmental review. No structures that would be used under the collaboration effort would be demolished.

Text has been added to Section 2.3 of the document to clarify that the identified buildings are the maximum number that could be demolished under a given Alternative, but the specifics of the collaboration would determine the final suite of buildings that would be demolished.

74e. The Agency-Preferred Alternative does not require demolition of the planetary radar power supply or administration building, but only allows for their demolition. Alternative 1 is defined by the reduction of NSF funding and the continuance of science-focused operations, not the disposition of any one facility or structure. Use or demolition of any particular building or instrument cannot be determined unless or until a viable collaboration option is under consideration. Because reduction of NSF funding may require the safe-abandonment, mothballing, or demolition of facilities, the proposed Alternatives are described under the most conservative (highest environmental impact) scenario in terms of NSF's analysis of potential changes to facilities, so that the EIS may be inclusive of the full range of potential environmental impacts. This analysis approach is consistent with NEPA guidance and is

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sufficiently broad to allow NSF to complete the analysis during planning and without regard to the specifics of a future collaboration. Table 2.3-1 provides a detailed list of facilities identified for potential retention, demolition, safe-abandonment, or mothballing under the proposed Alternatives for the purpose of NSF's environmental review. No structures that would be used under the collaboration effort would be demolished.

Text has been added to Section 2.3 of the document to clarify that the identified buildings are the maximum number that could be demolished under a given Alternative, but the specifics of the collaboration would determine the final suite of buildings that would be demolished.

76a and 76d. The Agency-Preferred Alternative does not require demolition of structures related to the planetary radar, but only allows for their demolition. Alternative 1 is defined by the reduction of NSF funding and the continuance of science-focused operations, not the disposition of any one facility or structure. Use or demolition of any particular building or instrument cannot be determined unless or until a viable collaboration option is under consideration. Because reduction of NSF funding may require the safe-abandonment, mothballing, or demolition of facilities, the proposed Alternatives are described under the most conservative (highest environmental impact) scenario in terms of NSF's analysis of potential changes to facilities, so that the EIS may be inclusive of the full range of potential environmental impacts. This analysis approach is consistent with NEPA guidance and is sufficiently broad to allow NSF to complete the analysis during planning and without regard to the specifics of a future collaboration. Table 2.3-1 provides a detailed list of facilities identified for potential retention, demolition, safe-abandonment, or mothballing under the proposed Alternatives for the purpose of NSF's environmental review. No structures that would be used under the collaboration effort would be demolished.

Text has been added to Section 2.3 of the document to clarify that the identified buildings are the maximum number that could be demolished under a given Alternative, but the specifics of the collaboration would determine the final suite of buildings that would be demolished.

82a. NEPA does not require this level of detail because the specifics of a future collaboration cannot be known. Alternative 1 is defined by the reduction of NSF funding and the continuance of science-focused operations, not the disposition of any one facility or structure. Use or demolition of any particular building or instrument cannot be determined unless or until a viable collaboration option is under consideration. Because reduction of NSF funding may require the safe-abandonment, mothballing, or demolition of facilities, the proposed Alternatives are described under the most conservative (highest environmental impact) scenario in terms of NSF's analysis of potential changes to facilities, so that the EIS may be inclusive of the full range of potential environmental impacts. This analysis approach is consistent with NEPA guidance and is sufficiently broad to allow NSF to complete the analysis during planning and without regard to the specifics of a future collaboration. Table 2.3-1 provides a detailed list of facilities identified for potential retention, demolition, safe-abandonment, or mothballing under the proposed Alternatives for the purpose of NSF's environmental review. No structures that would be used under the collaboration effort would be demolished.

Text has been added to Section 2.3 of the document to clarify that the identified buildings are the maximum that could be demolished under a given Alternative, but the specifics of the collaboration would determine the final suite of buildings that would be demolished.

86b. Alternative 1 does not include specific demolition of any structures, but only allows for the demolition of up to a certain number of structures based on the collaboration. Alternative 1 is defined by the reduction of NSF funding and the continuance of science-focused operations, not the disposition of any one facility or structure. Use or demolition of any particular building or instrument cannot be determined unless or until a viable collaboration option is under consideration. Because reduction of NSF funding may require the safe-abandonment, mothballing, or demolition of facilities, the proposed Alternatives are described under the most conservative (highest environmental impact) scenario in terms of NSF's analysis of potential changes to facilities, so that the EIS may be inclusive of the full range of potential environmental impacts. This analysis approach is consistent with NEPA guidance and is sufficiently broad to allow NSF to complete the analysis during planning and without regard to the specifics of a future collaboration. Table 2.3-1 provides a detailed list of facilities identified for potential retention, demolition, safe-abandonment, or mothballing under the proposed Alternatives for the purpose of NSF's environmental review. No structures that would be used under the collaboration effort would be demolished.

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Text has been added to Section 2.3 of the document to clarify that the identified buildings are the maximum number that could be demolished under a given Alternative, but the specifics of the collaboration would determine the final suite of buildings that would be demolished.

86c. All comments concerning the NEPA process and analysis have been considered in preparing the FEIS and will be considered in preparing the ROD.

No changes to the document have been made as a result of this comment.

88b. The NEPA process is distinct and separate from the solicitation of collaborators. While the two processes are being conducted largely parallel, a specific collaboration cannot be selected prior to the conclusion of the NEPA process. Alternatives 1 and 2 are sufficiently broad to allow appropriate consideration of potential environmental impacts of a broad range of solicitations. It is possible that the selected collaboration would include additional measures not evaluated in this EIS, including potential measures that might expand onsite infrastructure. If additional measures in the selected collaboration result in greater or unevaluated environmental impacts than those considered in the EIS, NSF would implement additional NEPA analysis and agency coordination as appropriate for the magnitude of the unevaluated impacts. As this would be an additional NEPA analysis, there would be additional opportunities for the public to comment.

No changes to the document have been made as a result of this comment.

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RESPONSE MATRIX FOR SUBSTANTIVE COMMENTS GROUPED BY TOPIC

Air Quality	
<p>26. 72.</p>	<p>Received from: (EPA) Judy-Ann Mitchell, 12-13-16 (duplicate of comment 72) (EPA) Judy-Ann Mitchell, 12-13-16</p>
<p>Comment:</p> <p>72e. Use of diesel equipment will be required during project activities. Clean diesel options should be considered. For new equipment contract specifications requiring advanced pollution controls and clean fuels please see: http://www.northeastdiesel.org/pdf/NEDC-Construction-Contract-Spec.pdf and http://www.epa.gov/cleandiesel/technologies/index.htm</p> <p>72f. Consider implementing diesel controls, cleaner fuel, and cleaner construction practices for on- road and off-road equipment used for transportation, soil movement, or other construction activities, including:</p> <ul style="list-style-type: none"> • Strategies and technologies that reduce unnecessary idling, including auxiliary power units, the use of electric equipment, and strict enforcement of idling limits; and • Use of clean diesel through add-on control technologies like diesel particulate filters and diesel oxidation catalysts, repowers, or newer, cleaner equipment. <p>For more information on diesel emission controls in construction projects, please see: http://www.northeastdiesel.org/pdf/NEDC-Construction-Contract-Spec.pdf</p>	
<p>Response:</p> <p>72e. and 72f.</p> <p>Clean diesel is not readily available to the construction industry in Puerto Rico. Further, the number of firms with the capability to technically handle the large-scale demolition that would occur under Alternative 4 or Alternative 5 is limited. Therefore, NSF will encourage the use of more efficient equipment and will implement idle restrictions and equipment maintenance requirements on the contractor selected.</p> <p>Best management practices on idle reduction and equipment maintenance to enable emission reductions during demolition have been added to the EIS in Section 1.6 where air quality is discussed.</p>	

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RESPONSE MATRIX FOR SUBSTANTIVE COMMENTS GROUPED BY TOPIC

Climate Change	
56.	<p>Received from: Robert Steele</p> <p>Comment: 56e. Climate Change</p> <p>One of the most important environmental issues facing the world today is climate change. Much has been written on this topic in general and will not be repeated in this comment letter. However, in addition to excluding air quality, the DEIS excludes consideration of climate change because it is an area that does not have the potential for noticeable or measureable impacts under any of the considered alternatives (Sections ES.5 and 1.6). This threshold conclusion is based on the fact that the facility as currently operated produces few greenhouse gas emissions. Various alternatives will involve either short-term or long-term increases or decreases of diesel generator and vehicle uses and are considered to be relatively insignificant from an overall climate change perspective. Also as stated in the DEIS, despite the presence of manufacturing and utility operations in Puerto Rico, the location of the Observatory is relatively remote from an air pollution perspective. Moreover, its inland elevated setting "is such that impacts from climate change would not affect operations," as with a coastal facility having to adapt to rising sea levels, or changing atmospheric or temperature conditions interfering with the functioning of the Observatory.</p> <p>By contrast, we submit that a mere site-specific judgment by NSF in the DEIS as to the "insignificance" of the climate change issue is inadequate. Instead climate change must also be analyzed for the proposed NSF actions "in several contexts such as society as a whole (human, national)" as well as the "degree to which the effects on the quality of the human environment are likely to be highly controversial." See 40 § CFR 1508.27. Numerous challenges to projects, agencies, and EIS work are underway around the country demanding that a broader view be taken of potential indirect impacts of proposed actions on climate change (even if sometimes an agency may not have jurisdiction in a particular program when preparing an EIS for a private project receiving a federal permit). See "Enviros Fight DOE Approval of LNG Exports at DC Circ.," Law 360, December 1, 2016 (export terminal analyses arguably should have included climate change impact of new natural gas production enabled by new terminals if built); "Fish Hatchery Enviro Review Missing Climate Change Impact," Law 360, November 22, 2016 (environmental review by National Marine Fisheries Service held arbitrary and capricious for not considering effects of climate change on water use given best available regional science).</p> <p>The Arecibo DEIS falls short in this regard because NSF fails to investigate and analyze the role of the Observatory in ongoing climate research and study. How would the loss of this facility impact that work, and potentially human health and the environment, moving into the future? Certain comments on this topic received by NSF during the scoping process are not even minimally addressed in the DEIS.</p> <p>Even though the DEIS favors the option of some level of partnering and continued science operation of the Observatory, NSF still fails to take the long view of potential climate change impact. Instead, based solely on the local view, the DEIS excludes climate change as an insignificant issue in this case. The DEIS notes that many scientists will lose important work capabilities if the Observatory goes away; but in this respect, the loss of important climate change study capabilities could contribute to climate impacts on human health, safety, and the environment going forward. Future climate change preventative actions could be based upon work done at the Observatory along with, and even considering the existence of, numerous other methods, facilities, and scientists working to assess and document climate change. Finally, while the newly elected President of the United States is expected to cut back on certain climate actions and national commitments undertaken recently, most across the political spectrum should agree that more climate research and data are necessary to resolve remaining scientific uncertainties, refine models, and inform choices on the "hot button" topic of climate change. As stated before by another party, Arecibo is an irreplaceable national jewel with unique capabilities for studying the atmosphere and ionosphere.</p>

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Even if this omission from the DEIS primarily relates to the multiple science-ending project alternatives not chosen by the DEIS, those options remain possible for selection in the ROD and in NSF actions thereafter which will be based upon many factors. If "a draft statement is so inadequate as to preclude meaningful analysis, the agency shall prepare and circulate a revised draft of the appropriate portion." 40 CFR § 1502.9(a). Thus, we recommend that, prior to finalizing the DEIS:

A. NSF review, revise, and supplement the DEIS to address the issue of climate change and the potential impact from loss of this science facility and its atmospheric research capabilities on human health and the environment, beyond the limited view of only boilers, bulldozers, and trucks; this work should appear in a new DEIS.

Response:

56e. In August 2016, the CEQ issued final guidance on climate change analysis for NEPA documents. While this guidance has been rescinded, it was in effect at the time the DEIS was prepared and provides a framework for focusing meaningful climate change analysis. The CEQ guidance did not identify climate change research as a topic of consideration in the NEPA analyses; however, consideration of climate change in the Arecibo Observatory EIS is consistent with the August 2016 CEQ guidance to consider the effects of the action on climate change and the effects of climate change on the action. These aspects are addressed in the EIS.

While climate change research could be conducted at the Arecibo Observatory, climate change is not the focus of research at the Observatory. Consideration of potential future contributions of research at the Arecibo Observatory on global climate change would be speculative and cannot be evaluated in a meaningful manner, as climate change research is conducted at multiple facilities outside the Arecibo Observatory.

No changes to the document were made as a result of this comment.

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RESPONSE MATRIX FOR SUBSTANTIVE COMMENTS GROUPED BY TOPIC

Biological					
	Received from:				
8.	Joyce Stanley (USFWS), 12-2-16	43.	Robert Minchin, 12-12-16	72.	Judy-Ann Mitchell, 12-13-16
20.	Andrew Seymour, 11-21-16	54.	Joanna Rankin, 12-12-16		
28.	Nelson Valazquez-Reyes (DNER), 12-12-16	56.	Robert Steele, 12-12-16		
Comments:					
<p>8a. The U.S. Department of the Interior (Department) has reviewed the Draft Environmental Impact Statement (DEIS) for the National Science Foundation Arecibo Observatory (AO) Project in Arecibo, Puerto Rico. Our comments ... are specifically related to the species listed under the ESA that were included in the DEIS. On June 24, 2016, we provided comments to NSF regarding the presence or potential presence of federally-listed species within the AO property. Those species and the potential impacts of the proposed project are included in the submitted DEIS. After reviewing the document, we offer the following comments:</p> <p>(1) The DEIS recognizes the presence of a Puerto Rican broad-winged hawk (BWAH) nest in a Maria tree on the south rim wall, above the 305-meter telescope dish. Although this and other Maria trees in the vicinity would not be impacted by deconstruction activities, it is important to indicate that this nest represents a BWAH territory and that there is a possibility of additional BWAH territories within the AO. According to Hengstenberg and Vilella (2004), the BWAH has a home range of 262 ac. Therefore, we recommend that NSF uses this information as well as survey data of the area to determine the number of territories occupied by this species. Such information will help develop appropriate conservation measures for the protection of the BWAH. Identification of territories becomes more relevant because for Alternative 5, the DEIS contemplates the use of explosives to deconstruct towers and other infrastructure. Even if deconstruction activities are conducted outside of the BWAH breeding season, disturbance from explosions and deconstruction activities may alter the behavior of the species and result in abandonment of occupied territories.</p> <p>8b. (2) <i>Auerodendron pauciflorum</i> - According to Axelrod (2011, p. 296) this species also occurs in the northern limestone hills of Puerto Rico (i.e., Arecibo and Isabela). Therefore, we believe this species may also occur at the AO area. Table 3.1-1 of the DEIS indicates this species does not have the potential to occur at the AO.</p> <p>8c. (3) <i>Thelypteris verecunda</i> - As stated in the DEIS, this species is known to occur on privately owned lands in the municipalities of Hatillo, Quebradillas, and San Sebastián. However, the species that occurs in the municipality of Yauco and Los Tres Picachos in Ciales is <i>T. yaucoensis</i>, not <i>T. verecunda</i> (5 yr. review, 2015). (4) <i>Eugenia haematocarpa</i> - According to the species' 5 yr. review (2014), a new locality was reported in 2011 in the municipality of Isabela by Marcos Caraballo and Dr. Eugenio Santiago (University of Puerto Rico, Río Piedras). The species was also found in two locations within the boundaries of the Guajataca Commonwealth Forest. (5) <i>Daphnopsis hellerana</i> - Approximately 2,047 individuals of <i>D. hellerana</i> were found within the proposed right of way of highway PR-10 in Arecibo (5 yr. review, 2013).</p> <p>8d. (6) <i>Cordia alliodora</i> - Due to its biology, this species has the potential to occur in areas that were previously disturbed for the construction of AO (e.g., areas that will be deconstructed). Therefore, we recommend searching for this species in the surroundings of buildings and infrastructure to be deconstructed. (7) <i>Solanum drymophilum</i> - This species was found during the construction of highway PR-10 and at the Río Abajo Commonwealth Forest (5 yr. review, 2015). Due to its biology, it may also be found in areas that were disturbed (e.g., areas that will be deconstructed). Therefore, we recommend searching for this species in the surroundings of buildings and infrastructure to be deconstructed.</p>					

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8e. (8) The DEIS states that the habitat that has developed beneath the 305-meter telescope dish is suitable to support the two listed fern species: *Tectaria estremerana* and *Thelypteris verecunda*. To mitigate for impacts to these two species from removal of the telescope dish, NSF proposes to retain or restore the mesic partial sun microclimates beneath the telescope dish as appropriate following removal, or would restore areas of existing fern habitat using native woody species to create mesic partial sun microclimates that would be conducive to fern growth. The document further indicates that under a restoration scenario, controlled propagation (either greenhouse rising of tissue culture propagation) of the two species would be done and the propagules would be outplanted into the restored habitat once it had developed sufficiently to support the ferns.

The Department acknowledges and agrees with the controlled propagation efforts under this scenario. However, the restored habitat will take too long (> two decades) to provide the microclimate conditions appropriate for the two ferns. Instead, we recommend that following the removal of the 305-meter telescope dish, that area be restored with native tree species, and that any propagated material of the two fern species be planted in already existing mature suitable habitat within the AO property. With appropriate monitoring, this strategy will hopefully increase the chance of survival of planted individuals.

8f. 9) The DEIS indicated that deconstructed areas would be naturally revegetated or re-landscaped after the deconstruction period, and open spaces would be revegetated with native vegetation to minimize the potential for the spread of exotic invasive species. The Department strongly recommends the use of native vegetation (i.e., species that naturally occur in the AO) for reforestation practices, and reducing to the maximum extent possible the use of species that are non-native to the area for landscaping purposes.

8g. (10) The DEIS indicates that soil would be brought in for vegetation establishment in disturbed areas where the remaining soils following infrastructure removal are insufficient. The Department caution NSF with the use of this practice because bringing soil from other areas particularly from outside the AO, has a high potential of also bringing seeds of exotic plant species and create a management issue on restoration areas. If soil is needed, we recommend using soil from within the AO property.

8h through 8n: USFWS also provided comments on the draft BA with their comments on the DEIS. These comments are provided in Appendix 3.2.A, but are not addressed in this response. Those comments were addressed through the ESA Section 7 consultation process.

8o. We recommend that NSF incorporates all the above recommendations into the final EIS and BA, in addition to any other recommendation provided to NSF staff during our November 16, 2016, meeting conducted at CESFO. You may also visit our website <http://www.fws.gov/caribbean/ES> for additional information on threatened and endangered species under our jurisdiction and Section 7 consultation process. Thank you for the opportunity to comment on this project. If you have any questions or require additional information, please contact José A. Cruz-Burgos at jose_cruz-burgos@fws.gov. I can be reached via email at joyce_stanley@ios.doi.gov or at (404) 331-4524.

20. The NSF has produced this draft (and I quote from the draft) “to analyze the potential environmental impacts associated with potential funding changes for the Arecibo Observatory”. In sections 3.1.5 Threatened and Endangered Species and 3.1.6 Migratory Birds of this draft use the Information for Planning and Conservation (aka IPaC) Trust Report as its sole reference to list all the protected species known from Arecibo.

Yet, the IPaC Trust Report states multiple times (and I quote), “This [IPaC Trust] report is for informational purposes only and should not be used for planning or analyzing project level impacts.” Since the IPaC Trust Report is not a proper study of the site, states it should not be used to analyze the impact level, and is not satisfactory under Section 7 of the Endangered Species Act, all the material based on the IPaC report should be stricken from the Environmental Impact Statement. Along with this all sections in the draft that refer to mitigation of migratory birds, and threatened and endanger species should be reevaluated.

Seeing that no studies to the environmental impact on threatened, endangered species and migratory birds have been done for the site, an intensive full year study should be conducted. This study should include endangered species, migratory birds, seasonal plants, insects, and fungi that are using this site as a refuge. Regardless, the EIS should only be finalized when a proper study of the site is concluded. While this is a difficult process for all, a proper job must be done to ensure we reduce the impact from any of these options and to ensure that this document is correct when referenced in the future.

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28a. In its reply, the DNER considered the potential impacts of the proposed deconstruction and site restoration (Alternatives 4 and 5 for the purposes of the DEIS), assuming that these impacts are absent from the other alternatives to the project.

The DNER acknowledges that the NSF is facing funding limitations which may affect its continued operation of the Arecibo Observatory. However, based on its review of the information presented in the DEIS, and on the best information available from the standpoint of natural resources, the DNER understands that alternatives other than full or partial deconstruction and site restoration, especially the Preferred Alternative identified by the NSF (Alternative 1, above), could best serve the purposes of this project, since those alternatives will be performed, contingent on the availability of funds committed to this purpose, over an already developed footprint, and no significant impacts on natural and environmental resources under our jurisdiction should be expected as a result. Therefore, the DNER does not object the proposed changes to the operations of the Arecibo Observatory, on the basis of the information presented in the DEIS.

28b. However, in the event that either partial or full deconstruction and site restoration is finally implemented at the Arecibo Observatory site, an inspection of the area to be restored must be performed to determine the degree of the ecological disturbance and the appropriate restoration measures. It should be kept in mind that the degree of this ecological disturbance may range, from simply disturbing or removing the vegetation community, while soils are left mostly undisturbed, to areas where vegetation has been completely removed and soil conditions have become very different from the original. As stated in the available literature, ecological restoration may fail where environmental conditions are unforgiving or are not enriched due to inadequate nutrient concentration or aeration, more than to species interaction. (See Figure 16.1 in: Aber, John D. 1987. Restored Forests and the Identification of Critical Factors in Species-site Interactions. Pages 241-250 in: Restoration Ecology: A Synthetic Approach to Ecological Research. W.R. Jordan, III, M.E. Gilpin, J.D. Aber, eds. Cambridge, UK: Cambridge University Press.)

28c. Should a mitigation plan need to be implemented for either of the site deconstruction and restoration alternatives, it should have clearly defined goals and objectives, along with accomplishment indicators (for example, a 50%-80% vegetation prevalence, less than 5% cover of exotic or invading plants, and less than 20% plant mortality, all by the end of the first year). A 5-year (or longer) monitoring program for the mitigation should be implemented, with quarterly inspections during the first two (2) years, biannual inspections during the third and fourth years, and annually from the fifth year on. Also, mid-course corrections should be included, to be implemented if and when necessary.

28d. Also, if implemented, the deconstruction and site restoration project must comply with the following requirements: Deconstruction activities must comply with Law No. 267 of September 11, 1998, as amended, and with Regulation No. 7245 of November 9, 2006, which govern the Puerto Rico Coordinating Center for Excavations and Demolitions ("Centro de Coordinación de Excavaciones y Demoliciones de Puerto Rico").

28e. A forestation program using native tree species is recommended, in order to minimize erosion and to benefit local wildlife, consistent with the requirement of Law No. 97 of June 24, 1998 (in Spanish, "Ley para Fomentar la Siembra de Arbo/es Cuyas Frutas y/o Semillas Provean Alimento a Especies de Aves Silvestres de Puerto Rico"). Article 4 of Law No. 97, supra, states that for public and/ or privately funded forestation projects, a 15% of the total number of trees to be planted in rural project sites (or 10% for urban sites) must be tree species which provide fruits and/ or seeds as food source for wild birds residing temporarily or permanently in the project area.

28f. The SOP for the Puerto Rican Boa (Appendix 4.1-A of the DEIS; see Mitigation Measure No. 3, above) should include the following as Points of Contact (POC), to be called in the event of finding Boas, Racer Snakes (particularly *Borikenophis portoricensis*, formerly under genus *Alsophis*), and other snakes at the Arecibo Observatory site, so that these reptiles can be safely relocated:

§ DNER Ranger Corps Regional Office, Arecibo: (787) 880-0656.

§ DNER Ranger Corps Headquarters, San Juan: (787) 724-5700.

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§ DNER's Habitats and Biodiversity Research and Conservation Bureau, Terrestrial Ecology Division: (787) 772-2028. This office should be contacted only in the event that the Ranger Corps cannot be contacted, and only during DNER working hours: Monday to Friday, 7:30 AM-12:00 PM, 1:00-4:00 PM (AST/EDT).

28g. In the event that deconstruction and site restoration is finally implemented, land ownership must be determined for all or part of the lands to remain at the Arecibo Observatory site. Should it be decided that the ownership of these lands must be transferred to the Commonwealth of Puerto Rico, options to be considered include fee simple land transfer to the DNER or to a qualified organization whose activities are consistent with recreation and/ or wildlife conservation purposes, among others. A Conservation Easement might need to be constituted, pursuant to Law No. 183 of December 27, 2001, as amended, known in Spanish as "Ley de Seroidumbre de Conseroación de Puerto Rico". A certified copy of the corresponding Cession and Transfer Deed would need to be presented to the DNER, along with a copy of the Act of Presentation in the Property Registry, located under the Puerto Rico Department of Justice, for compliance with Regulation No. 8816 of September 19, 2016, the New Regulation for the Acquisition of Real Estate and Property Rights.

28h. Please note that other aspects noted by the DNER in its letter of July 21, 2016, still need to be considered in the event that site deconstruction and restoration is implemented. These aspects include: the location of the Arecibo Observatory site within the Rio Abajo Karst Conservation Priority Area and the Restricted Special Planning Area of the Puerto Rican Karst (APE-RC), including its Buffer Zone; zoning as a "Non-residential, General" ("Dotacional General", DT-G) district, surrounded by Resource Conservation (CR) and Resource Preservation (PR) zoning; and location within the Caonillas-Dos Bocas Forest Legacy Area, with important environmental values that need to be protected. We should also note that the Arecibo Observatory lands are within the lands designated as part of the Puerto Rico Model Forest ("Bosque Modelo de Puerto Rico"), as per Article 4 of Law No. 182 of November 3, 2014. Law No. 182, supra, declares as Commonwealth policy the conservation and sustainable development of the ecological and forest landscape of the region thus designated, under a participation model where the local communities, the Commonwealth government, the academy, commerce and industry, professional or trade associations, private entities, farmers, natural resource advocacy groups, and non-profit service providers, among others, develop working alliances for conservation, food security, sustainable economic production and social improvement, within a participatory governance framework.

43. At the moment, the sinkhole in which the Observatory is situated is kept from flooding by diesel-powered pumps. If the site were to be completely abandoned, the habitat would not, as incorrectly claimed in the EIS, be protected by woody growth. It would, in actuality, become a tepid pool, drowning the rare ferns and any other flora and fauna, and potentially becoming a breeding ground for mosquitos that could spread infections to the local community. The EIS needs to be re-visited to assess this overlooked risk of habitat destruction and possible risk to public health in scenarios 4 and 5 (partial and complete demolition).

54b. Why was the no-action alternative (ES 4.6) not considered? How can this not be preferred from the point of view of minimizing environmental impact since other alternatives all come with negatives and few, if any, positives?

56d. 4. Endangered Species

The DEIS contains information about federally listed endangered and threatened species that are possibly found in the area of the Observatory. Several confirmed species of interest present - including the local boa snake, the nests of several hawk species, and possibly certain ferns living in the shade of the radio dish - are discussed, and limited practices and mitigation plans are set out for addressing possible impacts to them from the alternatives studied. At points throughout the DEIS, NSF states that it is consulting with, continues to consult with, or plans in the future to consult with the United States Fish & Wildlife Service ("FWS") on species and impact issues raised by the Observatory alternatives.

Despite the consultations and analysis to date, we believe the approach on species by NSF in the DEIS is flawed. The DEIS relies initially and heavily in Section 3.1.5 (Threatened and Endangered Species) and Section 3.16 (Migratory Birds) on the IPaC Trust Resources Report for identifying potential species and wildlife of concern in this region. This screening- level report, however, is described by FWS as being for information purposes only and not to be used for analyzing project-level impacts. For projects that require FWS review or concurrence, a party is supposed to request an official species list from FWS either through the Regulatory Documents page of its website or directly otherwise.

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In this case, it appears that NSF has not requested an official species list from FWS. Thus NSF may be over-relying on a general starting point screening tool, after which normally a study, official list, and/or biological opinion would follow. The IPaC Trust Resources Report itself states that it is not to be used alone for planning for or analyzing specific project effects on species. Aside from the other referenced consultations described generally in the DEIS (along with information on several known/confirmed/observed forms of protected flora and fauna, for which certain mitigation techniques and measures are outlined), what else has NSF specifically done now to assure that no other such endangered species are actually to be encountered and impacted at Arecibo? What additional plans need to be made up front, instead of putting them off "down the road" into the future, in order to have fully analyzed this important area of environmental impact before selecting a chosen EIS alternative and then a ROD based thereon?

A full biological assessment and biological opinion should take place now rather than later just before field work is undertaken in one way or another, to better understand site conditions and issues today and strengthen the NEPA process and NSF result. See 50 CFR Part 401.

"A biological assessment shall evaluate the potential effects of the action on listed and proposed species and designated and proposed critical habitat and determine whether any such species or habitat is likely to be adversely affected by the action, and is used in determining whether formal consultation or a conference is necessary. ... The procedures of this section are required for Federal actions that are "major construction activities".... The biological assessment shall be completed before any contract for construction is entered into and before construction is begun. Id. at § 402.12.

Almost all of the alternatives proposed and considered by NSF in the DEIS involve site actions with potential, or yet-unknown, species impacts. (The current plan also does not seem to call for a full-time biologist to be present on-site later during work, much less fill such gaps now.) Therefore, more needs to be done up front to assess these potential impacts and plan for their avoidance and/or mitigation in agency decision-making to come, and not to put off those next steps. Thus, we recommend that, prior to finalizing the DEIS:

A. NSF request an official species list from FWS, if not done already, for more knowledge and assurance as to potentially impacted species in Arecibo (and possibly other parts of Puerto Rico as may be affected by off-site activities under these project alternatives); this work should appear in a new DEIS.

B. NSF prepare or have prepared additional species assessments or biological opinions, under the consultation procedures of Section 7 of the Federal Endangered Species Act of 1973, 16 U.S.C. § 1536, or otherwise, including study in the unique environment beneath the 50+ year old radio dish; NSF should meet all other requirements and best practices in this area !!!!!. in order to better inform the overall process and results. See 40 CFR § 1508.27(9).

72d. • As there may be potential for landscaping after removal of structures on site, EPA's GreenScapes program provides cost-efficient and environmentally friendly solutions for landscaping. For additional information, please see: <http://www.epa.gov/wastes/conservation/tools/greenscapes/index.htm>

Responses:

8a. The text in Section 3.1 has been revised to reflect the results of the summer 2016 site visit, observations made during the January 2017 vegetation survey and USFWS's site visit, and information provided by USFWS regarding Puerto Rican broad-winged hawk territories and the potential for multiple territories to overlap on Arecibo Observatory. Under Alternative 4, NSF has committed to delaying proposed work if an active nest is found with no visual screening between the nest and the 305-meter-diameter telescope dish or within 150 meters of the reflector dish with visual screening until after the young have fledged. Section 4.1.4 and Section 4.1.7 have been revised to reflect this. Under Alternative 5, NSF proposes to delay demolition if an active nest is found with no visual screening between the nest and the 305-meter-diameter telescope dish, towers, and anchors, or within 150 meters of the reflector dish, towers, and anchors with visual screening; demolition of infrastructure with the potential to affect nesting birds would not occur from the onset of nesting behavior until after the young had fledged. Section 4.1.5 and Section 4.1.7 have been revised to reflect this. Given the amount of time between issuance of the Record of Decision (ROD) and the start of work under the proposed Alternative, surveys for the Puerto Rican broad-winged hawk would not be completed until closer to the time that work will begin. To provide relevant information prior to the start of work, the appropriate timing for the surveys would be determined through additional consultation with USFWS, as specified in the ROD.

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- 8b. *Auerodendron pauciflorum* was eliminated from consideration based on its published elevation limits (below 100 meters in elevation, per USFWS, 1997) The Institute for Regional Conservation also identifies this species as a species of low elevations (Plantas de la Isla de Puerto Rico, <http://regionalconservation.org/ircs/database/plants/PlantPagePR.asp?TXCODE=Auerpauc>). The Observatory property does not include low elevations and the property is above 230 meters at its lowest point and over 300 meters everywhere except beneath the 305-meter-diameter telescope dish. Based on the natural history of the species, there is no reason to expect *Auerodendron pauciflorum* to occur on the Observatory property. Plant surveys conducted in January 2017 considered this species, and *Auerodendron pauciflorum* was not observed in the proposed work areas. Based on the survey results and the described natural history of the species, *Auerodendron pauciflorum* is retained as eliminated from consideration. The results of the survey have been incorporated into Section 3.1 and Section 4.1 of the EIS.
- 8c. Table 3.1-1 and Section 3.1.5 have been revised to reflect the information provided.
- 8d. The disturbed areas around the towers, around the tower and catwalk anchors, and beneath the reflector dish were surveyed for *Cordia bellonis* and *Solanum drymophilum* in January 2017 and these species were not observed in the surveyed areas. Around other structures, the areas that may be deconstructed are paved and gravel lots, landscaped lawns that are routinely mowed to a height from 2 to 6 inches, and planted foundation shrubbery. While *Cordia bellonis* and *Solanum drymophilum* may colonize previously disturbed areas, the impervious or highly maintained areas would not support the species and were not surveyed. The results of the January survey have been incorporated into Section 3.1 and Section 4.1 of the EIS and the discussion on potential occurrence has been revised to reflect the potential occurrence in disturbed but undeveloped areas.
- 8e. Because no protected plant species were observed in the proposed work areas, no mitigation is proposed at this time. However, disturbed areas would be re-landscaped or revegetated. If revegetated, native species would be used to the extent possible.
- 8f. NSF has committed to using native species to the extent possible, and any use of non-native vegetation would be limited to species that have been demonstrated as non-invasive.
- 8g. Use of off-site soil is unlikely under Alternatives 1, 2, 3, and 4. Any such needs under Alternatives 1, 2, and 3 would be limited to areas that would continue to be landscaped. These areas would be maintained to keep lawn grasses short and foundation shrubs healthy. It is unlikely that invasive species would become established or spread, given the frequency and intensity of maintenance activities.
- While the amount of demolition under Alternative 4 would be greater than under Alternatives 1, 2, and 3, the large infrastructure (towers and anchors) would not be removed. No deep disturbance would occur, and there would be no maintained landscaping. If off-site soil is needed, for example, to backfill a hole, NSF would commit to implementing an 18-month monitoring and control plan to prevent the establishment and spread of invasive species.
- Alternative 5 would likely require the use of off-site soil to backfill holes created by removing the towers and anchors. It is very unlikely that soil from the Observatory could be used to backfill these holes. To minimize the amount of off-site fill needed, NSF proposes to use the waste concrete from demolition of the towers and anchors for most of the backfill, limiting soil placement to the top of the backfill volume, at a depth comparable to the surrounding landscape. NSF would commit to implementing an 18-month monitoring and control plan to prevent the establishment and spread of invasive species.
- 8h to 8n. USFWS provided comments on the draft BA along with its comments on the DEIS. These comments are provided in Appendix 3.2A, but are not addressed in this response. Those comments were addressed through the ESA Section 7 consultation process. On June 23, 2017, USFWS issued a concurrence letter regarding the BA, including the determinations and the mitigation measures committed to by NSF. The findings of this letter have been added to Section 4.1 of the FEIS.

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80. NSF has considered the comments provided by USFWS and has worked with USFWS to complete Section 7 consultation for the Proposed Action. Section 4.1 of the EIS has been revised to reflect the results of vegetation survey, additional information provided by USFWS, and the resolution of the Section 7 process.
20. NSF has completed consultation with the USFWS regarding protected species that occur or may occur on the Observatory property. Surveys of areas with the potential to harbor protected species not previously recorded on the Observatory were completed in January 2017. NSF committed to further surveys and consultation with USFWS if Alternative 5 is selected, as that Alternative could entail impacts that cannot be adequately analyzed until after a contract is awarded and a work plan developed. On June 23, 2017, USFWS issued a concurrence letter regarding the BA, including the determinations and the mitigation measures committed to by NSF. Section 4.1 of the FEIS has been updated to reflect the results of the consultation process.
- 28a. NSF acknowledges that DNER has no comments with regard to Alternatives 1, 2, and 3 and responds to the comments on Alternatives 4 and 5 in Responses 28b and 28c.
- 28b. As appropriate, soil to be planted would be augmented with nutrients, organic matter, or bulking agents to provide an appropriate medium for root establishment and subsequent growth of the species selected for planting.
- 28c. The undeveloped portions of the Observatory property contain a mix of native and naturalized species. Any restoration would use native species to the extent possible. NSF will develop and implement an 18-month monitoring and maintenance plan to use for “mid-course corrections” if issues requiring a management response arise. The monitoring and maintenance plan would be developed in coordination with DNER and USFWS.
- 28d. Excavation and demolition will comply with Law No. 267 of September 11, 1998, as amended, and with Regulation No. 7245 of November 9, 2006, to the extent applicable to the action.
- 28e. NSF is committed to using native species in site restoration to the extent practicable.
- 28f. These contacts have been added to the SOP.
- 28g. At present, NSF does not foresee a transfer of the land to the Commonwealth of Puerto Rico, under Alternatives 4 or 5. If such a transfer occurs, NSF would work with DRNA and the Commonwealth to establish the details of the transfer, including a conservation easement, if appropriate.
- No changes to the document were made as a result of this comment.
- 28h. If site restoration is necessary under the selected Alternative, the site would be restored to natural habitats to the extent practicable. No appreciable impacts to karst would be expected.
- No changes to the document were made as a result of this comment.
43. The area would not become a pool if the pumping is stopped. The pump protects the man-made infrastructure and electrical components beneath the reflector dish to keep the Observatory operational. The karst beneath the reflector dish is connected to groundwater and any flooding from removal of the pump would be temporary, with the water draining quickly to the subsurface.
- Water would not pond long enough to adversely affect the vegetation community. The Observatory property has multiple sinkholes that briefly pond following major precipitation events. These sinkholes contribute to the diverse native vegetation community. A similar process would occur beneath the reflector dish if pumping were discontinued.
- Water would not pond long enough for mosquitoes to grow from egg to maturity, so there would be no increased risk of disease from increased mosquito vectors.

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No changes to the document were made as a result of this comment.

54b. The No-Action Alternative does not meet the purpose and need for the action because it would not result in a cost reduction by NSF. Therefore, the No-Action Alternative is not considered a feasible alternative. No changes to the document have been made with regard to this comment.

56d. A. The DEIS did not rely entirely on the IPaC Report for listed species information. The DEIS references and includes a letter from FWS identifying the species potentially occurring on or near the Observatory, and this serves as the official species list as required under ESA. The list of species identified by FWS is evaluated in the DEIS, not the list from the IPaC Report. The IPaC Report is cited because FWS recommends beginning any activity by reviewing the project through the IPaC website. NSF took that initial step and followed up with FWS to obtain the species list, as documented in the DEIS. Item A on Commenter's list was done prior to the DEIS being issued, as documented in the DEIS. NSF developed a BA and conducted consultation with FWS during the development of the EIS. On June 23, 2017, USFWS issued a concurrence letter regarding the BA, including the determinations and the mitigation measures committed to by NSF. Section 4.1 of the FEIS has been updated to reflect the results of the consultation process.

B. NSF engaged in consultation with FWS regarding Endangered Species Act compliance through Section 7 of the Act. This consultation process, including site surveys conducted during the consultation process, was documented in the FEIS. NSF developed a BA and conducted consultation with FWS during the development of the EIS. On June 23, 2017, USFWS issued a concurrence letter regarding the BA, including the determinations and the mitigation measures committed to by NSF. The mitigation measures agreed to with FWS through the Section 7 consultation process are identified in Section 4.1.7 of the FEIS and will be documented in the Record of Decision and implemented.

72d. Note: The weblink provided by EPA is now under an EPA archive website, with the note "EPA no longer updates this information, but it may be useful as a reference or resource." NSF is committed to using native species to the extent possible in revegetation of areas disturbed by demolition. No changes to the document have been made with regard to this comment.

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RESPONSE MATRIX FOR SUBSTANTIVE COMMENTS GROUPED BY TOPIC

Cultural Resources			
45.	Received from: Cariangeli León Moraza, Esq. (PR SHPO), 12-12-16	55.	Francisco Córdova, 12-12-16
47b.	Xavier Siemens, 12-13-16	88.	Carmen Pantoja (University of Puerto Rico), 11-16-2016
<p>Comments:</p> <p>45. We acknowledge receipt of your documentation describing five proposed changes to the operation of the Arecibo Observatory; a property listed in the National Register of Historic Places at the national level of significance. We believe all five alternatives, including number 3 (which would change the character of the property's use for an indefinite period of time), meet the criteria of adverse effect. As such, we recommend you notify the Advisory Council on Historic Preservation (Council), pursuant to 36 CFR 800.G(a)(1), and continue consultation with the consulting parties to seek ways to resolve adverse effects. Considering the strong island wide interest in this undertaking and the national significance of the Arecibo Observatory, we recommend you invite the Council to participate in the consultation. Please include the SHPO project number in any future correspondence. If you have any questions, please contact Berenice Sueiro (bsueiro@prshpo.pr.gov) or Miguel Bonini (mbonini@prshpo.pr.gov) at our Office. You may also contact us by phone at (787) 721-3737.</p> <p>47b. In our response to the scoping notice dated June 23rd 2016 we requested that certain issues related to human and cultural environment be addressed in the EIS. Section 3.2 defines the region of influence (ROI) for cultural impacts as the property boundary of the observatory, and section 3.9 defines the ROI for population, housing, employment, economy, and income as the municipality of Arecibo. However, the human and cultural environment of the Arecibo Observatory goes well beyond the ROI considered in the report.</p> <p>55l. We also request the following:</p> <ul style="list-style-type: none"> • A complete archeological site survey be performed as part of the official EIS process. This will ensure no critical historic archaeological artifacts are on the site (or in the general vicinity). No facts or data were provided to specify why this was omitted from the DEIS. Understand this is also a requirement of Section 106 of the National Historic Preservation Act. <p>55q. Comments associated with Section 106 – National Historic Preservation Act</p> <ul style="list-style-type: none"> • Pursuant to Section 106 of the historic preservation act, we request that Arecibo be treated as a National Landmark, not just as a district within the national registry, since a submission for the Arecibo site has already been performed in 1989 for its consideration as a national landmark by Harry A. Butminsky of the National Park Services. A separate note to the Advisory Council on Historic Preservation Office of Federal Agency Programs will be sent making this request as well. <p>55r. The current mothballing process as it has been detailed in the DEIS does not comply with the State Historic Preservation Office Mothballing guidelines. We request that this section be revised to ensure compliance. After reviewing the guidelines, we believe it to be highly unlikely for the Arecibo Observatory to comply with such guidelines, for which this option should be completely eliminated from the process, and a new DEIS issued taking into consideration only the appropriate viable alternatives.</p> <p>55s. In accordance with Section 106, ample notification to the public shall be given to ensure participation in these public meetings/events. As it was noted at the meeting held on Thursday November 17th, 2016, very little participation from the general public was present, mainly due to the lack of notification provided to the public by NSF. We request that new public meetings be performed with at least 8 weeks' notice to be clearly advertised in both Spanish and English in 3 local newspapers to Puerto Rico (both printed and electronic) as well as 3 national newspapers (both printed and electronic) in the United States. We believe this is critical not only to alert the local residents of Puerto Rico but the broader community in the United States, as the Arecibo Observatory is an international entity. This process should include a clear communication plan that also includes social media and printed media (flyers to be handed out in shopping malls</p>			

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across Puerto Rico). We also request that one of these events should be held on a Saturday or Sunday, to allow working residents of the Island to attend without impacting their current job responsibilities. Note that this also applies to the notifications for the Environmental Impact Statement and NEPA processes.

- 55t. Public notification when simultaneously performing the NEPA and Section 106 processes needs to be performed in accordance with Section 106 of the National Historic Preservation Act. We are not aware that public notification stating the combination of these 2 processes has been performed, thus violating Section 106 of the National Historic Preservation Act.
- 55u. Impact Boundaries of the Arecibo Observatory have not been clearly defined within the Section 106 process. We believe, that as an international research facility, these impact boundaries need to be extended at least to include the entire the Continental U.S.
- 55v. In accordance with Section 110 of the National Historic Preservation Act we request NSF to provide the preservation program for the Arecibo Observatory before continuing with either the EIS process under NEPA or any process associated with Section 106 or 110 of the National Historic Preservation Act. This program should be approved by SHPO and reviewed by the consulting parties before continuing with the Section 106 or Section 110 processes.
- Section 110(a)(2) requires that agency preservation programs be established "in consultation with the Secretary." Federal agencies seeking such consultation should contact the Associate Director, Cultural Resource Stewardship and Partnerships, National Park Service, Department of the Interior, 1201 Eye St., NW, Washington, D.C. 20005.
- 55x. We also request a new meeting in accordance with Section 106 of the National Historic Preservation Act.
- 88c. Arecibo Observatory is a historic property that is included in the National Register of Historic Places. There is no way to minimize or avoid or mitigate the adverse effects of deconstruction of a historical site of worldwide recognition and importance. The U.S. would lose an important historical place and the world will lose a historical place. That needs to be addressed.

Responses:

45. Response to SHPO letter: The ACHP was notified about the project numerous times between July 19, 2106, and May 26, 2017 and asked to participate in the consultation process. A new ACHP representative was established and invited to a conference call on May 5, 2017. During this conference call, ACHP verbally agreed to participate in the Section 106 consultation on the Programmatic Agreement, and in a letter to NSF dated May 26, 2017, ACHP formally stated its intent to participate. NSF conducted a follow-up call with ACHP and Puerto Rico SHPO on June 1, 2017. Additional consultation meetings that included ACHP and the Puerto Rico SHPO were conducted including the June 21, 2017 Consulting Parties teleconference and the July 6, 2017 in-person Consulting Parties meeting in Arecibo. NSF is continuing to coordinate with ACHP and SHPO through the Programmatic Agreement process. Section 4.2.3 of the FEIS was updated to find the effects from mothballing in Alternative 3 adverse under Section 106.
- 47b. The ROI for cultural resources is referred to as the Area of Potential Effects (APE). During a Section 106 Consultation Meeting on November 17, 2017, the Puerto Rico SHPO and Section 106 Consulting Parties agreed to the APE as the Observatory boundary. The APE boundary was defined in this way to encompass all areas where the Alternatives could affect the historic property of the NRHP-listed Arecibo Observatory historic district. No changes to the document have been made with regard to the APE definition for cultural resources. The NRHP nomination form notes that the property is considered significant nationally, but the property is generally acknowledged as an internationally important science facility. This information was added to the architectural resources subsection of Section 3.2 of the FEIS. A nomination for NHL status has not been submitted at this time.
- 55l. As noted in Section 4.2 of the DEIS, ground disturbance would be limited to activities associated with the deconstruction of buildings at the Arecibo Observatory. The soil in these areas has been disturbed by previous construction, so no intact archaeological resources would remain in the areas that would be disturbed. In addition, an unanticipated discovery plan would be in place prior to demolition to address the unlikely discovery of an archaeological resource during demolition. Section 106 does not require an archaeological survey but instead a "good faith" effort to identify likely historic properties. Per 36 CFR 800.4, "The agency official shall take into account ... the magnitude and nature of the undertaking..., the nature and extent of potential effects on historic properties, and the likely nature and location of historic properties within the area of potential effects."

The nature of the proposed project and the likely nature and location of historic properties that could be affected demonstrates that an archaeological survey

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would not be productive in this situation. In addition, the steep terrain and rock cliff face would preclude the ability to conduct a meaningful archeological survey outside the previously disturbed areas. No changes were made to the FEIS regarding archaeological impacts/effects.

55q. In consultation with the Puerto Rico SHPO, ACHP, and Consulting Parties, NSF determined that no additional evaluation or documentation was required for Arecibo Observatory at this stage of the Section 106 process. No changes were made to the FEIS as a result of this comment.

55r. The Puerto Rico SHPO has confirmed that the Commonwealth of Puerto Rico has no standards for mothballing. The SHPO follows the National Park Service guidelines for mothballing. If NSF considered selecting Alternative 3, NSF would consult with the SHPO and Consulting Parties to work out mothballing and preservation methodology and other ways to address impacts to historic properties. The NPS Preservation Brief 31, “Mothballing Historic Buildings,” applies specifically to historic buildings (Park, 1993). However, since a similar approach would be used to preserve certain historic instruments and structures at Arecibo Observatory, the term mothballing is used in this FEIS for historic instruments as well as historic buildings to indicate that they will be preserved and protected, and maintained in an operational readiness condition. Historic instruments and equipment at Arecibo Observatory would be protected and preserved in accordance with The Secretary of the Interior's Standards for the Treatment of Historic Properties (NPS, 1992), and the Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Buildings (Weeks and Grimmer, 1995). This explanation has been added to Section 4.2 of the FEIS.

55s. Section 106 does not specify public notification; public involvement is determined by the federal agency and depends on the nature and complexity of the undertaking and its effects on historic properties, among other factors. Public involvement activities for NEPA are defined in 40 CFR 1506.6 - Public involvement. Public notice and involvement regarding the undertaking included pre-assessment notification letters to agencies, social media announcements, website updates, scientific digests and blogs, newspaper public notices, and public scoping meetings (conducted on June 7, 2016 in San Juan and Arecibo). A Notice of Availability for the Draft EIS was announced in the Federal Register on November 1, 2016; the Draft EIS was posted on NSF’s Division of Astronomical Sciences website, and NSF announced the availability of the Draft EIS using social media. Public meetings were held on the Draft EIS (conducted November 16, 2017, in Arecibo and on November 17, 2016 in San Juan). A Section 106 consultation meeting was held after the Draft EIS public meetings (conducted on November 17, 2016 in San Juan), and a Section 106 (telephonic) consultation meeting with Consulting Parties was held (June 21, 2017). Both English and Spanish versions of media notifications and the materials distributed during the meetings were made available to the public. An English/Spanish interpreter was present during all in-person public meetings. NSF prepared a Draft PA and sent it out to the Consulting Parties and interested members of the public on June 23, 2017 for public review and comment. The Public Notice announcing the availability of the draft PA and the details of the public consultation meeting on July 6, 2017 was published in *El Nueva Dia* (June 28) and in *El Norte* (July 6). The Draft PA was also posted on NSF’s Division of Astronomical Sciences website for review and comment, and the June 28 and July 6 Public Notice advertised the availability of the draft PA on NSF’s website. Copies of the Draft PA were also available at the Biblioteca Electrónica Pública Municipal Nicolás Nadal Barreto and the Archivo General y Biblioteca Nacional de Puerto Rico.. NSF has reviewed the regulations and determined that sufficient public notice was provided. Furthermore, Section 36 CFR 800.2(5)(d)(2) describes public involvement as follows:

The agency official must...provide the public with information about an undertaking and its effects on historic properties and seek public comment and input.

With regard to the use of agency procedures, 36 CFR 800.2(5)(d)(3) states, “The agency official may use the agency's procedures for public involvement under the National Environmental Policy Act or other program requirements in lieu of public involvement requirements in subpart B of this part, if they provide adequate opportunities for public involvement.” The table showing Section 106 correspondence and consultation was updated in the FEIS.

No change was made to the FEIS as a result of this comment.

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- 55t. NSF did not combine NEPA and Section 106 (that is, NEPA “in lieu of” Section 106), as stated in Section 3.2 of the DEIS. Therefore, the notification alluded to is not required. 36 CFR 800.8 allows federal agencies to coordinate compliance with the two regulations, including planning their public participation in such a way that it can meet the purposes and requirements of both statutes in a timely and efficient manner. Consequently, the Notice of Intent was published in the *Federal Register* on May 23, 2016, and the Section 106 meetings were announced in the *Federal Register* notices for both the scoping meetings (June 2016) and the DEIS meeting (October 2016). No change was made to the FEIS as a result of this comment.
- 55u. Under Section 106, the impact area is the Area of Potential Effects (APE), which is defined as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties. For this project, the APE is defined as the property boundary of the Arecibo Observatory, which includes 118 acres of land. The boundaries of the Observatory property were determined as the APE by NSF as the federal agency. The APE encompasses all areas where the proposed Alternatives could occur, as well as all of the Arecibo Observatory National Register of Historic Places-listed historic district. There is no potential for historic properties outside the APE boundary as presently defined to be affected by the project. The APE was discussed during the November 17 Section 106 Consultation Meeting and no objections were raised. No change was made to the FEIS as a result of this comment.
- 55v. At this juncture, NSF needs to first determine whether NSF will select one of the proposed Alternatives before determining how to address Section 110. No change made to the FEIS.
- 55x. Several Section 106 Consultation Meetings have occurred: November 17, 2017, June 21, 2017 (teleconference), and July 6, 2017 (in-person at Arecibo). Another Consulting Parties teleconference is scheduled for July 13, 2017. The Table of Section 106 Consultation has been updated in Section 3.2 of the FEIS.
- 88c. 36 CFR 800 directs a federal agency to “avoid, minimize, or mitigate adverse effects on historic properties.” If there is an adverse effect, the federal agency must consult with the SHPO and others to resolve those adverse effects. Mitigation is required if there is an adverse effect. The type and amount of mitigation should be considered relative to the severity of the adverse effect and the significance of the historic property affected. For instance, for a very important property that would experience a substantial adverse effect, a greater amount of mitigation would be appropriate. There are ways to avoid and minimize deconstruction (demolition) – avoidance would be done by implementing another alternative, one that does not include demolition; minimization would also be achieved through implementing another alternative, one that includes less demolition. Mitigation for demolition of Arecibo Observatory would be agreed to through the consultation process, and the final decision reached on the types of mitigation that would be implemented would be stipulated in a Programmatic Agreement, which is a legally binding document. No change was made to the FEIS as a result of this comment.

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RESPONSE MATRIX FOR SUBSTANTIVE COMMENTS GROUPED BY TOPIC

Geology	
57. 62.	<p>Received from: Robert Minchin, (12-12-16) Michael Nolan, (12-12-16)</p>
<p>Comments:</p> <p>57. It is clear that many of the mitigation measures mentioned in ES6 have the potential to substantially increase the cost and timescale of deconstruction. In order to properly inform decision making, the geophysical survey work would need to be undertaken before a final decision is made on deconstruction, not after deconstruction has been decided upon, and would need to be capable of identifying hidden karst features. The full EIS should include such a survey.</p> <p>62b The Draft Environmental Impact Statement states that explosives could cause damage to the karst terrain in a way such that “Impacts to underlying geology would be moderate, adverse, and long-term”. As the karst system is protected under Puerto Rican law, such damage would be unacceptable. The large concrete structures on site are, by design and construction, well-coupled to the underlying terrain, so that it would be impossible to restrict explosive shocks to the structures without affecting the underlying karst terrain.</p>	
<p>Responses:</p> <p>57. While specific geophysical information is not available for analyses in the EIS, underlying karst features were assumed to be present for both the estimation of demolition costs and the analysis of potential impacts from the implementation of the proposed Alternatives. Additional geotechnical information would not substantially change the predicted impacts.</p> <p>No change has been made to the document based on this comment.</p> <p>62b. The DEIS states that localized impacts to underlying karst are predicted for the proposed Alternative that involves the use of explosives. However, whether, and to what extent, any use of explosives may impact underlying karst cannot be determined until a specific demolition plan is developed detailing how the explosives would be used. Such a plan would be developed only if Alternative 5 is selected and would be developed by the contractor prior to use. The purpose of the NEPA documentation is to provide sufficient information for the decision-maker to make an informed decision. The current text identifies potential impacts to the karst system, thereby allowing for that consideration by the decision-maker.</p> <p>No change has been made to the document based on this comment.</p>	

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RESPONSE MATRIX FOR SUBSTANTIVE COMMENTS GROUPED BY TOPIC

Hazardous Waste			
	Received from:		
26.	Judy-Ann Mitchell, 12-13-16 (duplicate of comment 72)	59.	Robert Minchin, 12-12-16
54.	Joanna Rankin, 12-12-16	72.	USEPA (Judy-Ann Mitchell), 12-13-16
56.	Robert Steele, 12-12-16		
Comments:			
<p>54i. Similarly, the impacts of the use of hazardous materials (explosives) in deconstruction are not adequately addressed with regard to water and vegetation.</p> <p>56a. A.NSF cause CH2M to update and revise the EBS not only to make it more current, but also to reach a more accurate "REC's-found" conclusion; this work should appear in a new DEIS.</p> <p>B. NSF cause CH2M to carry out a Phase II Environmental Site Assessment, with that investigation to include soil and groundwater sampling and possibly soil gas/vapor intrusion testing, at both of these REC locations.</p> <p>C. Depending upon the results of the Phase II work, regardless of the differences among future alternatives considered, NSF should carry out necessary environmental response actions now; these steps could include removal and/or replacement of failed equipment, treatment or removal of impacted soil as needed from these locations, and other appropriate measures.</p> <p>D. NSF use these actions and additional environmental information to strengthen and complete the EIS and resulting Record of Decision ("ROD") on which later NSF decision- making will be based.</p> <p>56b. Asbestos and Lead-Based Paint. Many of the buildings and structures that make up the Observatory are of an age and construction that make them rife with asbestos-containing materials ("ACM") and other hazardous components. The EBS refers to a 2005 site study by a contractor that found ACM in buildings 1, 2, 3, 4, 6, and 17, and another 2007 study that found lead-based paint ("LBP") in many of the same and additional buildings and structures. Further details about ACM and LBP locations and descriptions appear in the EBS and DEIS. No records indicate any ACM or LBP abatement done in the past at the Observatory other than some area re-paintings. Also there appears to be no discussion in the DEIS of any ACM Operation and Maintenance ("O&M") plans existing there now to manage asbestos in place and protect human health from exposure to friable asbestos fibers. An O&M plan is required even when the law does not mandate removal of ACM from occupied structures. Every project alternative for the Observatory studied by NSF in the DEIS involves significant destruction and demolition of buildings, except for the No-Action option and to some degree the Alternative 3 Mothballing. In each case the DEIS notes that updated and specific ACM surveys must be done before deconstruction occurs at any building under any option selected. For ACM found and to be disturbed, abatement must be accomplished first in order to protect health and the environment and to comply with applicable laws and rules of the Environmental Protection Agency ("EPA"), the Occupational Safety and Health Administration ("OSHA"), and their Puerto Rican counterparts. See, e.g., 29 CFR § 1926.62. However, even for buildings that would remain on-site under mothballed conditions or in continued use under the 1, 2, and No-Action Alternatives, information is still needed as to current ACM and LBP conditions and ongoing potential exposures or releases. Thus, determination of friable material locations/deterioration/repairs/management should receive more attention in the impact assessment process now. Finally, disposal of ACM and LBP wastes is discussed in the DEIS by simply noting that Ponce Landfill - operated by Republic Services and located some 39 miles by road route from the Observatory - has the capacity to take all of the potential ACM/LBP waste generated by any alternative of this project. That permitted landfill is authorized to accept such special waste in addition to ordinary debris and solid waste, but the DEIS does not mention what waste analysis is required for disposal. Section 4.6 of the DEIS then presents estimates, based on those prior studies, of quantities of ACM and LBP waste to be generated by deconstruction under each of the analyzed alternatives. For example, metric tons of ACM abatement waste are thought to range from 0 under the Mothballing and No-Actions plans up to 260 for Alternatives 4 and 5 involving partial or complete destruction. Similarly, LBP waste produced could vary from 0 to 80 metric tons under these alternatives.</p>			

59. If demolition is carried out on-site of buildings, such as Building 2, that have been identified in the Environmental Baseline Study as containing hazardous substances such as lead and asbestos, it will be necessary not only to engage in runoff control to prevent erosion but to trap water that may be contaminated with hazardous substances until it can be treated.
- 72b. The DEIS addresses hazardous and solid waste management practices properly, however there is very limited discussion of any potential sustainability, recycling and re-use practices that could apply during deconstruction activities for the Agency preferred Alternative. You may wish to add or consider the following information to sections 4.5 and/or 4.6 where applicable.

Responses:

- 54i. No impacts to biological or water resources would result from the use of explosives in demolition under Alternative 5. Explosives would be limited to small shaped charges inside of structures that would be no larger than necessary to remove structural supports. This work would follow standard demolition techniques. No explosives or explosive residues would be released into the environment.
- No change to the document was made as a result of this comment.
- 56a. A. The oil-water separator and septic tank/leach field system were flagged as areas of concern in the EBS because of the materials handled and age of the facilities. These facilities were not identified as RECs because the EBS site walk and records search did not identify concrete evidence of releases to the environment from these facilities. It is normal to identify these types of structures as areas of concern instead of RECs without concrete evidence of a release.
- B. Unless there is a change in ownership/control of the property, there would be no need to conduct a Phase II investigation, as those investigations are completed for real estate transfers. The EIS process is not intended to identify studies that may need to be performed in the event that a new operator commences management of Arcibo; rather, NSF will determine what studies are appropriate, if any, in the event a new operator manages Arcibo.
- C. Whether, and to what extent, any remediation actions need to be implemented is dependent on the proposed Alternative selected. To implement such actions in advance of the decision would constitute an irrevocable commitment of resources that is not warranted prior to the decision being made. The ROD will specify whether any such actions are necessary prior to the selected action being undertaken.
- D. Based on the previous responses, no changes to the EIS have been made based on these comments.
- 56b. A. Arcibo Observatory has an approved O&M plan in place to address hazardous materials/wastes at the facility. This plan was not discussed in detail because it has no bearing on the final decision. Under the proposed Alternatives where the Observatory would remain operational or be mothballed, the plan would remain in effect, and it would be unnecessary under the proposed Alternatives that result in discontinuation of the operations at the Observatory. NEPA does not require inclusion and discussion of information that will not influence the decision to be made. No changes have been made to the document based on this comment.
- B. The Arcibo Observatory has an approved O&M plan in place to address hazardous materials/wastes at the facility. This plan was not discussed in detail because it has no bearing on the final decision. Under the proposed Alternatives where the Observatory would remain operational or be mothballed, the plan would remain in effect, and it would be unnecessary under the proposed Alternatives that result in discontinuation of the operations at the Observatory. NEPA does not require inclusion and discussion of information that will not influence the decision to be made. No changes have been made to the document based on this comment.
- C. The Ponce landfill was contacted during development of the DEIS. The landfill staff confirmed that it regularly accepts these wastes for disposal and has the capacity to accommodate any such wastes generated under the considered Alternatives. The information provided by the landfill staff is sufficient to support the decision to be made and detailed analysis of the potential for disposal of LBP and ACM is not warranted. No changes have been made to the document based on this comment.

59. The EIS states that abatement procedures will be followed according to regulations if testing identifies ACM or LBP. These procedures include steps to prevent the spread of ACM and LBP during the abatement process. No changes have been made to the document based on this comment..
- 72b. Comment regarding hazardous materials is noted. The recommended approaches have been included in the biological resources (Section 4.1), solid waste (Section 4.6) sections of the EIS, and in Section 1.6 where air quality is discussed, and the text indicates the approaches would be implemented where feasible.

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RESPONSE MATRIX FOR SUBSTANTIVE COMMENTS GROUPED BY TOPIC

Solid Waste	
26. 72.	<p>Received from: US EPA (Judy-Ann Mitchell), 12-13-16 (duplicate of comment 72) US EPA (Judy-Ann Mitchell), 12-13-16</p>
<p>Comment:</p> <p>72c. Recycling and/or reuse of construction and demolition (C&D) material can lessen the impacts of increasing disposal at solid waste facilities. The project should incorporate recycling, reuse and disposal options for C&D waste associated with deconstruction/demolition as appropriate. You may find more detailed information about recycling of C&D waste at: http://www.epa.gov/osw/conserv/imir/cdm/recycle.htm.</p>	
<p>Response:</p> <p>72c. The DEIS included a commitment to recycling and reuse to the extent practicable. This commitment is included for each evaluated Alternative in Section 4.6. Because implementation will be substantially later than the NEPA decision, the specifics of potential recycling and reuse cannot be known at this time. The commitment to recycling and reuse will be retained through the FEIS.</p>	

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RESPONSE MATRIX FOR SUBSTANTIVE COMMENTS GROUPED BY TOPIC

Safety			
	Received from:		
11.	Michael W. Busch, 11-14-16	52.	Patrick A. Taylor, 12-12-16
18.	Nicholas White	54.	Joanna Rankin, 12-12-16
39.	Robert Minchin, 12-12-16	55.	Francisco Córdova, 12-12-16
49.	Anne Virrki, 12-12-16	85.	Luisa Zambrano,
Comments:			
11.	<p>The Public Safety section grossly misrepresents both the asteroid impact hazard and Arecibo's role in addressing it. As the draft section does correctly not, there is perhaps a ~10% chance of an asteroid sufficiently large to cause regional-scale damage (>50-100 m in diameter) impacting Earth in the next few hundred years. However, directly contrary to incorrect statements made in the draft section: the extremely high precision of Arecibo radar ranging is critical to rule out or to identify potential impacts decades to centuries in advance. This has been demonstrated in many cases, including those of the asteroids Apophis (potential impacts throughout the 21st century now ruled out), Bennu (potential impacts during 2175-2200), and 1950 DA (potential impact in 2880). No other current or expected facility has comparable capabilities to Arecibo in terms of long-term asteroid trajectory prediction. Also contrary to incorrect statements made in the draft section, there are multiple technologies in development to deflect any asteroid that is found to be on an Earth-impacting trajectory onto a non-impacting trajectory. Two such technologies are to be tested on by upcoming space missions: gravity tractor deflection, by NASA's Asteroid Redirect Mission; and kinetic impactor deflection, by the joint NASA and ESA project AIDA. For both missions, Arecibo radar observations of the target asteroids will be required to demonstrate that they have been deflected as intended. This makes the continued operation of Arecibo through the next decade critical to addressing the asteroid impact hazard. The current draft section does not mention either the Asteroid Redirect Mission or AIDA. This is a glaring omission. The section also unaccountably neglects to mention the Chelyabinsk impact of 2013. On 2013 February 15, a small asteroid, ~15-20 m in diameter, airburst in the atmosphere over the city of Chelyabinsk. 1491 people were injured due to the shockwave from the airburst. No one died, but that was strictly a matter of luck. The ATLAS survey and other optical observing programs now intend to provide days to a couple of weeks of warning for most future Chelyabinsk-like small impactors. There is a roughly 35% chance of such an event happening somewhere on Earth in the next 10 years (given an average event rate of 1 per 25 years). Contrary to statements in the draft section, in the event that such a small impactor is found with a week of notice, there are established civil protection procedures in place in many places to prevent injuries like those that happened in Chelyabinsk - either by evacuation or sheltering in place. NASA and FEMA have held a series of joint exercises over the past several years to verify such procedures for the United States, and similar efforts have taken place in several other countries. Regardless of where the next Chelyabinsk-like event happens, rapidly reducing the uncertainty in the upcoming impact location is crucial to implement civil protection. Arecibo radar observations would provide the exact impact location a few days earlier than any other facility could, giving the time necessary to prevent injuries or deaths. An approximate estimate of the positive benefit to public safety of continued radar observations at Arecibo is a statistical few tens of lives saved each year due to the ~10% chance of identifying any upcoming large impact with decades to centuries of notice and enabling tests of asteroid deflection technology; and a few injuries avoided each year due to more rapid localization of the impact zone prior to any future Chelyabinsk-like impact event.</p>		
18a.	<p>I will focus my comments on the Planetary Radar, which the Draft EIS incorrectly summarizes the safety hazard. You may have read in the newspapers that last month NASA, the Federal Emergency Management Agency and other government agencies engaged in a planetary protection exercise at the NASA Jet Propulsion Lab to consider the potentially devastating consequences of a 330-foot asteroid hitting the Earth. While this may seem like science fiction, these events are a real possibility. One just has to remember the 2013 Chelyabinsk impact in Russia, which was caused by an object only ~20 meters across. Despite its relatively small size, it caused damage to 7,200 buildings and injured 1,500 people. How is this relevant to the discussion today? Well the Arecibo Observatory is the world's most powerful and sensitive radar system which is used to track these killer objects. It is a vital part of our planetary defense system. These hazardous asteroids are found</p>		

by optical telescopes that scan the sky looking for moving points of light. Once an Asteroid is found Arecibo Observatory within days turns its radar to pinpoint its orbit. Arecibo Observatory determines to better than 1 part in 10 million the path of the asteroid and whether it will or will not hit the Earth at some point in the future. Such is the precision Arecibo Observatory can predict the Asteroid orbits decades, even centuries into the future. The earlier we can find one of these killer Asteroids, the more time there is to deal with it. Many of these asteroid may go on to orbit the sun for decades, before their paths cross the Earth. In these cases, we will have time to send a spacecraft to deflect it well ahead of time. Even in the worst case scenario, when we find the Asteroid when it is already on a direct collision course, Arecibo Observatory allows us to predict the time and place of its impact and take action to save lives. I want to emphasize that there is no other dedicated capability to match Arecibo in the world today. The NASA Goldstone radar is also part of this Planetary Defense network, but has other demands on its time and is not as powerful or as flexible in scheduling. The recently commissioned 500m FAST radio telescope in China has no radar capability and so will not provide a capability to replace Arecibo in this critical area. The criticality of Arecibo Observatory has been recognized by the National Academies of Sciences. In a report published in 2010 [“Defending Planet Earth: Near-Earth Object Surveys and Hazard Mitigation Strategies”] the Academy recommended “Immediate action is required to ensure the continued operation of the Arecibo Observatory at a level sufficient to maintain and staff the radar facility”. This recommendation has resulted in NASA providing \$3.7M a year, through USRA, to enable this capability, fully one third of the total funding for the observatory. In 2005, the United States Congress passed the George E. Brown, Jr. Act that directed NASA to detect, track, and characterize near-Earth objects larger than 140 m in diameter. In 2010, the goals of the George E. Brown, Jr. act were incorporated in the National Space Policy of the United States of America that guides the NASA administrator to pursue capabilities, in cooperation with other departments, agencies, and commercial partners, to “detect, track, catalog, and characterize near-Earth objects to reduce the risk of harm to humans from an unexpected impact on our planet”. Shutting down the planetary radar operations at Arecibo Observatory will put lives and property at risk. NSF is the Federal steward for this facility and it is USRA’s expectation that NSF will maintain the national need to track and characterize Near Earth Asteroids. The DEIS fails to note all these critical facts and USRA requests that it be corrected.

39. If Arecibo is left relying, in whole or in part, on selling telescope time to fund its continued operation, this makes the purchase of time by METI (Messaging to Extra-Terrestrial Intelligence, also known as Active SETI) projects inevitable. Some scientists (e.g. <http://lifeboat.com/ex/shouting.at.the.cosmos>) have said this risks attracting the attention of more advanced and possibly hostile alien civilisations, which could lead to the extinction or enslavement of the human race. The EIS should therefore contain a risk assessment of METI transmissions under the assumption that these will go ahead if Arecibo Observatory is left to seek its own funding

49p. “Negligible, adverse, and long-term impacts to public safety could occur during operations, primarily resulting from the reduced capability to observe potentially hazardous near Earth objects (PHOs).”

The effect of the asteroid research in terms of public safety is treated in the DEIS (section 4.7.1.1.) in large part with misleading, naïve arguments. The Arecibo Observatory planetary radar system is a necessary asset for national and international security, both for tracking and the physical characterization of potentially hazardous objects and for validating impact mitigation technologies. The AST Portfolio review committee strongly encouraged NSF AST to continue to support the Arecibo planetary radar program. Several scientific boards and committees, including the decadal survey “Vision & Voyages for Planetary Science in the Decade 2013-2022,” endorse the capabilities of the Arecibo planetary radar system as unmatched, essential, and unique. Even several national laws, policies, and mandates require the continued operation of the planetary radar at Arecibo Observatory. All this is omitted in the DEIS. Once more, the discussion concerning the planetary radar in the DEIS is grossly misleading, disrespectful for the whole scientific community, and against the national principles on planetary defense.

52c. In Section 4.7.1.1, the document notes that Arecibo can only see roughly 30% of the sky. However, this limitation does not mean a minority of asteroids is visible from Arecibo. On the contrary, because asteroids are moving targets, they move in and out of Arecibo’s field of view as they pass by Earth. In fact, an internal NASA study led by Dr. Jon D. Giorgini of the Jet Propulsion Laboratory submitted as a white paper to the Vision and Voyages planetary science decadal survey found that Arecibo could detect more than 80% of potentially hazardous asteroids before they impact Earth. The draft EIS document’s implication that Arecibo is inefficient at detecting asteroids is false. The natural motion of asteroids combined with the unmatched sensitivity of the planetary radar system allows Arecibo to characterize dozens of potentially hazardous asteroids per year and dozens more that could cause destructive airbursts if they were to collide with Earth, e.g., the airburst over Chelyabinsk, Russia in 2013 that caused nearly 1500 injuries and damaged thousands of buildings. Removing the Arecibo planetary radar capability, leaving only the Goldstone Solar System Radar, would reduce the number of radar detected and characterized asteroids to roughly 30% of its current value. No facility can replace Arecibo in this respect.

- 52e. The document concentrates unnecessarily on an imminent, inevitable impact threat. Part of the Arecibo planetary radar system’s power is to extend predictions of an asteroid’s location decades or centuries into the future to determine potential long-term hazards to Earth such that there is ample time to plan necessary impact mitigation strategies (see the cases of asteroids 99942 Apophis and 101955 Bennu). The comparison of predicted impact frequencies to the lifetime of the observatory is irrelevant and misleading and should be removed.
- 54h. The draft EIS fails to address the secondary environmental effects of the deconstruction process itself, with heavy truck traffic on narrow local roads, and the associated effects on air quality and road maintenance. (1.6) ES 4.1 should address the impact on public safety of the deconstruction of 26 buildings and the associated removal of heavy materials via small roads. Road bed and road surface testing is needed to see whether the roads can still withstand such heavy loads between site and landfill and whether this meets federal requirements for public safety.
- 54j. A major oversight in the draft EIS is not addressing the congressional mandate to NASA to characterize hazardous near-Earth objects (NEOs). It is not scientifically justified to use the term negligible in the statement: “Negligible, adverse, and long-term impacts to public safety could occur during operations, primarily resulting from the reduced capability to observe potentially hazardous near- Earth objects (PHOs).”
- 55i. “This improved characterization and tracking has an impact on public safety only if there is a means of deflecting or disrupting objects on a collision course with Earth, which would be completely independent of Arecibo Observatory. The U.S. Government does not currently have such a capability.”
- This logic is similar to saying that the human race should stop studying the disease of cancer, because we have no way to cure it, that we should stop looking for other galaxies, because we have no way to reach them. It is the very essence of research to dive into the unknown, to accomplish what had never been accomplished before, in order to make our World a better one.
85. You know Arecibo. You receive annual reports of our work. You publish; you know. How can you publish a document that states “Minor or negligible impact to public safety by ceasing operations of the Radar Program”? Your office knows the system’s capabilities and its annual asteroids detections. Arecibo has participated in multiple asteroid and comet missions, such as Dawn Mission, NEAR-Shoemaker, EPOXI, JAXA, Hayabusa, and the recently launched OSIRIS-REx Mission, and helped recover the SOHO satellite. It will also help future deflection missions, including the ESA NASA Asteroid Impact and Deflection Assessment AIDA and the Asteroid Retrieval Mission.

Responses:

- 11, 18a. In coordination with NASA, the current conditions (Section 3.7) and the assessment of impacts (Section 4.7) have been revised to more fully consider the potential for public safety impacts should the 305-meter-diameter radio telescope cease operations. NASA also identified potential mitigation measures for the loss of the PHO characterization capability at Arecibo Observatory.
- There was no change in the expected magnitude of potential adverse impacts should the 305-meter-diameter radio telescope at Arecibo Observatory be removed. The potential impacts remain assessed as likely negligible.
39. At present, selling time to METI is not viewed as a likely outcome and probably would not occur under Alternative 1. The scenario described in the comment is considered implausible.
- No change to the document has been made as a result of this comment.
- 49p. Laws, policies, and mandates that require the continued operation of the planetary radar at the Arecibo Observatory are not relevant to the decision on reducing funding for the Observatory because they are not binding on NSF’s funding mechanisms. In coordination with NASA, the current conditions (Section 3.7) and the assessment of impacts (Section 4.7) have been revised to more fully consider the potential for public safety impacts should the 305-meter-diameter radio telescope cease operations. NASA also identified potential mitigation measures for the loss of the PHO characterization capability at Arecibo Observatory.

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There was no change in the expected magnitude of potential adverse impacts should the 305-meter-diameter radio telescope at Arecibo Observatory be removed. The potential impacts remain assessed as likely negligible.

- 52c, e. In coordination with NASA, the current conditions (Section 3.7) and the assessment of impacts (Section 4.7) have been revised to more fully consider the potential for public safety impacts should the 305-meter-diameter radio telescope cease operations. The revisions to Section 3.7 include a revised description of what the Arecibo Observatory telescope can observe and characterize. NASA also identified potential mitigation measures for the loss of the PHO characterization capability at Arecibo Observatory.

There was no change in the expected magnitude of potential adverse impacts should the 305-meter-diameter radio telescope at Arecibo Observatory be removed. The potential impacts remain assessed as likely negligible.

- 54h. The EIS includes information on the change in frequency of haul trucks and potential haul routes. Text has been added to the EIS transportation section to clarify that trucks would operate within the weight limits for roads used for hauling and that appropriate permits will be obtained if oversized vehicles must be used or if oversized loads must be transported.

- 54j. The Congressional mandate to NASA to characterize hazardous near-Earth objects is not relevant to the decision on reducing funding for the Observatory, because the mandate is not binding on NSF's funding mechanisms. In coordination with NASA, the current conditions (Section 3.7) and the assessment of impacts (Section 4.7) have been revised to more fully consider the potential for public safety impacts should the 305-meter-diameter radio telescope cease operations. The revisions to Section 3.7 include a revised description of what the Arecibo Observatory telescope can observe and characterize. NASA also identified potential mitigation measures for the loss of the PHO characterization capability at Arecibo Observatory.

There was no change in the expected magnitude of potential adverse impacts should the 305-meter-diameter radio telescope at Arecibo Observatory be removed. The potential impacts remain assessed as likely negligible.

- 55i. In coordination with NASA, the current conditions (Section 3.7) and the assessment of impacts (Section 4.7) have been revised to more fully consider the potential for public safety impacts should the 305-meter-diameter radio telescope cease operations. The revisions to Section 3.7 include a revised description of what the Arecibo Observatory radio telescope can observe and characterize. NASA also identified potential mitigation measures for the loss of the PHO characterization capability at Arecibo Observatory.

There was no change in the expected magnitude of potential adverse impacts should the 305-meter-diameter radio telescope at Arecibo Observatory be removed. The potential impacts remain assessed as likely negligible.

85. The Arecibo Observatory 305-meter-diameter radio telescope cannot discover asteroids and other near-Earth objects but it can characterize them. In coordination with NASA, the current conditions (Section 3.7) and the assessment of impacts (Section 4.7) have been revised to more fully consider the potential for public safety impacts should the 305-meter-diameter radio telescope cease operations. The revisions to Section 3.7 include a revised description of what the Arecibo Observatory telescope can observe and characterize. NASA also identified potential mitigation measures for the loss of the PHO characterization capability at Arecibo Observatory.

There was no change in the expected magnitude of potential adverse impacts should the 305-meter-diameter radio telescope at Arecibo Observatory be removed. The potential impacts remain assessed as likely negligible.

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RESPONSE MATRIX FOR SUBSTANTIVE COMMENTS GROUPED BY TOPIC

Socioeconomics					
	Received from:				
5.	Carlos Padín Bibiloni, 11-17-16	47.	Xavier Siemens, 12-13-16	61.	Robert Minchin, 12-12-16
6.	Luis Ortíz Ortíz, 11-16-16	49.	Annie Virkki, 12-12-16	74.	Ryan Lynch, 11-17-16
23.	Donald Campbell, 11-16-16	55.	Francisco Córdova, 12-12-16	88.	Carmen Pantoja, 11-16-16
30.	Joan Schmelz, 12-11-16	56.	Robert Steele, 12-12-16		
Comments:					
5a.	<p>My name is Carlos M. Padin Bibiloni, and I am the Chancellor of Universidad Metropolitana (UMET) and a member of the management team of the Arecibo Observatory. This statement reflects the views of Universidad Metropolitana and the Ana G. Mendez University System of Puerto Rico regarding the Educational and Public Outreach of the Arecibo Observatory and the socio-economic impact of the Agency-preferred Alternative (Alternative 1 - Collaboration with Interested Parties for Continued Science-focused Operations).</p> <p>It is our understanding that the role of the Arecibo Observatory in Puerto Rico and its impact on our education efforts and socioeconomic situation was not adequately reflected nor considered in the Declaration of Environmental Impact Draft Statement published by the National Science Foundation in October 2016. First, the five (5) alternatives presented in said document underestimate the impact of the Education and Public Outreach Program of the Observatory in Puerto Rico,</p>				
5b.	<p>and second, the Draft Statement does not recognize the significant role of the Arecibo Observatory on the economic development of the island.</p>				
5c.	<p>For over 53 years, the Arecibo Observatory has established a significant track record of scientific accomplishments in astronomy, planetary science, and space and atmospheric sciences. Its world-renowned scientists have served as mentors to many young scientists throughout the STEM pipeline in the United States. Here in Puerto Rico, and in contrast with many scientific research facilities in other locations, and particularly during these past five (5) years, the Arecibo Observatory and its surrounding society have established a close and significant partnership. The Government of Puerto Rico, through its Department of Education, has invested more than \$600,000 in training teachers in the use of the Arecibo Observatory in their classroom teachings. The Angel Ramos Foundation and the Ana G. Mendez University System have invested \$2.1 M to revamp the Science and Visitors Center because both partners are certain of the educational contribution of this cutting-edge research facility and its potential to positively impact the STEM pipeline in Puerto Rico. The Puerto Rico Infrastructure Financing Authority (AFI, for its initials in Spanish) also provided \$828,635 for infrastructure improvements at the Observatory. These actions all point to a real commitment of the people of Puerto Rico to the Arecibo Observatory.</p>				
5d.	<p>Another key aspect of the Arecibo Observatory is its role in the economic landscape of the island; specifically, in its impact on our tourism industry, the development of our Aerospace Cluster, and its broader impact on the development of a STEM workforce on the island. The Aerospace Cluster is part of the economic recovery strategy of the government of Puerto Rico, aimed at integrating aerospace manufacturers, providers and related institutions to develop strategies and foster synergies that will enhance the business environment in the areas where cluster members conduct their operations. Virtually overnight, Puerto Rico has become a magnet for some of the world's leading aviation and aerospace companies. With a long history of manufacturing expertise and a strong pipeline of engineering talent, the island has attracted multimillion-dollar investments by these and other major firms during recent years. The Arecibo Observatory is part of Puerto Rico, part of this strategy and a key asset for the development of this aerospace cluster. (See attached map for a visual representation of the Aerospace Cluster.)</p>				

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- 5e. The many activities implemented by the Education and Public Outreach component of the Arecibo Observatory evidences the broader impact of this research facility, which meets the goals of the agency to broaden the participation of underrepresented groups in STEM initiatives. Since October 2011, the Angel Ramos Foundation Science and Visitor Center at the Observatory has hosted more than 450,000 visitors; approximately 30% of these are school children. In addition, the activities hosted have included Saturday academies for high school students; Research Experiences for Undergraduates (REU) projects sponsored by NSF; Observation nights in consortia with the Puerto Rico Astronomy Society, which attract more than 700 participants per event; research opportunities as part of undergraduate capstone/practicum courses from various local higher education institutions; and mentoring for theses (master and PhD level). In addition, the creation of the Arecibo Observatory Council of Chancellors and Stakeholders has enabled different universities to come together to use, promote, and create innovative programs that broaden the opportunities for students across the island to become part of a nationally recognized research institution. These opportunities create the real, meaningful pathways that increase the STEM workforce.
- 5f. The Agency-preferred Alternative includes the deconstruction of over 26 buildings at the site and implies the elimination of the planetary radar, and the space and atmospheric science capabilities at the Arecibo Observatory. These actions will negatively impact the promotion of the aerospace cluster and will limit the possibilities of the Arecibo Observatory Management Team to pursue other sources of income for the financial stability of this outstanding research facility.
- 5g. This alternative will also limit the educational research opportunities for undergraduate and graduate students, the space academy and all active and current educational activities. Furthermore, eliminating most of the housing at the site will reduce the opportunities to host scientists, teachers, and students who avail themselves of these options due to the geographical and logistic challenges related to the location of the site.
- 5h. We feel it is imperative that the DEIS explain in more detail the impact of the alternatives on the Education and Public Outreach component of the Observatory, the local economy, and the science that only occurs at Arecibo.
6. I would like to point out that the Puerto Rico Industrial Development Company's business development program to attract Aerospace companies has benefited from the Arecibo Observatory. Closing this research institution will not serve the interest of the people of Puerto Rico and it will be a setback in establishing this sector as a main contributor in the economic development of the Island.
- For many years, the Arecibo Observatory stood proud but somewhat isolated from the economic development of the Island. But in 2007, the stakeholders began to incorporate the research capability of the institution to attract innovation-driven companies mostly in aerospace. In ten years, the industry grew from less than 1,000 employees to 5,000 employees.
- Today, it is anticipated that this sector will double the number employees in a 5-year period. Companies in the space subsector will contribute the most and are the one that requires ground support to receive communications from the satellites as well as space weather data and analytics to assist in their missions. The Arecibo Observatory has the capability and the talent to assist this new breed of companies looking at space for commercialization. We certainly understand NSF's financial concerns in keeping the facility open for research and education but the center has been both a symbol and a driver for innovation to many Puerto Rican students in their pursuit of science and engineering knowledge. Therefore, it is time to reinvent the business model of the center to meet the challenges of the scientist community and to become active participant of the business innovation community.
- Closing is not the answer. Changes must be instituted. New services and educational activities must be incorporated.
- PRIDCO supports Alternative 1 with a new and sustainable operation of the Arecibo Observatory in a manner consistent with the principles of the NSF. Given a short period of time the center will flourish and will continue to be an economic development tool for the betterment of Puerto Rico and humankind.
- 23h. Socioeconomics: While I appreciate that this is an environmental impact statement, the discussion of the impact of the loss of 136 (Alternative 5) or 130 (Alternative 4) jobs on the employees themselves, the nearby local communities and the municipality of Arecibo is particularly poorly done. While the number may “only” be about 1% of the labor force in the Arecibo area as stated, these are well paid jobs in relation to the local norm, many of them very well

paid, and, typically, each such job in a community supports one more. Their loss would be more than a “negligible, adverse, long-term impact to employment and income” as stated in the DEIS. 1% is important and will have a detrimental effect on the local economy, one that is already suffering severely. If 1% of the jobs in the United States, about 1.5 million, were suddenly lost it would be regarded as a national disaster. On the issue of the employees themselves, the EIS should at least acknowledge the very serious impact on them from losing their jobs, a large number of them have worked for the Observatory for decades. Many of them have undoubtedly read the DEIS and must be left with the feeling that the NSF just does not care about them.

30a. The STEM Education Mission of Arecibo Observatory

Executive Summary: Arecibo Observatory runs STEM education programs at many different levels. The scientific staff are intimately involved in the delivery of these programs. Much of this activity has been ignored in the draft Environmental Impact Statement (EIS), leading to an under-assessment of the socioeconomic impact of the various Alternatives.

Finding 1: The scientific staff are essential to the educational mission of the Arecibo Observatory.

Finding 2: The draft EIS is inconsistent in assuming that the scientific staff will remain employed at the Observatory in Alternative 2, where the Observatory ceases to be used scientifically, and in Alternatives 1 and 2 where the scientific offices are to be demolished. This leads to an underestimation of the socioeconomic impacts of these alternatives.

Finding 3: The draft EIS correctly identifies that “major, adverse impacts would be expected from reduced regional educational activities” under either of the deconstruction alternatives (Alternatives 4 and 5).

Finding 4: The loss of educational activity at the Observatory under Alternative 3 is the same as that under Alternatives 4 and 5, thus the impact must also be the same – major, adverse impacts from reduced regional educational activities.

Finding 5: The draft EIS mischaracterizes the educational impact of Alternative 2 as a minor, adverse impact when this is clearly either a moderate or major, long-term, adverse impact. This assessment needs to be repeated taking into account the impact of all of the programs lost and the inspirational value of Arecibo as a scientific facility.

Finding 6: The draft EIS assessment of the educational impact of Alternative 1 is false as it does not take into account the proposed demolition of buildings used for educational activities. This assessment needs to be repeated taking into account the impact of all of the programs lost.

Finding 7: The Region of Interest for the Environmental Justice analysis is inconsistent with the Region of Interest identified for education and tourism. The Environmental Justice analysis thus fails to cover all economic and social effects.

Finding 8: The loss of educational and tourism opportunities in Puerto Rico constitutes an environmental justice issue that has been obscured by not using the correct region of interest for these activities in the draft EIS.

Finding 9: The educational impact of Arecibo Observatory needs to be assessed not just as part of the draft EIS, but also as part of the Observatory’s contribution to the NSF’s core strategic objectives, goals and overall mission.

30b. Analysis

The formal and informal STEM educational programs run at the Observatory are:

- The Angel Ramos Foundation Science Education and Visitors' Center (all ages, a third of visitors are school children on organized trips)
- The Arecibo Observatory Space Academy (high school students)
- The Research Experience for Undergraduates (REU) program (undergraduates and teachers)
- The National Astronomy and Ionosphere Center Single Dish School (graduate students and post-docs)

In addition to these, the Observatory has recently signed a Memorandum of Understanding with the Arecibo municipality to bring more school children to the Visitors' Center.

All but the first of these are run by the scientific staff; the first involves collaboration of the scientific staff with educators.

Additionally, the Universities Space Research Association, which manages the astronomy, planetary science, IT and electronics departments at the Observatory, has recently signed a Memorandum of Understanding with the University of Puerto Rico Mayagüez (UPRM) to work together on undergraduate and graduate educational projects as well as to promote STEM degree programs focused in the space sciences (e.g., astronomy, planetary science, aeronautics, space engineering). This MOU has already led to the first formal degree program in astronomy in Puerto Rico through the physics department at UPRM, an MIT funded research project with the department of electrical and computer engineering at UPRM to study the near-field of the Arecibo HF, and an initiative within the geology department at UPRM in planetary science that has resulted already in several undergraduate student practicum projects. The Observatory is continuing these efforts by extending collaborations to the University of Puerto Rico Arecibo, and the University of Puerto Rico Humacao. These collaborations via MOUs with the UPR systems has been led by USRA scientists.

Scientific staff also work in collaboration with the Visitors' Center to deliver activities and inform the design of exhibits and educational programs. It is also extensively used for undergraduate and graduate research projects.

30c. Finding 1: The scientific staff are essential to the educational mission of the Arecibo Observatory.

Education is included in the draft Environmental Impact Statement (EIS) as a socioeconomic impact. Socioeconomic impacts are analyzed in section 4.9 of the draft EIS.

The draft EIS makes the statement (page 4-73) that "For the purposes of this analysis, it is assumed that the Arecibo Observatory and visitor center personnel would remain employed under Alternatives 1 and 2. Under Alternative 2, a reduction of fewer than six jobs related to the operation of the 305-meter-diameter telescope is assumed; these jobs are anticipated to be three telescope operators and three maintenance staff." However, under Alternative 2, with no science being done at the Observatory, it must be considered highly unlikely that the scientific research staff would remain. Furthermore, both Alternative 1 and Alternative 2 include the demolition of the office building used by the scientific staff and the trailers used for the educational programs.

30d. Finding 2: The draft EIS is inconsistent in assuming that the scientific staff will remain employed at the Observatory in Alternative 2, where the Observatory ceases to be used scientifically, and in Alternatives 1 and 2 where the scientific offices are to be demolished. This leads to an underestimation of the socioeconomic impacts of these alternatives.

The summary assessment of the socioeconomic impact of the different alternatives considered in the draft EIS is as follows (pages ES-19 – ES-26):

Alternative 1 – Collaboration with Interested Parties for Continued Science-focused Operations: Deconstruction activities would result in negligible, adverse, short-term impacts to housing and minor, adverse, short-term impact to education and tourism in the Municipality of Arecibo. There would be negligible,

short-term benefits to employment, income, and the economy. There would be no socioeconomic impacts during operations. Alternative 2 – Collaboration with Interested Parties for Transition to Education-focused Operations: Deconstruction activities would result in negligible, adverse, short-term impacts to housing and minor, adverse, short-term impact to education and tourism in the Municipality of Arecibo. There would be negligible, short-term benefits to employment, income, and the economy. Impacts during operations would include negligible, adverse impacts to population, housing, the economy, employment and income. A minor, adverse, long-term impact would result from fewer regional education activities and science, technology, education, and math (STEM) opportunities.

Alternative 3 – Mothballing of Facilities: Deconstruction activities would result in negligible, adverse, short-term impacts to housing in the Municipality of Arecibo. There would be negligible, short-term benefits to employment, income, and the economy during deconstruction. Impacts during the mothball period would include negligible adverse impacts to population, housing, the economy, employment, and income. A moderate, adverse, long-term impact would result from less regional education activities. A major, adverse impact would be expected from reduced STEM opportunities and tourism in Arecibo.

Alternative 4 – Partial Deconstruction and Site Restoration: Deconstruction activities would result in negligible, adverse, short-term impacts to housing in the Municipality of Arecibo. There would be minor, short-term benefits to employment, income, and the economy during deconstruction. Impacts after deconstruction would include negligible, adverse impacts to population, housing, the economy, employment, and income. Major, adverse impacts would be expected from reduced regional education activities, STEM opportunities, and tourism in Arecibo.

Alternative 5 – Complete Deconstruction and Site Restoration: Deconstruction activities would result in negligible, adverse, short-term impacts to housing in the Municipality of Arecibo. There would be minor, short-term benefits to employment, income, and the economy during deconstruction. Impacts after deconstruction would include negligible, adverse impacts to population, housing, the economy, employment, and income. Major, adverse impacts would be expected from reduced regional education activities, STEM opportunities, and tourism in Arecibo after deconstruction.

- 30e. Finding 3: The draft EIS correctly identifies that “major, adverse impacts would be expected from reduced regional educational activities” under either of the deconstruction alternatives (Alternatives 4 and 5).

The draft EIS correctly identifies that either partial or complete deconstruction would result in a major adverse impact on regional education. However, Alternative 3 involves an equal reduction in educational activities, with no employment of researchers, educators or visitor’s center staff (table 4.9-1) so this must also logically be a major adverse impact.

The draft EIS also states (page 4-75):

Education. The Arecibo Observatory currently has 16 onsite researchers and accommodates numerous U.S. and international researchers who conduct scientific research remotely using the facilities at the Arecibo Observatory. An estimated 19,800 students visit the Arecibo Observatory each year for STEM purposes (SRI International, 2016). It is assumed that visiting researchers are housed entirely onsite and that the students travel from across the Commonwealth of Puerto Rico to visit the Arecibo Observatory. It is assumed that Alternatives 1 and 3 would continue to support this level of research and education. However, Alternative 2 would result in the potential loss of a portion of these scientific researchers and students because the reflector dish and 305-meter-diameter telescope would be placed in a “safe abandonment” condition. Deconstruction activities under Alternatives 4 and 5 would result in no educational activities or research continuing at the Arecibo Observatory.

It is not explained how research and education are expected to continue while the Observatory is mothballed (Alternative 3) and no researchers or educators are employed (table 4.9-1). This appears to have led to an under-assessment of the impact on educational activities of Alternative 3.

- 30f. Finding 4: The loss of educational activity at the Observatory under Alternative 3 is the same as that under Alternatives 4 and 5, thus the impact must also be the same – major, adverse impacts from reduced regional educational activities.

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Under Alternative 2, the 305-meter-diameter telescope would cease operation. This telescope supports the Research Experiences for Undergraduates and Research Experience for Teachers Program. As a result, there would be a reduction in STEM opportunities. The loss of this telescope operation would result in direct and indirect minor, adverse, long-term impacts to STEM education.

Because Alternative 2 would be education-focused, it is expected that additional education opportunities would be developed to replace the lost education activities associated with the 305-meter-diameter telescope. It is expected that direct and indirect, minor, long-term benefits to education would result. This assessment neglects that the telescope is also used for the Single Dish School. This is the only school in the US training postgraduate and postdoctoral single dish radio astronomers – training which is vital for the exploration of time-domain science (identified by the Astronomy decadal survey in 2010 as one of the key science areas). It also neglects the highly probably loss of the scientific staff in an alternative where no science activities are taking place, and thus the loss of the Arecibo Observatory Space Academy. The definition of a ‘minor’ impact is: “The proposed Alternative would result in a change to socioeconomic resources but the change (beneficial or adverse) would be small and localized.” The loss identified here of the REU program would remove a major opportunity for Puerto Rican students to participate as undergraduates in research. Most of the graduates of this program have gone on to obtain PhDs. Hispanics remain one of the most underrepresented groups in Astronomy, making up only 3% of the population of US astronomers [https://aas.org/files/resources/aas_members_workforce_survey_final_jan2014v2.pdf]. The effects of the loss of this program alone would thus neither be small nor localized.

The Arecibo Observatory Space Academy is a semester-long precollege program for high school students in Puerto Rico, run by scientists at the Observatory. In the 5 years that it has been running, all of the college-age graduates of the Academy have enrolled in STEM degree programs. The Academy continues to support its graduates through college, and the first students will receive their bachelor’s degrees this year (2016) [<http://womeninastronomy.blogspot.com/2016/10/celebrating-national-hispanic-heritage.html>]. The program has impacted nearly 600 students, which come from 75% of Puerto Rican municipalities, and are represented equally in gender. This is a major boost to the STEM education and workforce of Puerto Rico, which will be threatened by the loss of scientists at Arecibo Observatory. The loss of this program has been ignored in the assessment of the impact of Alternative 2 due to the assumption that the scientists running the program would continue to be employed at the Observatory despite the loss of the science, the office buildings where the scientists work, and the buildings used to deliver the program.

- 30g. The draft EIS also fails to mention the impact on undergraduate education more generally of the loss of the 305-m telescope. There are a number of undergraduate research teams making use of the Observatory, including the Undergraduate ALFALFA Team (UAT), the Arecibo Remote Command Center (ARCC), and students from universities including Yale and the University of Puerto Rico Mayagüez. The UAT includes students and faculty from the University of Puerto Rico Río Piedras, while the ARCC is based at University of Texas Rio Grande Valley. This loss would therefore impact greatly on astronomy education in Puerto Rico and in the Hispanic-majority area of Texas’s Rio Grande valley. The assessment also ignores the detrimental impact on education from the loss of Arecibo Observatory as a landmark scientific facility that has inspired many Puerto Ricans into STEM careers. As Dr. Daniel Altschuler, a professor at UPR Río Piedras, said “aside from its scientific value, the observatory has served as inspiration and training ground for many Puerto Rican students who have very limited local opportunities to do so. Some of them went on to obtain their doctoral degrees in science. If NSF wants to further the participation in STEM by minorities and women, closing or otherwise limiting the operation is again a bad idea.” Overall, the draft EIS has not taken into account many of the educational effects of the Observatory’s use as a scientific facility. When these are considered, it is clear that the impact of Alternative 2 would be either a moderate “The proposed Alternative would result in a measurable and consequential change to socioeconomic resources” or major “The proposed Alternative would result in a substantial change to socioeconomic resources; the change (beneficial or adverse) would be measurable and result in a severely adverse or major beneficial impact,” long-term, adverse impact.
- 30h. Finding 5: The draft EIS mischaracterizes the educational impact of Alternative 2 as a minor, adverse impact when this is clearly either a moderate or major, long-term, adverse impact. This assessment needs to be repeated taking into account the impact of all of the programs lost and the inspirational value of Arecibo as a scientific facility.

Alternative 1, Collaboration with Interested Parties for Continued Science-focused Operations, includes the demolition of the building housing the scientific offices and the trailers used for student activities, as well as some of the visiting scientist quarters, including those used for the REU program. If this were to

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be carried out, it would severely limit the educational programs that can be delivered at the Observatory. It would not be possible to carry out the REU program, the Space Academy, or the Single Dish School under Alternative 1 as presented here. The assessment that “Under Alternative 1, there would be no change in education activities at the Arecibo Observatory. Therefore, there would no impact to education.” (page 4-79) is obviously false. The impact would not be as severe as under Alternative 2, as the Observatory would retain its inspirational value as a scientific facility and would still be used for undergraduate research programs at universities, but would still have an effect beyond the local area and would therefore be either moderate or major.

- 30i. Finding 6: The draft EIS assessment of the educational impact of Alternative 1 is false as it does not take into account the proposed demolition of buildings used for educational activities. This assessment needs to be repeated taking into account the impact of all of the programs lost.
- 30n. Finding 9: The educational impact of Arecibo Observatory needs to be assessed not just as part of the draft EIS but also as part of the Observatory’s contribution to the NSF’s core strategy, strategic objectives, goals, and overall mission.
- 47c. Members of NANOGrav and the larger scientific user community depend on Arecibo for their research careers. Any scenario that reduces the amount of time available for scientific research negatively impacts the income and employment of this user group and that should be reflected and discussed quantitatively in the final EIS for all scenarios considered. Early-career scientists are especially impacted. As we wrote in our previous correspondence, over the past decade NANOGrav has involved a diverse group of hundreds of US high school and undergraduate students in Arecibo observations of pulsars and gravitational wave astronomy. These students are from institutions in Maryland, Michigan, Montana, New York, Ohio, Pennsylvania, Texas, Vermont, Virginia, Washington, West Virginia, and Wisconsin.

49o. However, NSF fails to consider the need of the science staff and instrumentation (including office space) for educational purposes. For example the REU program heavily relies on these assets.

49q. 2. “Deconstruction activities would result in negligible, adverse, short-term impacts to housing and minor, adverse, short-term impact to education and tourism in the Municipality of Arecibo. There would be negligible, short-term benefits to employment, income, and the economy. There would be no socioeconomic impacts during operations.”

This is untrue. The deconstruction of half of the buildings would inevitably lead to reduction of staff. The staff of the Arecibo Observatory is among the best-paid employees in the municipality of Arecibo. The dismissal would have a significant adverse effect on the tax income of the municipality of Arecibo, and thus, the population that is classified a minority as well as low income. The deconstruction of the buildings could lead to cancellation of the Arecibo Observatory Space Academy program that supports the Puerto Rican to higher education and eventually to better-paid jobs. This could also lead to long-term, adverse effects on the economy.

55g. A thorough financial analysis outlining the exact maintenance and operational costs for each of the buildings also needs to be performed and included in the document as data

- 55m. We request a revision to the socioeconomic impact associated with alternatives 2-5 of the DEIS. We believe the number of jobs that would be lost are different than what is presented on the report.
- We request a revision to the socioeconomic impact associated with alternative 1 of the DEIS. As it is currently written, alternative 1 would result in significant reduction in scientific and maintenance staff as the number of staff required only to support radio astronomy observations ONLY, would be dramatically different from the current staff that also support radar and space weather activities.

55p. We request a revision to the cost estimates associated with the deconstruction of the site to be performed by a different contractor than the one who provided the current set of estimates included in the DEIS. The deconstruction costs are radically different from those that have been presented in the past. We recommend multiple local construction companies familiar with the structure and the terrain to provide input for this.

56c. 3. Site Demolition and Removal Cost Closing the Observatory would be a devastating blow to the people of Arecibo and of Puerto Rico as a whole, as well as to scientific communities and interests in many places around the world. These points are detailed in numerous comments submitted before and during this DEIS process. The various project alternatives will also have other environmental impacts such as those analyzed in the DEIS and beyond. But the full deconstruction and site restoration alternative could also have a major effect on the NSF budget as we believe that the total cost thereof stated in the DEIS at Section 49 and elsewhere has been badly underestimated. Certain associated time estimates, such as for revegetation of the entire site after deconstruction, also appear to be inaccurate as now stated in the DEIS. While neither partial nor complete deconstruction is a favored or chosen alternative of NSF under the DEIS, it is still important for the DEIS to be accurate when looking toward both its finalization and the important decisions to be made thereafter by NSF based on this document.

We will not recount all of the steps and components for planning and field work and their aftermath under the deconstruction alternatives considered. However, the total cost that the DEIS presents for the Complete Destruction and Site Restoration Alternative appears to be \$18.7 million. A footnote records how this number assumes the use of explosives for demolition of the towers and rim wall during the removal of all improvements, and other methods would be substantially greater in cost. However, even with explosives use, the deconstruction cost is likely to be much greater than estimated in the DEIS. This view and our concern are based upon the existence of a prior Decommissioning Study undertaken for NSF by ECCi, dated January 2008 (not just the EBS done by ECCi in 2008). In that report the near-complete or complete demolition options detailed were estimated to cost \$79 million to \$89 million projected ahead to 2012. Those totals would now be even greater for 2017 and beyond. The alternative at that time, when use of explosives was included, produced a reduced cost estimate of approximately \$21 million looking ahead to 2012. That option also excluded the rim wall and supports, which are included now in the DEIS as perhaps the only structures on which explosives will be used. While the new DEIS cost estimates may seek to update the earlier study, it seems clear that the current 2017 removal project option should cost far greater than \$18.7 million.

We believe that NSF did not sufficiently consider the existence, content, and conclusions of this prior work when analyzing the cost of full Observatory demolition and removal in the DEIS. More accurate discussion and quantification need to be added to the DEIS on this topic at this time to further support the conclusions reached, choices considered, and actions to be taken. Thus, we recommend that, prior to finalizing the DEIS:

- A. NSF revisit the demolition/removal/restoration cost estimation process and result, including reference to and consideration of the prior Decommissioning Study and any other essential or relevant current information and past data; this work should appear in a new DEIS.
- B. NSF should revise and update all such cost references to better support the alternatives that do not call for major or complete deconstruction, and to further disfavor those that do.

61b. It should also be noted that the buildings used for the REU program and the scientific offices used by REU mentors are removed, so in this scenario there is a loss of this educational program. This is also not included in the 'worst case' analysis.

74a. I have some additional comments to read after what I already said last night. Section 3.2 and 3.9 of the Draft EIS define the reach of influence for cultural, employment, economic and income impacts too narrowly.

74b. Astronomers across the U.S and the world depend on open skies access to Arecibo for their research careers. Any scenario that reduces the amount of time available for scientific research negatively impacts the incoming employment of the user group and diminishes the scientific and cultural landscape of the U.S as a whole. So I ask that this be considered in the Final EIS.

74c. Also, Sections 3.9.3 and 4.9 reference students and researchers at colleges and universities when assessing educational impacts. The assumptions that this group would not be negatively impacted under Scenario 1 are erroneous. Any reduction in open-sky time will impact students who use the telescope for research, unless they can come with their own funding. So I also ask that this be considered

88a. I want to comment on the Alternative 1. It says that NSF will reduce its funding, and under Alternative 1 the future stakeholders are responsible for maintenance and upgrades. But that alternative is not clear. What is the amount that NSF will provide and for how long? It is not clear in that alternative either for those stakeholders -- are they responsible for future deconstruction and site restoration under Alternative 1? And if so, it needs to address specifically how much would that deconstruction and site restoration cost in 2016.

Responses:

5a. Alternative 1 would continue science-based operations with no appreciable changes from current operations. While specific research areas may change, depending on the collaboration, on balance there would be no change. The assessment of no impact is not an underestimate. No changes have been made to the document as a result of this comment.

Alternative 2 has the potential for both negative and beneficial impacts. Upon reconsideration of the magnitude of the potential impact of the loss of the radio telescope for use in educational activities and as a focal point to spur students' interest in this type of education, the magnitude of impacts under Alternative 2 (Section 4.9.2) has been changed and the assessment for Alternative 2 is now direct and indirect moderate, adverse, long-term impacts to education and public outreach programs associated with Arecibo Observatory radio telescope. However, because additional educational and public outreach opportunities not related to the radio telescope would be offered, the continued education-focused operation of the facility would result in an indirect, minor, beneficial, long-term impact.

Alternatives 3, 4, and 5 would have direct and indirect major, adverse, long-term impacts to education and public outreach. This is the most severe category of impacts. As it is assessed as the most severe category of impact, it cannot be an underestimate. The text has been revised in Sections 4.9.3, 4.9.4, and 4.9.5 to reflect the reassessment of impacts associated with Alternative 2.5b, 5c, 5d. Section 3.9 of the DEIS includes sections on the local economy of Puerto Rico, the local economy of the Municipality of Arecibo, employment, income, education, and tourism. It describes higher education-focused STEM opportunities offered at Arecibo Observatory.

Section 3.8 of the Affected Environment was updated to state that Arecibo Observatory is part of the aerospace cluster. The potential economic impact of the loss of scientific research cannot be easily quantified, especially as much of the information and data that Arecibo Observatory provides to the industrial sector can be provided remotely by other sources. While Arecibo Observatory may have helped establish the industries involved in the aerospace cluster, the technically skilled jobs offered by this sector would provide a greater stimulus for students pursuing STEM education across a broad range of STEM categories than would Arecibo Observatory, with its focus on radio astronomy. The data provided by Arecibo Observatory to these industries can be provided by other sources, and remote data transfer is not an obstacle to business operation.

Section 3.9.3 has been revised to include the following historical investments:

- The Government of Puerto Rico, through the Department of Education, has invested more than \$600,000 in training teachers in the use of AO in their classroom teachings.
- The Angel Ramos Foundation and the Ana G. Mendes University System have invested \$2.1.
- The Puerto Rico Infrastructure Financing Authority has provided \$828,635 for infrastructure improvements at Arecibo Observatory.

The scientific ramifications of the loss of scientific research opportunities at this location are not addressed in this NEPA analysis. The decision to reduce scientific research opportunities at Arecibo Observatory was made as a result of budget reductions and mission decisions by NSF. The decision to reduce the budget and change the role of NSF has been made and is not being analyzed in this NEPA document.

Impacts to tourism are described qualitatively in Section 4.9 and summarized in Table 4.9-3.

While there likely would be a loss of some STEM opportunities under certain proposed Alternatives, the presence of the aerospace corridor and the potential for job growth in that sector would serve as an additional stimulus for students to pursue STEM education, with or without Arecibo Observatory. It is likely that this incentive (growing job sector) would be a greater stimulus for STEM education than that provided currently by Arecibo Observatory.

Published SRI data indicate that only 22 percent of visitors to Visitor Center at Arecibo Observatory are children. No changes have been made to the document as a result of this comment.

Many of the educational programs cited by the commenter were included in the DEIS: Saturday academies for high schools, Research Experiences for Undergraduates (REU), and the internship programs sponsored by Arecibo Observatory Council of Chancellors and Stakeholders. No changes have been made to the document as a result of this comment.

Observation nights in consortia with the Puerto Rico Astronomy Society, while noteworthy, are not relevant to the decision to be made. The Puerto Rico Astronomy Society holds these events at multiple observatories across Puerto Rico and they would continue with or without Arecibo Observatory.

The merits of specific science/research issues is outside the scope of this NEPA analysis. It is acknowledged in the EIS that science research opportunities at Arecibo Observatory would cease under proposed Alternatives 2, 3, 4, and 5. Under proposed Alternative 1, while it is expected that there would be no reduction in the science conducted at Arecibo Observatory, specific research activities may change. No changes have been made to the document as a result of this comment.

- 5e. Under Alternatives 3 through 5, the specific role of Arecibo Observatory in promoting STEM would be eliminated, as Arecibo Observatory would no longer be operational. However, Arecibo Observatory is not the only pathway to STEM education. The Council of Chancellors and Stakeholders could shift to a broader STEM focus and continue to provide pathways to increase the STEM workforce.
- 5f. Alternatives 1 and 2 are defined by the reduction of NSF funding and the continuance of science-focused (under Alternative 1) or education-focused (under Alternative 2) operations, not the disposition of any one facility or structure. Use or demolition of any particular building or instrument cannot be determined unless or until a viable collaboration option is under consideration. Because reduction of NSF funding may require the safe-abandonment, mothballing, or demolition of facilities, the proposed Alternatives are described under the most conservative (highest environmental impact) scenario in terms of NSF's analysis of potential changes to facilities, so that the EIS may be inclusive of the full range of potential environmental impacts. This analysis approach is consistent with NEPA guidance and is sufficiently broad to allow NSF to complete the analysis during planning and without regard to the specifics of a future collaboration. Table 2.3-1 provides a detailed list of facilities identified for potential retention, demolition, safe-abandonment, or mothballing under the proposed Alternatives for the purpose of NSF's environmental review. No structures that would be used under the collaboration effort would be demolished.
- Text has been added to Section 2.3 of the document to clarify that the identified buildings are the maximum number that could be demolished under a given Alternative, but the specifics of the collaboration will determine the final suite of buildings that would be demolished.
- 5g. Alternative 1 is defined by the reduction of NSF funding and the continuance of science-focused operations, not the disposition of any one facility or structure. Use or demolition of any particular building or instrument cannot be determined unless or until a viable collaboration option is under consideration. Because reduction of NSF funding may require the safe-abandonment, mothballing, or demolition of facilities, the proposed Alternatives are described under the most conservative (highest environmental impact) scenario in terms of NSF's analysis of potential changes to facilities, so that the EIS may be inclusive of the full range of potential environmental impacts. This analysis approach is consistent with NEPA guidance and is sufficiently broad to allow NSF to complete the analysis during planning and without regard to the specifics of a future collaboration. Table 2.3-1 provides a detailed list of facilities identified for potential retention, demolition, safe-abandonment, or mothballing under the proposed Alternatives for the purpose of NSF's environmental review. Because no structures that would be used by the collaborator would be demolished, Alternative 1 would not necessarily constrain opportunities for undergraduate and graduate students or visiting scientists.

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Text has been added to Section 2.3 of the document to clarify that the identified buildings are the maximum number that could be demolished under a given Alternative, but the specifics of the collaboration will determine the final suite of buildings that would be demolished.

- 5h. The DEIS addresses the impact of each proposed Action Alternative on education and public outreach, and this FEIS provides additional descriptions of current education and public outreach based on input from the public comments on the DEIS (see Section 5). The DEIS and FEIS address secondary impacts of the level of loss to the economy from a qualitative standpoint. The potential loss of science is not part of the NEPA analysis.

No changes have been made to the document as a result of this comment.

6. While Arecibo Observatory may have helped establish the industries involved in the aerospace cluster, the technically skilled jobs offered by this sector would provide a greater stimulus for students pursuing STEM education across a broad range of STEM categories than Arecibo Observatory would, with its focus on radio astronomy. The data provided by Arecibo Observatory to these industries can be provided by other sources, and remote data transfer is not an obstacle to business operation.
- 23h. The initial impact assessment was corrected where minor should have been assessed instead of negligible, as changes were measurable and more than barely perceptible. The impact assessments for proposed Alternatives 3, 4, and 5 were revised to reflect that the loss of 136 jobs (1 percent of regional labor force) would be a minor, adverse, and long-term impact on the economy, employment, and income within the Municipality of Arecibo. No change to the assessment for proposed Alternative 2 was made, as no net change in number of jobs is expected, even though specific jobs would change.
- 30a. Comment is noted as providing background information for following specific comments on the DEIS. No changes have been made to the document as a result of this comment.
- 30b. The specific educational opportunities offered at Arecibo Observatory were not intended to be all inclusive, as specific educational opportunities may change. The assessment is qualitative in nature to capture both negative and beneficial changes that may result. No changes have been made to the document as a result of this comment.
- 30c. Alternatives 1 and 2 are defined by the reduction of NSF funding and the continuance of science-focused (under Alternative 1) or education-focused (under Alternative 2) operations, not the disposition of any one facility or structure. Use or demolition of any particular building or instrument cannot be determined unless or until a viable collaboration option is under consideration. Because reduction of NSF funding may require the safe-abandonment, mothballing, or demolition of facilities, the proposed Alternatives are described under the most conservative (highest environmental impact) scenario in terms of NSF's analysis of potential changes to facilities, so that the EIS may be inclusive of the full range of potential environmental impacts. No changes to the economic impact of Alternative 1 have been made, as no net change in numbers of jobs is expected. Upon reconsideration of the magnitude of the potential impact of the loss of the radio telescope for use in education activities and as a focal point to spur students' interest in this type of education, the magnitude of impacts under Alternative 2 has been changed and the assessment for Alternative 2 is now direct and indirect moderate, adverse, long-term impacts to education and public outreach programs associated with Arecibo Observatory radio telescope. However, because additional education and public outreach opportunities not related to the radio telescope would be offered, the continued education-focused operation of the facility would result in an indirect minor, beneficial, long-term impact. The text in Section 4.9.2 has been revised to reflect this reassessment.
- 30d. The text in Section 4.9 is summarized in the Executive Summary and the Executive Summary has been changed to reflect the revision noted under Response 30c.
- 30e. The typographical error has been corrected. The text on page 4-75 of the DEIS has been revised from "Alternative 1 and Alternative 3 would continue to support this level of research" to "Alternative 1 and Alternative 2 would continue to support this level of research."

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Also, the text on page 4-85 correctly states that impacts under Alternative 3 were categorized as major, adverse, and long-term for education as a result of mothballing. Table 4.9-3 also correctly shows a major, adverse, and long-term impact for education under Alternative 3.

- 30f. See response 30e, which notes the correction of the typographical error on page 4-75 of the DEIS. The text on page 4-85 and in Table 4.9-3 of the DEIS correctly state that impacts under Alternative 3 are categorized as major, adverse, and long-term for education as a result of mothballing. No additional changes were made regarding impact categorization for Alternative 3.
- Upon reconsideration of the magnitude of the potential impact of the loss of the radio telescope for use in education activities and as a focal point to spur students' interest in this type of education, the magnitude of impacts under Alternative 2 has been changed and the assessment for Alternative 2 is now direct and indirect moderate, adverse, long-term impacts to education and public outreach programs associated with Arecibo Observatory radio telescope. However, because additional education and public outreach opportunities not related to the radio telescope would be offered, the continued education-focused operation of the facility would result in an indirect minor, beneficial, long-term impact.. The text in Section 4.9.2 has been revised to reflect this reassessment.
- 30g. Alternative 2 has the potential for both negative and beneficial impacts. Upon reconsideration of the magnitude of the potential impact of the loss of the radio telescope for use in education activities and as a focal point to spur students' interest in this type of education, the magnitude of impacts under Alternative 2 in Section 4.9.2 has been changed and the assessment for Alternative 2 is now direct and indirect moderate, adverse, long-term impacts to education and public outreach programs associated with Arecibo Observatory radio telescope. However, because additional education and public outreach opportunities not related to the radio telescope would be offered, the continued education-focused operation of the facility would result in an indirect minor, beneficial, long-term impact. The text has been revised to reflect this reassessment.
- 30h. No changes to the economic impact of Alternative 1 have been made, as no net change in numbers of jobs is expected. Upon reconsideration of the magnitude of the potential impact of the loss of the radio telescope for use in education activities and as a focal point to spur students' interest in this type of education, the magnitude of impacts under Alternative 2 in Section 4.9.2 has been changed and the assessment for Alternative 2 is now direct and indirect moderate, adverse, long-term impacts to education and public outreach programs associated with Arecibo Observatory radio telescope. However, because additional education and public outreach opportunities not related to the radio telescope would be offered, the continued education-focused operation of the facility would result in an indirect minor, beneficial, long-term impact. The text has been revised to reflect this reassessment.
- 30i. Alternative 1 is defined by the reduction of NSF funding and the continuance of science, not the disposition of any one facility or structure. Use or demolition of any particular building or instrument cannot be determined unless or until a viable collaboration option is under consideration. Because reduction of NSF funding may require the safe-abandonment, mothballing, or demolition of facilities, the proposed Alternatives are described under the most conservative (highest environmental impact) scenario in terms of NSF's analysis of potential changes to facilities, so that the EIS may be inclusive of the full range of potential environmental impacts. This analysis approach is consistent with NEPA guidance and is sufficiently broad to allow NSF to complete the analysis during planning and without regard to the specifics of a future collaboration. Table 2.3-1 provides a detailed list of facilities identified for potential retention, demolition, safe-abandonment, or mothballing under the proposed Alternatives for the purpose of NSF's environmental review. Because no structures that would be used under the collaboration effort would be demolished, Alternative 1 would not preclude a proposed activity or use of infrastructure and would not adversely affect any potential collaboration efforts.
- Text has been added to Section 2.3 of the document to clarify that the identified buildings are the maximum number that could be demolished under a given Alternative, but the specifics of the collaboration will determine the final suite of buildings that would be demolished.
- 30n. The role of Arecibo Observatory and its contribution to NSF's core strategy, strategic objectives, goals, and overall mission are not within the scope of this NEPA analysis, which addresses the potential Alternatives to implement changes to the operations of Arecibo Observatory. No changes have been made to the document as a result of this comment.

- 47c. Quantitative analysis of lost research opportunities is not possible because the specifics of any future collaboration cannot be known at the time of the analysis and any specific research that may be forgone is merely speculative at this time. The DEIS used a qualitative assessment of potential changes in the expected number of jobs to analyze potential economic impacts of the proposed Alternatives. No changes have been made to the document as a result of this comment.
- 49o. Alternatives 1 and 2 are defined by the reduction of NSF funding and the continuance of science-focused (under Alternative 1) or education-focused (under Alternative 2) operations. While buildings may be demolished, the specific buildings and the number of buildings that may be demolished cannot be determined until a specific collaboration option is under consideration. The analysis is based on the number of jobs at Arecibo Observatory remaining essentially the same under a continuation of science-focused operations (Alternative 1). The locations where people work may change, but the positions would not be expected to be eliminated. Similarly, with education-focused operations under Alternative 2, it is assumed that the numbers of jobs would remain essentially the same (expected to be six fewer jobs) as current operations, although the specific jobs would change. Although some existing jobs would end, new jobs would be created to meet the education-focused needs. While this would result in impacts to individuals, the overall economic impact would be expected to be negligible. Therefore, no negative impact on scientific staff and scientific research would be expected under Alternative 1, and while the scientific research staff likely would not remain under Alternative 2, additional education-related jobs of a comparable number would be expected to develop, resulting in no net socioeconomic impacts at the level of the ROI.
- 49q. Alternatives 1 and 2 are defined by the reduction of NSF funding and the continuance of science-focused (under Alternative 1) or education-focused (under Alternative 2) operations. While buildings may be demolished, the specific buildings and the number of buildings that may be demolished cannot be determined until a specific collaboration option is under consideration. The analysis is based on the jobs at Arecibo Observatory remaining essentially the same under a continuation of science-focused operations (Alternative 1). The locations where people work may change, but the positions would not be expected to be eliminated. Similarly, with education-focused operations under Alternative 2, it is assumed that the numbers of jobs would remain essentially the same (expected to be 6 fewer jobs) as current operations, although the specific jobs would change. While this would mean some existing jobs would end, new jobs would be created to meet the education-focused needs. While this would result in impacts to individuals, the overall economic impact would be expected to be negligible. Therefore, no negative impact on scientific staff and scientific research would be expected under Alternative 1, and while the scientific research staff likely would not remain under Alternative 2, additional education-related jobs of a comparable number would be expected to develop, resulting in no net socioeconomic impacts at the level of the Region of Influence.
- While socioeconomic losses would occur in an area that is already economically depressed and may affect low-income populations, the impacts are not disproportionate, because they would not be borne solely or disproportionately by minority and low-income populations. Therefore, the impacts from any of the proposed Alternatives would not result in disproportionately high and adverse impacts to minority and low-income populations.
- No changes have been made to the document as a result of this comment.
- 55g. There is no meaningful savings in operations and maintenance costs under Alternatives 1, 2, and 3 as a result of potential demolition. Because there is no meaningful difference for this aspect, operations and maintenance costs for proposed Alternatives 1, 2, and 3 cannot be used as a decision criterion. No changes have been made to the document as a result of this comment.
- 55m. As noted under response 30c, specific buildings are not slated for demolition; this decision would be made by the collaborator chosen. The demolition of buildings under Alternative 1 is conceptual. Specific job duties per building were not assessed, because the specifics of a future collaboration cannot be known, and any effort to parse the possibilities would be speculative. It is assumed that education activities could continue under Alternative 2 and the education staff size would be comparable in size to the staff currently employed at Arecibo Observatory, with the exception of three radio telescope-related jobs (and three maintenance jobs) that would be eliminated under Alternative 2. While specific jobs would change, the number of jobs is expected to remain comparable. Under Alternative 1, it is assumed that all staff would remain. Under Alternative 2, it is assumed that there would be a reduction of six jobs (three radio telescope operators and three maintenance personnel), and while there would be staff turnover, the number of jobs would remain comparable. The reduction of these six jobs would have negligible impacts on the local economy.

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Under Alternative 3, only maintenance staff would be retained because the mothballed facilities and grounds would require maintenance throughout the mothball period. Under Alternative 4, a small security staff would be maintained, and under Alternative 5, all jobs would be eliminated. There is no reason to reassess the number of jobs lost under the proposed Alternatives as there is no basis to expect the job numbers to be different than what has been analyzed.

- 55p. The cost of implementing any of the proposed Action Alternatives is not relevant to the NEPA analysis, which focuses on anticipated environmental impacts associated with each proposed Alternative. No changes have been made to the document as a result of this comment.
- 56c. The cost of implementing any of the proposed Action Alternatives is not relevant to the NEPA analysis, which focuses on anticipated environmental impacts associated with each proposed Action Alternative. No changes have been made to the document as a result of this comment.
- 61b. Alternative 1 is defined by the reduction of NSF funding and the continuance of science-focused operations, not the disposition of any one facility or structure. Use or demolition of any particular building or instrument cannot be determined unless or until a viable collaboration option is under consideration. Because reduction of NSF funding may require the safe-abandonment, mothballing, or demolition of facilities, the proposed Alternatives are described under the most conservative (highest environmental impact) scenario in terms of NSF's analysis of potential changes to facilities, so that the EIS may be inclusive of the full range of potential environmental impacts. This analysis approach is consistent with NEPA guidance and is sufficiently broad to allow NSF to complete the analysis during planning and without regard to the specifics of a future collaboration. However, it must be emphasized that a collaboration may not require the full extent of activities analyzed and could involve none or only a subset of the demolition activities listed in Table 2-1. NSF's Record of Decision would contain an explanation of which components of any selected alternative would be implemented. In any case, the Agency-preferred Alternative does not include, and the EIS does not *mandate*, the demolition/removal of specific buildings and infrastructure, even if specific buildings are identified in the various proposed Alternatives. Because of this, Alternative 1 would not preclude a proposed activity or use of infrastructure.
- 74a. The Region of Influence for cultural resources is based on NHPA requirements and is defined as the Area of Potential Effects, which, for purposes of this analysis, is defined as the boundary of Arecibo Observatory (Section 4.2).
- The Region of Influence for socioeconomics (economy, employment, and income) is the Municipality of Arecibo (Section 4.9), as it is assumed most employees live within the Municipality of Arecibo. It is also assumed that the majority of the demolition workers will reside locally (within the municipality). The United States is not used as the reference community for economy, employment, or income. Impacts to specific researchers are not considered as part of the NEPA analysis. See also responses 30j and 30k for additional related discussion.
- 74b. The loss of scientific research opportunities at this location, including the potential reduction in the amount of time available for the use of the radio telescope, is not addressed in this NEPA analysis. The decision to reduce scientific research opportunities was made as a result of budget reductions and mission decisions by NSF. The decision to reduce the budget and change the role of NSF has been made and is not being analyzed in this NEPA document.
- 74c. Under Alternative 1, operations would continue much as they are now. Impacts to research users would not be expected unless their research was not compatible with the collaborators' use for the facility. There is no reason to expect that would occur. No changes have been made to the document as a result of this comment.
- 88a. Demolition and site restoration are part of the NSF Proposed Action and would not be the responsibility of the stakeholders. The collaborative stakeholders would be responsible for annual maintenance, which would be addressed through the collaborative agreement. Any future upgrades not included in the Proposed Action would be the responsibility of the collaborative stakeholders, and determining the funding mechanisms for those future upgrades is not within the scope of this NEPA analysis.

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RESPONSE MATRIX FOR SUBSTANTIVE COMMENTS GROUPED BY TOPIC

Transportation	
<p>49 63 77</p>	<p>Received from: Anne Virkki, (12-12-16) Robert Minchin (12-12-16) Gerrit Verschuur (11-16-16)</p>
<p>Comments: 49r. “Minor, adverse, short-term impacts to traffic and transportation would be expected during deconstruction. No traffic impacts would be expected during operations.” This is incorrect in terms of the durability of any roads leading to the Observatory without full reconstruction of the local road network to be used by the deconstruction trucks. 63. The draft EIS states that “Minor, adverse, short-term impacts to traffic and transportation would be expected during deconstruction.” However, the proposed route makes use of roads that are already falling away due to subsidence and which the local council does not have the money to repair. Unless the cost of making good the local roads during and after deconstruction is covered by the NSF, there are likely to be major, adverse, long-term impacts to transportation in the local area. This should be included in the cost analysis. 77a. All the traffic and transportation statements in the DEIS include this rather disingenuous claim: “Minor, adverse, short-term impacts to traffic and transportation would be expected during deconstruction.” Only someone who has never driven on the local roads would claim that only minor impacts would be experienced. Having hundreds of debris-laden trucks navigating local roads, for instance taking shortcuts across to Highway 10, will cause enormous damage and pose traffic hazards all day, every day. Will the city of Arecibo be willing to repay this minor damage?</p>	
<p>Responses: 49r, 63, 77a: NSF recognizes the potential for additional damage to regional roads due to demolition traffic and included the following text in the DEIS: <i>Vehicles used for material transport would be required to comply with local standards for height, width, and length of vehicles when practicable. If at any time vehicles of excessive size and weight are required on local roads and bridges, permits would be obtained. Further detailed waste haul routes and concerns would be addressed during the detailed design phase of the Proposed Action, including verification that all bridge crossings on the delivery routes have adequate strength and capacity to allow safe hauling of waste.</i> However, based on public concern, NSF has added the following new impact to the text in Section 4.10 to capture the potential for damages to regional roadways: Minor, adverse, and long-term impacts are expected from Alternatives 1, 2 and 3. Moderate, adverse, and long-term impacts are expected from Alternatives 4 and 5. In addition, the text concerning the mitigation measure in Section 4.10.7 has been revised as follows: <i>If at any time vehicles of excessive size and weight are required on local roads and bridges, NSF will coordinate with the appropriate transportation authority to obtain the necessary permits and determine the appropriate mitigations.</i> NSF will coordinate with the appropriate transportation authority to determine the appropriate mitigations, and NSF is prepared to address any road damage it is responsible for causing.</p>	

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RESPONSE MATRIX FOR SUBSTANTIVE COMMENTS GROUPED BY TOPIC

Environmental Justice			
	Received from:		
30.	Joan Schmelz, 12-11-16	81.	Robert Minchin, 12-12-16
56.	Robert Steele, 12-12-16	88.	Carmen Pantojas, 11-16-17
Comments:			
<p>30j. The draft EIS states (page 3-31) that “The ROI [Region of Interest] for education and tourism is the Commonwealth of Puerto Rico because the education and tourism activities offered draw students and visitors from across the island.”</p> <p>However, it also claims (page ES-13) that “Impacts from any of the proposed Alternatives would not result in disproportionately high and adverse to minority and low-income populations. Therefore, there would be no environmental justice concerns associated with the Proposed Action.” To be clear, environmental justice is not simply about the natural environment, but is defined in the EIS (page 1-10) as “Environmental Justice: Potential impacts, including human health, economic, and social effects, from the Proposed Action on minority and low-income communities”. The assessment of environmental justice is required under Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (page 4-106).</p>			
<p>30k. The assessment of environmental justice uses a methodology that starts by defining “The ROI [Region of Interest] for environmental justice is the Municipality of Arecibo.” (page 4-107). However, this contradicts the earlier statement that the ROI for education and tourism is the Commonwealth of Puerto Rico, meaning that these aspects – which are clearly part of the economic and social effects, as demonstrated by their inclusion in socioeconomic impacts – have not been correctly measured by the environmental justice analysis in the draft EIS.</p>			
<p>30l. Finding 7: The Region of Interest for the Environmental Justice analysis is inconsistent with the Region of Interest identified for education and tourism. The Environmental Justice analysis thus fails to cover all economic and social effects.</p> <p>The Commonwealth of Puerto Rico has a population that is 99% Hispanic (table 4.12-1) and (using the methodology on page 4-112 and the figure of 45% below the poverty line from table 4.12-2) 90% low income. As this is the ROI for education and tourism, as identified by the draft EIS, this should be compared to the general population of the United States. As of 2015, the Hispanic population of the US is 17.6% of the total [http://www.census.gov/newsroom/facts-for-features/2016/cb16-ff16.html] and the official poverty rate is 13.5%, giving a low-income population of 27% [http://www.census.gov/library/publications/2016/demo/p60-256.html]. This indicates that there is a potential environmental justice issue here.</p> <p>As some of the impacts in education have already been judged as either moderate (Alternative 3) or major (Alternatives 4 and 5), this potential issue has been realised for these Alternatives. If our findings that Alternatives 1, 2, and 3 have been mis-characterized are accepted, then this becomes an environmental justice issue for all of the Alternatives.</p>			
<p>30m. Finding 8: The loss of educational and tourism opportunities in Puerto Rico constitutes an environmental justice issue that has been obscured by not using the correct region of interest for these activities in the draft EIS.</p> <p>According to the NSF Strategic Plan 2014-2018 [https://www.nsf.gov/pubs/2014/nsf14043/nsf14043.pdf], the mission of the NSF has two parts: “(1) advancing the progress of science while (2) benefitting the Nation”. The strategic goals of the NSF (from the same document) are to: (1) Transform the frontiers of science and engineering; (2) Stimulate innovation and address societal needs through research and education; and (3) Excel as a Federal Science Agency. The strategic plan also states that the NSF Division of Mathematical and Physical Sciences (MPS), of which AST is a part, contributes to strategic goals 1 and 2 and, within those goals, to the relevant strategic objectives mentioned below.</p>			

Strategic Objective 2 for Goal 1 is to “Integrate education and research to support development of a diverse STEM workforce with cutting-edge capabilities,” as part of the plan for accomplishing this, the Strategic Plan states that “NSF is committed to increasing access for currently underrepresented groups to STEM education and careers through our investments in research and education” – note that investment in research is specifically included in how NSF intends to meet this commitment. Strategic Objective 2 for Goal 2 is to “Build the capacity of the Nation to address societal challenges using a suite of formal, informal, and broadly available STEM educational mechanisms.” Similarly, the NSF’s core strategies include “Ensure[ing] diversity is at the forefront of all of NSF’s internal and external activities to develop the Nation’s intellectual potential.”

56f. 6. Environmental Justice

Another important issue, both substantively and as a "hot button" topic of the day, is "Environmental Justice." Executive Order 19898 and various authorities and policies giving rise to the need to consider Environmental Justice in federal actions are well-documented and discussed in the DEIS and elsewhere. Included in the DEIS is use of the EJ Screen tool appearing at Appendix 4.12-A. (Once again, this is a screening tool leading to additional consideration, analysis, and outreach rather than forming a basis for decision-making.) Considerable further information appears at Sections 4.9 and 4.12 of the DEIS among other segments. However, the conclusion reached by NSF in the DEIS is that there are no Environmental Justice concerns associated with any of the proposed actions and alternatives. This position essentially is based on the fact that since nearly all of the population of Arcibo (100%) and of Puerto Rico (99%) is minority (Hispanic), as well as low-income people forming a strong majority of the population both in Arcibo and in Puerto Rico, then there is no Environmental Justice issue because the proposed actions do not produce disproportionately high and adverse impacts to any minority and low-income populations. See DEIS sections ES.5 and 4.12.

Once again we believe that NSF is taking too narrow a view of this issue because of its setting in Puerto Rico as an island Commonwealth of the United States. We believe that NSF should and must take a broader view and recognize the critical importance of Environmental Justice in this case. Otherwise almost no activity anywhere in Puerto Rico could ever be seen as arousing these concerns. (This advice is especially true given past disregard for the interests of Puerto Ricans by certain major federal actions taken and their cumulative impacts, such as abrupt accelerated closure of Roosevelt Roads Naval Station and Department of Defense activities with respect to Ramey Air Force Base and Vieques Island.) The Observatory is a cultural icon of Puerto Rico, a source of great local, ethnic, and territorial pride as well as a significant driver of employment, spending, tourism, income, and education there. Yet NSF states in the DEIS that there is no Environmental Justice impact, even upon facility closure, on cultural resources or socioeconomic resources because the impact will be borne equally among demographic groups and not disproportionately or solely by minority or low-income populations - even if those most negatively impacted are minorities in the larger sense and are already economically depressed.

If the Observatory were instead located within downtown Detroit, or in the middle of the Navajo Nation, in both cases surrounded for many miles by minority and low-income populations being impacted by a proposed major federal facility deconstruction or closure, would this same Environmental Justice conclusion be reached by an agency in a DEIS? Would not the existence of non-minorities and higher income persons utilizing the facility from farther away be influential? Are the impacts to be considered solely environmental in nature if the DEIS process by rule extends beyond just environmental factors? Does the broader (including climate-related) human health risk created by the loss of this facility's research functions expand the affected populations beyond those only within a limited mileage radius of the Observatory, the local community, the trucking zones, and the waste disposal locations? Thus would not the extreme local impacts, even if primarily cultural and socioeconomic, be looked upon as further overburdening existing minority and low-income communities compared to all others impacted? Should NSF not favor or even err on the side of inclusion in this case? See, e.g., “FERC Ignored Pipeline’s Impact on Minorities, DC Circ. Told,” Law 360, December 9, 2016.

In performing Environmental Justice analyses under NEPA, Federal agencies including NSF "should recognize the interrelated cultural, social, occupational, historical, or economic factors that may amplify the natural and physical environmental effects of the proposed agency action." Environmental Justice: Guidance Under the National Environmental Policy Act, Council on Environmental Quality, December 10, 1997 (p. 9). Assessors should not be locked into rigid formulas for determining affected communities and may exercise appropriate and reasonable judgment in considering appropriate comparison groups. See references to "disproportionately high and adverse human health effects" and other key

determinations, id. at Appendix A; see also Technical Guidance for Assessing Environmental Justice in Regulatory Analysis, EPA, June 2016. While current guidance may recognize that regular uniform distribution of impacts may not indicate potential for disproportionate adverse impact, defining the affected environment under NEPA is also flexible and reasonably subjective and may vary for each resource topic analyzed in a DEIS. As stated by EPA also in 2016: "After considering unique conditions (e.g., ecological, aesthetic, historic, cultural, economic, social, or health) of the potentially affected minority populations and low-income populations, Agencies may wish to consider that the extent of the affected environment may also not be contiguous" (emphasis added). Promising Practices for EJ Methodologies in NEPA Reviews, EPA, March 2016 (p. 15).

Furthermore, for Environmental Justice analyses, "agencies can benefit by being sensitive to situations where a large percentage of the residents is comprised of minority individuals.... A larger scale reference community (e.g., municipal, state, or regional) may be required under this circumstance to obtain results that accurately reflect the existence of a minority population in the geographic unit of analysis...." Id. at p. 21. We believe that social impacts, and indirect effects over time and farther removed in distance, may enter into the picture in cases such as this. Extraordinary circumstances and unique situations may also be considered. (Climate change, for example, may constitute a project issue that also disproportionately affects poor people's lives when looked at on a larger geographic scale.) Finally, EPA notes again that agencies "may wish to recognize that in instances where an impact from the proposed action initially appears to be identical to both the affected general population and the affected low-income populations, there may be inter-related ecological, aesthetic, historic, cultural, economic, social, or health factors that amplify the impact.... After consideration of factors that can amplify an impact to minority populations and low-income populations in the affected environment, an agency may determine the impact to be disproportionately high and adverse." Id. at p. 39.

Additionally, aside from age and functional differences of NSF astronomic facilities, what are the demographics of people living near and impacted by the other similar NSF facilities that are competing with the Observatory for shrinking budget dollars and future priority status? How can this facility located in an "all-minority" and "nearly all poor" area of the United States be the one facing possible closure without Environmental Justice concerns found?

A finding of Environmental Justice impacts in an EIS does not preclude a proposed Federal action from going forward. Nor does it necessarily compel a conclusion that a proposed action is environmentally unsatisfactory. However, it is critical for the DEIS to have fairly weighed all applicable considerations, and to propose measures to address them in light of the alternatives analyzed, since the ROD and final NSF decision-making will be based on the final EIS in large part. All alternatives other than the No-Action option and the favored Alternative 1 may well have greater detrimental permanent impacts, including health effects, on the local population and community, the larger Hispanic Commonwealth, Puerto Ricans living elsewhere in the United States, and Hispanics in general as compared to the populations living near other NSF facilities and the overall impacted American population and international scientific communities. Others are affected by this matter, including non-Hispanics and non-poor, but to a lesser degree in comparison to the disproportionate minority and low-income human impacts. (Native Hawaiian group reactions to Mauna Kea facility plans may provide further tangential lessons in this regard.) Thus, we recommend that, prior to finalizing the DEIS:

A. NSF revisit and revise/supplement its Environmental Justice analysis in this DEIS and exercise available flexibility to recognize unique circumstances that show that cessation or closure Alternatives here present significant Environmental Justice concerns; this should be addressed and this work should appear now in a new DEIS, and later it should be fully taken into account in final agency decision-making on the future of the Observatory.

- 81d. Removal of the scientific staff would massively set back efforts to bring Puerto Ricans into astronomy and space sciences and send messages to Hispanics and other minorities that the NSF doesn't care. Yet the Draft report makes the claim that there would be no disproportionate impact on low income or minority populations. That is an outright lie.
- 88f. And the other point is the minorities. How many minority-graduate students are using Arecibo to train, and how that will be affected adversely? I am a professor of physics at the Department of Physics at the UPR. I am the only woman in the Department of Physics and I did my graduate studies at the Arecibo Observatory. So I know this would have an adverse effect.

Responses:

30j, 30k, 30l. NSF recognizes the presence of minority and low-income populations in the vicinity of Arceibo Observatory and consequently, performed the analysis provided in Section 4.12 to assess potential disproportionately high and adverse impacts to these populations, per Executive Order 12898. The findings demonstrate no disproportionately high and adverse effects to these populations. Under NEPA Regions of Influence (ROI) are established to provide an appropriate analysis that neither obscures or dilutes the effect of an action. Socioeconomics required differing ROIs dependent on the sub-resource being analyzed; for example, housing required a smaller ROI than tourism. The most appropriate ROI for environmental justice was determined to be the municipality of Arecibo, which accurately demonstrated the presence of minority and low-income populations. If a larger ROI was chosen, the presence of minority and low-income populations would have been underestimated.

No changes to the document have been made as a result of these comments.

30m, 56f, 81d, 88f. EPA notes the following with regard to environmental justice:

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

EPA has this goal for all communities and persons across this nation. It will be achieved when everyone enjoys:

- The same degree of protection from environmental and health hazards, and
- Equal access to the decision-making process to have a healthy environment in which to live, learn, and work.

The Proposed Action under consideration would not create environmental health or health hazards for minorities, low income populations, or any other populations. The people of Puerto Rico have had the opportunity to be fully involved in the NEPA decision-making process. As such, the proposed action meets the goals of EPA. While there would be the potential loss of STEM/educational opportunities and economic opportunities in the region, these are not specific environmental justice issues. They are appropriately addressed in sections that address education and economics (Sections 3.9 and 4.9 of the FEIS).

No changes to the documents have been made as a result of these comments.

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5-J- Original DEIS Comments

From: Henri A Radovan
To: Envcomp-AST@nsf.gov
Subject: Arecibo Observatory Review Process
Date: Saturday, December 03, 2016 9:30:04 AM

Dear NSF,

I'm disappointed about your attitude toward two gems of US radio astronomy -- the Arecibo Observatory (AO) and the Green Bank Observatory. Both observatories are entering an uncertain future that might well lead to its extinguishing. Please allow me to voice my concerns that exist on four different levels.

1. I'm disappointed at the astronomy level. While the AO is over 50 years old, it is a state-of-the-art national facility with the highest sensitivity of any tracking-enabled radio telescopes worldwide and the one with the highest intensity radar. The AO offers unparalleled views of the Milky Way and beyond, possibly for years to come. It is outfitted with the most modern signal processing units and attracts some of the world's most distinguished scientists.

2. I'm disappointed at the national interest level. You will extinguish US radio astronomy if you close down both observatories. It appears to me that the path you are taking is effectively outsourcing radio astronomy by supporting facilities on foreign soil (most notably ALMA in Chile), while trying to abandon domestic facilities. As you know, technological advances have their roots in fundamental science. Curbing the latter will ultimately adversely affect the first.

3. I'm disappointed on a personal level. Several years ago I decided to change my academic career path -- from solid state physics to radio astronomy. I spent years in preparing myself professionally to be competitive in my new field. Finally, in this current semester, together with a colleague, we obtained observing time at the AO and are performing radio pulsar research. Quite possibly, we are the only ones in Puerto Rico dedicated to pulsar astronomy.

4. I'm disappointed at the academic level. For the past two years I was working in establishing a minor-type program at my home university -- the University of Puerto Rico Mayaguez. Our new program will officially commence next year and will be the only such program at this level in Puerto Rico. It will attract local students to pursue astronomy/astrophysics studies and research by using the world-class AO radio telescope that [still] is virtually in our backyard.

I'm quite convinced that my writing won't change a thing, but hopefully somebody will read it and reflect for a minute on its message.

Thank you for your time.
Sincerely,

Henri Radovan

Henri A. Radovan, Ph.D.
Professor
Department of Physics

University of Puerto Rico
Mayagüez, PR 00681

Email: henri.radovan@upr.edu

Tel.: 787-265-3844 (department office)

quaestio -- interrogatio -- disputatio

From: Steele, Robert
To: Envcomp-AST@NSF.gov
Subject: Request for Extension of Time - ARECIBO OBSERVATORY
Date: Monday, November 28, 2016 2:56:22 PM

To Ms. Elizabeth Pentecost
National Science Foundation (NSF)

Dear Ms. Pentecost:

We are emailing you today officially to request that NSF extend the public comment period on the Draft Environmental Impact Statement (DEIS) for the proposed Arecibo Observatory project in Puerto Rico for an additional period of time beyond the current stated comment submission deadline of December 12, 2016. At this time we would request the ability to submit relevant comments to NSF on this DEIS by January 11, 2017, an extension of 30 days (although a longer time would be acceptable as well).

We have clients that have only recently gained a more heightened awareness and understanding of this very important matter. They need more time in order to review the lengthy, complex, and detailed document that has been produced and made available to the public, along with the previous work product elements cited throughout the DEIS. Such an extension of time would not materially delay the work of the NSF on these issues, while at the same time it would show fairness and due process to all interested parties. This comment period extension would also move the response deadline beyond the remainder of the holiday season and business year-end to allow for more thorough analysis and reasoned input and dialogue. We are aware that there was a scoping process performed earlier in 2016 and that recently there were two public meetings held in Puerto Rico on this matter. We are also aware of certain concerns raised as to whether notices were sufficiently disseminated in the community there (even if technical regulatory compliance may have taken place) and some people either not being able to attend or having their time to speak shortened due to the heightened interest in the situation, times of day for these events, or time taken for necessary translation for many speakers during these meetings. NSF reasonably granting more time now for written comment from the public and all parties may help to alleviate certain concerns on the front end and make for a stronger process and better result when completed by NSF. Finally, I would note that your regulations at 45 CFR 640.5(a) and elsewhere under CEQ/NEPA refer to DEIS comments being accepted for a "**minimum**" of 45 days after DEIS publication, but the rules should not preclude a somewhat longer period being allowed when necessary or appropriate.

Please consider this request and let us know **as soon as possible** if an extension of the public comment period may be granted in this case. If there is NSF counsel or other official with whom we should speak about this in addition to yourself, such as my contacting you or others by telephone tomorrow (November 29) if needed, then please so advise. Thank you very much for your consideration and best regards.

- Robert Steele

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The Arecibo Observatory and its Future

November 2016, NSF Public Hearing, San Juan, Puerto Rico

The future of the Arecibo Observatory in Puerto Rico is again a matter of public discussion. We would like to add with these short comments to that public discussion, and clarify a few issues which have confused the public. Our long time association with the observatory allows us to make the following comments.

Although it recently celebrated its fiftieth anniversary, it continues to serve scientific research in several areas, and in some of them it is a *unique* instrument. In a 2006 headline, the journal *Nature* declared that Arecibo might be “no longer the dish of the day”, but then it never was! It has always been something of a gourmet dish, and definitely something very special.

In particular, its radar capabilities, are unique and allow important investigations in the areas of atmospheric science and planetary radar.

We begin by expressing our disagreement with statements that seem to imply that because it is no longer the largest single dish aperture on our planet, being surpassed by the recently inaugurated FAST telescope (Five hundred meter Aperture Spherical Telescope) in China, it has therefore become obsolete. It is still the second largest single dish in the world, mainly serving the US scientific community, and FAST is in China.

It is also not true that the SKA (Square Kilometer Array) being constructed in South Africa and in Australia, makes Arecibo obsolete. The SKA is under construction and at any rate does not and will not have certain capabilities which Arecibo does have (Radar).

In particular we wish to point out that even if all that Arecibo could do was planetary radar, this capability is well worth the relatively small budget needed to maintain the Arecibo Observatory open. It is needed to establish the precise orbit of a near earth asteroid which could represent a threat to a region of the earth in the event of an impact which, although of low probability, is not impossible. Arecibo represents a first line of defense to verify such a threat. An insurance premium of \$12 million a year is a real bargain. (Total NSF budget is about \$7.4 billion)

Furthermore, it is not just another telescope. It is an international scientific icon and has been designated by the *Institute of Electrical and Electronics Engineers* (IEEE) as an important historical milestone of electrical engineering. The *American Society of Mechanical Engineers* (ASME) declared it a monument of mechanical engineering, both events happening in 2001. It was registered in the national registry of historic places by the U.S. Department of the Interior National Park Service in 2008.

Closing or decommissioning have therefore implications which go beyond strictly scientific matters, since attention must also be given to section 106 of the federal code for the protection of historical sites. (www.achp.gov).

Many of our colleagues agree that closing the Observatory is a bad move. Changes in its operation will also have significant consequences beyond the issues mentioned above, including a negative effect on the already gloomy economic situation of Puerto Rico,

We think that the preferred option by the NSF, of finding partners for funding the Observatory, must be looked upon with some concern, especially if the idea is to "offer" the observatory to the local government, (likely through the University of Puerto Rico).

The alternative of transforming the observatory into an educational institution is also not a good one, and just another way to find local money for a federal facility mostly used by US scientists. The telescope is not an adjunct to the educational activities, it is exactly the opposite.

Furthermore, aside from its scientific value, the observatory has served as inspiration and training ground for many Puerto Rican students who have very limited local opportunities to do so. Some of them went on to obtain their doctoral degrees in science. If NSF wants to further the participation in STEM by minorities and women, closing or otherwise limiting the operation is again a bad idea.

Dr. Daniel R. Altschuler (Former Director of the Arecibo Observatory)
Dra. Mayra E. Lebrón (Former Research Associate of the Arecibo Observatory)
Dra. Carmen A. Pantoja (Former REU coordinator for the Arecibo Observatory)
Faculty members, University of Puerto Rico, Rio Piedras Campus.

→ here



WRITTEN COMMENT CARD

Environmental Impact Statement and Section 106 Consultation for
Proposed Changes to Arecibo Observatory Operations

PUBLIC MEETING

November 16, 2016

Puerto Rico Professional College of Engineers and
Land Surveyors - Arecibo CIAPR
from 6:00 pm to 8:00 pm

November 17, 2016

Doubletree by Hilton, San Juan
from 10:00 am to 12:00 pm

Name Kevin Shocket
Address Guabo, Puerto Rico
Affiliation Puerto Rico Pythia Group
Phone (787) 410-2058
Date 11/17/16

We welcome your participation. You may submit comments at the Public Meeting by either of the following methods:

E-mail: envcomp-AST@nsf.gov, with subject line "Arecibo Observatory"

Mail to: Ms. Elizabeth Pentecost, RE: Arecibo Observatory, National Science Foundation, Suite 1045 4201 Wilson Blvd, Arlington, VA 22230

Project information will be posted, throughout the EIS process, at www.nsf.gov/AST.

Please note that the deadline for public comments is December 12, 2016.

COMMENTS:

(Attach additional sheets if necessary)

The Arecibo Observatory is a Puerto Rican national treasure and every possibility that could save it should be explored.

While it may have been surpassed by telescopes more and more efficient, but its unique capabilities and location make the telescope worthy of preserving.

Every measure should, regardless of the outcome, be taken to save the facility and can be continue to be a source of important scientific and our cultural significance and inspiration.

Let us not see the telescope fall into the same state of Puerto Rico's 360° light houses system. From the late 1800's, this system protected maritime traffic safe in and around Puerto Rico. Now, the Arecibo telescope protects the planet from rogue asteroids. Let's not let history repeat itself, many of those lighthouses are abandoned and in disrepair. Don't let the same happen to our national treasure.

Comments to the National Science Foundation on the Draft Environmental Impact Statement

November 17, 2016

My name is Carlos M. Padín Bibiloni, and I am the Chancellor of Universidad Metropolitana (UMET) and a member of the management team of the Arecibo Observatory. This statement reflects the views of Universidad Metropolitana and the Ana G. Méndez University System of Puerto Rico regarding the Educational and Public Outreach of the Arecibo Observatory and the socio-economic impact of the Agency-preferred Alternative (Alternative 1 – Collaboration with Interested Parties for Continued Science-focused Operations).

It is our understanding that the role of the Arecibo Observatory in Puerto Rico and its impact on our education efforts and socioeconomic situation was not adequately reflected nor considered in the Declaration of Environmental Impact Draft Statement published by the National Science Foundation in October 2016. First, the five (5) alternatives presented in said document underestimate the impact of the Education and Public Outreach Program of the Observatory in Puerto Rico, and second, the Draft Statement does not recognize the significant role of the Arecibo Observatory on the economic development of the island.

For over 53 years, the Arecibo Observatory has established a significant track record of scientific accomplishments in astronomy, planetary science, and space and atmospheric sciences. Its world-renowned scientists have served as mentors to many young scientists throughout the STEM pipeline in the United States. Here in Puerto Rico, and in contrast with many scientific research facilities in other locations, and particularly during these past five (5) years, the Arecibo Observatory and its surrounding society have established a close and significant partnership. The Government of Puerto Rico, through its Department of Education, has invested more than \$600,000 in training teachers in the use of the Arecibo Observatory in their classroom teachings. The Angel Ramos Foundation and the Ana G. Méndez University System have invested \$2.1M to revamp the Science and Visitors Center because both partners are certain of the educational contribution of this cutting-edge research facility and its potential to positively impact the STEM pipeline in Puerto Rico. The Puerto Rico Infrastructure Financing Authority (AFI, for its initials in Spanish) also provided \$828,635 for infrastructure improvements at the Observatory. These actions all point to a real commitment of the people of Puerto Rico to the Arecibo Observatory.

Another key aspect of the Arecibo Observatory is its role in the economic landscape of the island; specifically, in its impact on our tourism industry, the development of our

Aerospace Cluster, and its broader impact on the development of a STEM workforce on the island.

The Aerospace Cluster is part of the economic recovery strategy of the government of Puerto Rico, aimed at **integrating** aerospace manufacturers, providers and related institutions to **develop strategies** and **foster synergies** that will enhance the business environment in the areas where cluster members conduct their operations. Virtually overnight, Puerto Rico has become a magnet for some of the world's leading aviation and aerospace companies. With a long history of manufacturing expertise and a strong pipeline of engineering talent, the island has attracted multimillion-dollar investments by these and other major firms during recent years. The Arecibo Observatory is part of Puerto Rico, part of this strategy and a key asset for the development of this aerospace cluster. (See attached map for a visual representation of the Aerospace Cluster.)

The many activities implemented by the Education and Public Outreach component of the Arecibo Observatory evidences the broader impact of this research facility, which meets the goals of the agency to broaden the participation of underrepresented groups in STEM initiatives. Since October 2011, the *Angel Ramos Foundation Science and Visitor Center* at the Observatory has hosted more than 450,000 visitors; approximately 30% of these are school children. In addition, the activities hosted have included Saturday academies for high school students; Research Experiences for Undergraduates (REU) projects sponsored by NSF; Observation nights in consortia with the Puerto Rico Astronomy Society, which attract more than 700 participants per event; research opportunities as part of undergraduate capstone/practicum courses from various local higher education institutions; and mentoring for theses (master and PhD level). In addition, the creation of the Arecibo Observatory Council of Chancellors and Stakeholders has enabled different universities to come together to use, promote, and create innovative programs that broaden the opportunities for students across the island to become part of a nationally recognized research institution. These opportunities create the real, meaningful pathways that increase the STEM workforce.

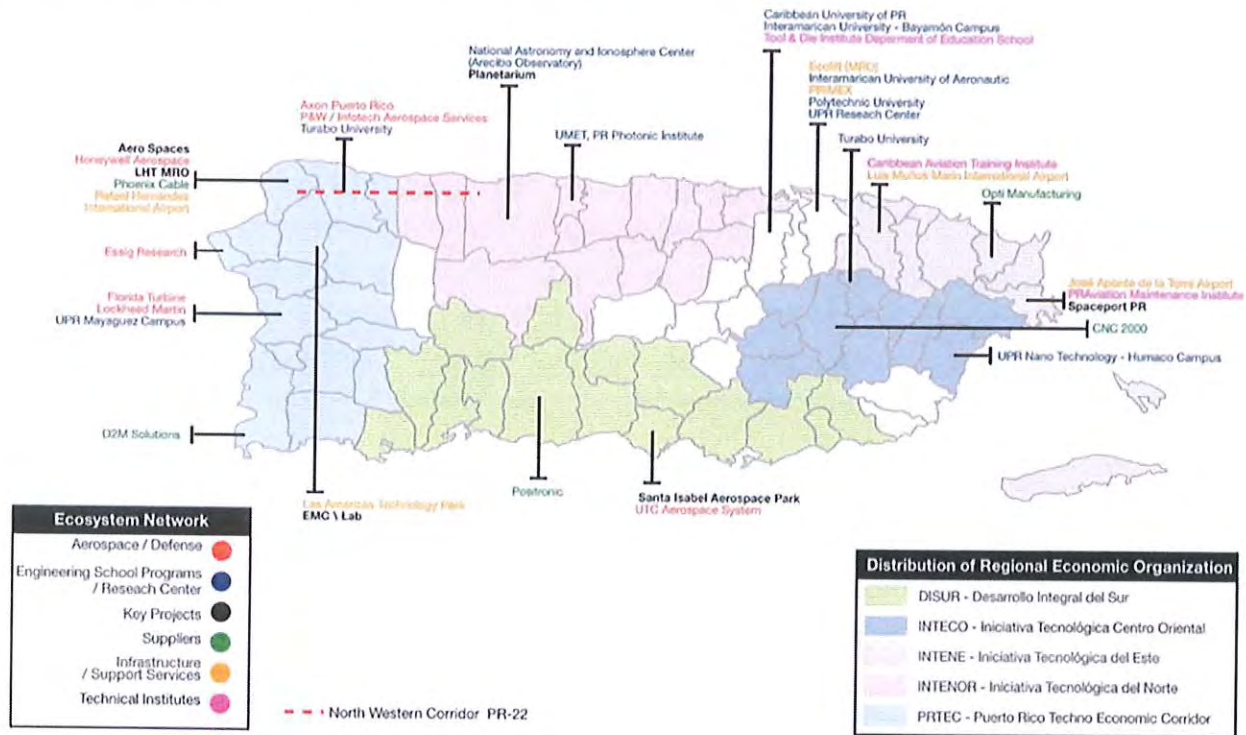
The Agency-preferred Alternative includes the deconstruction of over 26 buildings at the site and implies the elimination of the planetary radar, and the space and atmospheric science capabilities at the Arecibo Observatory. These actions will negatively impact the promotion of the aerospace cluster and will limit the possibilities of the Arecibo Observatory Management Team to pursue other sources of income for the financial stability of this outstanding research facility. This alternative will also limit the educational research opportunities for undergraduate and graduate students, the space academy and all active and current educational activities. Furthermore, eliminating most of the housing at the site will reduce the opportunities to host scientists, teachers, and students who avail themselves of these options due to the geographical and logistic challenges related to the location of the site.

We feel it is imperative that the DEIS explain in more detail the impact of the alternatives on the Education and Public Outreach component of the Observatory, the local economy, and the science that only occurs at Arecibo. The Agency-preferred Alternative will most likely negatively impact the possibilities of obtaining funds from the private sector and from other federal agencies, such as NASA.

UMET, as well as the Puerto Rico Council of Chancellors and Stakeholders of the Arecibo Observatory, strongly believes that the best option for a sustainable and productive future for the Arecibo Observatory is to maintain the site with multiple scientific research capabilities. Our vision of the Arecibo Observatory is one that will continue supporting the STEM pipeline in Puerto Rico and the economic development of the island.

Carlos M. Padin, Ph.D.
Chancellor
PO Box 21150
Universidad Metropolitana
San Juan, Puerto Rico 00928-1150
787-766-1717 ext. 6400
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Graphic 1. Aerospace Cluster





COMMONWEALTH OF
PUERTO RICO

Puerto Rico Industrial Development Company

November 16, 2016

Ms. Elizabeth Pentecost
RE: Arecibo Observatory
4201 Wilson Blvd, Ste 10455
Arlington, VA 22230

Dear Ms. Pentecost:

I would like to point out that the Puerto Rico Industrial Development Company's business development program to attract Aerospace companies has benefited from the Arecibo Observatory. Closing this research institution will not serve the interest of the people of Puerto Rico and it will be a setback in establishing this sector as a main contributor in the economic development of the Island.

For many years, the Arecibo Observatory stood proud but somewhat isolated from the economic development of the Island. But in 2007, the stakeholders began to incorporate the research capability of the institution to attract innovation-driven companies mostly in aerospace. In ten years, the industry grew from less than 1,000 employees to 5,000 employees.

Today, it is anticipated that this sector will double the number employees in a 5-year period. Companies in the space subsector will contribute the most and are the one that requires ground support to receive communications from the satellites as well as space weather data and analytics to assist in their missions. The Arecibo Observatory has the capability and the talent to assist this new breed of companies looking at space for commercialization.

We certainly understand NSF's financial concerns in keeping the facility open for research and education but the center has being both a symbol and a driver for innovation to many Puerto Rican students in their pursuit of science and engineering knowledge. Therefore, it is time to reinvent the business model of the center to meet the challenges of the scientist community and to become active participant of the business innovation community.

Closing is not the answer. Changes must be instituted. New services and educational activities must be incorporated.

PRIDCO supports Alternative 1 with a new and sustainable operation of the Arecibo Observatory in a manner consistent with the principles of the NSF. Given a short period of time the center will flourish and will continue to be an economic development tool for the betterment of Puerto Rico and humankind.

Sincerely

Luis Ortiz Ortiz
Executive Director

Subject: RE: Arecibo Observatory
Date: Monday, December 5, 2016 at 11:52:05 PM Eastern Standard Time
From: Becker, Tracy
To: NSF/AST Environmental Compliance Mailbox
CC: achp@achp.gov
Attachments: AO_Letter.pdf

Good evening Ms. Pentecost,

Please find the attached letter written with regard to the NSF proposed changes to the Arecibo Observatory. I would be happy to answer any questions you may have.

Sincerely,
Tracy

Tracy M. Becker, Ph.D.
Postdoctoral Researcher
Southwest Research Institute
Tracy.Becker@SwRI.org
+1-210-522-6315

Dr. Tracy M. Becker
Southwest Research Institute
Space Science and Engineering Division
6220 Culebra Rd. San Antonio, TX 78238

Ms. Elizabeth Pentecost
RE: Arecibo Observatory
4201 Wilson Blvd, Ste 1045S
Arlington, VA 22230

Dear Ms. Pentecost,

I am writing to you with grave concern for the future of the Arecibo Observatory. Not only does the observatory continue to produce significant contributions in multiple fields (planetary sciences, radio astronomy, and space & atmospheric sciences), but it also remains a critical tool for planetary defense; it is vital for identifying and characterizing potentially hazardous objects that could threaten the planet Earth.

I believe that the AO Management team's statement in response to the NSF Draft Environmental Impact Statement (DEIS) written by Francisco Cordova addresses the specifics of the issues within the DEIS better than I possibly could; however, I would like to highlight and reiterate the concern for dismantling the unique radar and space weather capabilities of the observatory that (1) make the telescope unique and more powerful than any other in the world; (2) destroy prospects of future partnerships through the destruction of these capabilities; and (3) are critical for planetary defense.

Instead I will focus on several other crucial contributions that the Arecibo Observatory has made to me, the field and to the public. My personal journey as a planetary scientist began at the Arecibo Observatory. In 2008, as a college junior at Lehigh University, I applied to the NSF Research Experience for Undergraduates (REU) program and was astonished when I was accepted to work at such a celebrated telescope. At that time, I had no research experience or computer programming skills, only passion and extreme curiosity. As it turned out, the wise scientists at the observatory were looking to bring students like me – students from smaller universities with fewer research opportunities – to their REU program to give us the tools and experience that we would not have had otherwise and are essential for a successful future in a STEM field. The aid, knowledge, support, and encouragement I received from my mentors at AO were beyond exceptional and my experience at the Arecibo Observatory was indisputably the foundation for my career as a planetary scientist. In May of 2016 I earned my PhD in physics & planetary science from the University of Central Florida and I am currently a postdoctoral scientist at the Southwest Research Institute. The research I began at the observatory as an inexperienced student led to my first peer-reviewed publication. That research focused on the first-ever detection of a near-Earth asteroid that had its own two small satellites. The discovery was made at the Arecibo Observatory a few months prior to my internship, and was thought by many to be an impossible asteroid system until the AO observations proved otherwise. The triple asteroid could not have been discovered without radar (the satellites are small and close to the primary asteroid) and yet it is critical for understanding the evolution of the asteroids that come closest to our planet.

The exciting research I conducted at the Arecibo Observatory is not the only reason I remained in the field. I was one student among eight REU students that summer – half of whom were young women. Several of the students were from Puerto Rico and one student was international. The diversity among us was not only fun, but also encouraging. A number of science staff of all levels at the observatory were women, including my direct advisor and a postdoc with whom I often interacted. My introduction into the world of science was far more welcoming and inclusive than that experienced by many of my colleagues and many of the young scientists currently being introduced into the field. This remains true for AO – I am aware of several early career scientists of diverse backgrounds currently employed at the observatory.

The most obvious and critical contribution that the Arecibo Observatory has made and continues to make towards diversity and inclusivity in the field is that of increasing the historically underrepresented group of Latinos in STEM. Most recently, the Arecibo Observatory Space Academy has proven to be a wildly successful program for recruiting, preparing, and retaining Puerto Rican high school students in STEM majors in college. The program's first graduating class produced students so well prepared that they had a college graduation rate of 100%. This does not even address the profound impact that the observatory has had on the countless number of Puerto Rican students that visit on school field trips or the pride most Puerto Ricans carry as host to the most powerful single dish radio telescope in the world.

In addition to the observatory's public service as a teaching and outreach resource, the observatory serves as a critical instrument for studying the skies. Radar is one of the most powerful and unique tools at the Arecibo Observatory and is threatened by the planned changes to the observatory. It is from radar images, in conjunction with light curves and direct imaging of the asteroids, that we can build up highly accurate shape models of the objects. Radar is the best way to "see" an asteroid without sending a spacecraft to it. Radar observations are also essential for spacecraft missions, since estimates for the shape and gravity field of the bodies are crucial for asteroid flybys, orbits, and especially future landings. Radar is also the absolute best method for determining the velocity of an asteroid and determining its trajectory.

The Arecibo Observatory is one of the most iconic U.S. observatories for the public. Whether they recognize the telescope from social media shares of ghostly radar images of asteroids, the detection of the WOW signal, or as the dish in a *James Bond* film, the impact that the observatory has made on the public is undeniable; its power to detect and characterize asteroids may have an even more important impact in the future. In addition to serving as an inspiration to me and to thousands of other students and visitors, the Arecibo Observatory is a fully functioning, critical instrument for exploring our universe and protecting our planet.

As a planetary scientist and a U.S. citizen, I implore the National Science Foundation to reconsider the proposed changes that would be devastating to the indispensable science conducted at the Arecibo Observatory.

Sincerely,



Tracy M. Becker

Subject: Comments and Recommendation on the Draft Environmental Impact Statement (DEIS) for the National Science Foundation - Arecibo Observatory, Arecibo, Puerto Rico - ER 16-0620
Date: Monday, December 5, 2016 at 11:59:26 AM Eastern Standard Time
From: Stanley, Joyce
To: NSF/AST Environmental Compliance Mailbox
Attachments: National Science Foundation for the Arecibo Observatory - Arecibo, PR - ER 16-0620.docx

*Joyce A. Stanley, MPA
Regional Environmental Officer
US Department of the Interior
Office of Environmental Policy and Compliance
(404) 331-4524 - Office
(404) 331-1736 - Fax
(404) 852-5414 - Mobile*

joyce_stanley@ios.doi.gov

<http://www.doi.gov/oepc/atlanta.html>



United States Department of the Interior



OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Richard B. Russell Federal Building
75 Ted Turner Drive, S.W., Suite 1144
Atlanta, Georgia 30303

ER 16/0620
9043.1

December 2, 2016

James S. Ulvestad, Director
Division of Astronomical Sciences
National Science Foundation
4201 Wilson Blvd, Suite 1045
Arlington, VA 22230

Re: Comments and Recommendation on the Draft Environmental Impact Statement (DEIS) for the National Science Foundation - Arecibo Observatory, Arecibo, Puerto Rico

Dear Mr. Ulvestad:

The U.S. Department of the Interior (Department) has reviewed the Draft Environmental Impact Statement (DEIS) for the National Science Foundation Arecibo Observatory (AO) Project in Arecibo, Puerto Rico. Our comments are provided as technical assistance under the Endangered Species Act (ESA; 87 Stat. 884, as amended; 16 United States Code 1531 *et seq.*) and Fish and Wildlife Coordination Act (FWCA; 48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*). The National Science Foundation (NSF) prepared this DEIS to analyze the potential environmental impacts associated with the potential funding changes for AO. The five action alternatives analyzed in the DEIS are: 1) collaboration with interested parties for continued science-focused operations (NSF-preferred alternative), 2) collaboration with interested parties for transition to education-focused operations, 3) mothballing of facilities, 4) partial deconstruction and site restoration, and 5) complete deconstruction and site restoration.

Our comments are specifically related to the species listed under the ESA that were included in the DEIS. On June 24, 2016, we provided comments to NSF regarding the presence or potential presence of federally-listed species within the AO property. Those species and the potential impacts of the proposed project are included in the submitted DEIS. After reviewing the document, we offer the following comments:

- (1) The DEIS recognizes the presence of a Puerto Rican broad-winged hawk (BWAH) nest in a Maria tree on the south rim wall, above the 305-meter telescope dish. Although this and other Maria trees in the vicinity would not be impacted by deconstruction activities, it is important to indicate that this nest represents a BWAH territory and that there is a possibility

of additional BHOWA territories within the AO. According to Hengstenberg and Vilella (2004), the BHOWA has a home range of 262 ac. Therefore, we recommend that NSF uses this information as well as survey data of the area to determine the number of territories occupied by this species. Such information will help develop appropriate conservation measures for the protection of the BHOWA. Identification of territories becomes more relevant because for Alternative 5, the DEIS contemplates the use of explosives to deconstruct towers and other infrastructure. Even if deconstruction activities are conducted outside of the BHOWA breeding season, disturbance from explosions and deconstruction activities may alter the behavior of the species and result in abandonment of occupied territories.

- (2) *Auerodendron pauciflorum* - According to Axelrod (2011, p. 296) this species also occurs in the northern limestone hills of Puerto Rico (i.e., Arecibo and Isabela). Therefore, we believe this species may also occur at the AO area. Table 3.1-1 of the DEIS indicates this species does not have the potential to occur at the AO.
- (3) *Thelypteris verecunda* - As stated in the DEIS, this species is known to occur on privately owned lands in the municipalities of Hatillo, Quebradillas, and San Sebastián. However, the species that occurs in the municipality of Yauco and Los Tres Picachos in Ciales is *T. yaucoensis*, not *T. verecunda* (5 yr. review, 2015).
- (4) *Eugenia haematocarpa* - According to the species' 5 yr. review (2014), a new locality was reported in 2011 in the municipality of Isabela by Marcos Caraballo and Dr. Eugenio Santiago (University of Puerto Rico, Río Piedras). The species was also found in two locations within the boundaries of the Guajataca Commonwealth Forest.
- (5) *Daphnopsis hellerana* - Approximately 2,047 individuals of *D. hellerana* were found within the proposed right of way of highway PR-10 in Arecibo (5 yr. review, 2013).
- (6) *Cordia bellonis* - Due to its biology, this species has the potential to occur in areas that were previously disturbed for the construction of AO (e.g., areas that will be deconstructed). Therefore, we recommend searching for this species in the surroundings of buildings and infrastructure to be deconstructed.
- (7) *Solanum drymophilum* - This species was found during the construction of highway PR-10 and at the Río Abajo Commonwealth Forest (5 yr. review, 2015). Due to its biology, it may also be found in areas that were disturbed (e.g., areas that will be deconstructed). Therefore, we recommend searching for this species in the surroundings of buildings and infrastructure to be deconstructed.
- (8) The DEIS states that the habitat that has developed beneath the 305-meter telescope dish is suitable to support the two listed fern species: *Tectaria estremarana* and *Thelypteris verecunda*. To mitigate for impacts to these two species from removal of the telescope dish, NSF proposes to retain or restore the mesic partial sun microclimates beneath the

telescope dish as appropriate following removal, or would restore areas of existing fern habitat using native woody species to create mesic partial sun microclimates that would be conducive to fern growth. The document further indicates that under a restoration scenario, controlled propagation (either greenhouse rising of tissue culture propagation) of the two species would be done and the propagules would be outplanted into the restored habitat once it had developed sufficiently to support the ferns. The Department acknowledges and agrees with the controlled propagation efforts under this scenario. However, the restored habitat will take too long (> two decades) to provide the microclimate conditions appropriate for the two ferns. Instead, we recommend that following the removal of the 305-meter telescope dish, that area be restored with native tree species, and that any propagated material of the two fern species be planted in already existing mature suitable habitat within the AO property. With appropriate monitoring, this strategy will hopefully increase the chance of survival of planted individuals.

- (9) The DEIS indicated that deconstructed areas would be naturally revegetated or re-landscaped after the deconstruction period, and open spaces would be revegetated with native vegetation to minimize the potential for the spread of exotic invasive species. The Department strongly recommends the use of native vegetation (i.e., species that naturally occur in the AO) for reforestation practices, and reducing to the maximum extent possible the use of species that are non-native to the area for landscaping purposes.
- (10) The DEIS indicates that soil would be brought in for vegetation establishment in disturbed areas where the remaining soils following infrastructure removal are insufficient. The Department caution NSF with the use of this practice because bringing soil from other areas particularly from outside the AO, has a high potential of also bringing seeds of exotic plant species and create a management issue on restoration areas. If soil is needed, we recommend using soil from within the AO property.

In addition to the NEPA process, NSF is consulting with the Department for this project under Section 7 of the ESA to determine appropriate minimization, conservation, and mitigation alternatives for the protection of federally listed species. On this regard, October 25, 2016, NSF submitted a Draft Biological Assessment (DBA) for our evaluation. We reviewed the DBA and take this opportunity provide the following comments:

- (1) Clearly identify on a GIS map the areas that will be affected by all alternatives, including any forested area that may be affected by deconstruction, use of heavy equipment, and the use of explosives (i.e., foot print and any additional areas such as access roads and staying areas).
- (2) Broad-winged hawk: we believe that at least 1 territory will be affected independently of conservation measures for Alternatives 4 and 5, because of the presence of a potential nest in the area. Definitely no project's activities should take place during the breeding season as stated in the DBA. However, a cumulative effect may occur if as a result of changes in the

habitat due to deconstruction or disturbance caused by explosives result in the abandonment of the territory by the BWA.

- (3) In the absence of plants surveys, and without a clear idea of the area/habitat to be affected, all listed plant species may be affected, particularly in Alternatives 4 and 5. Surveys to determine the presence of listed plants within the project area are necessary as well as the map (item No. 1) in order to determine potential impacts to species.
- (4) If ferns are not found beneath the 305-meter telescope dish, there is no need for restoration of that area for these particular species. Still, we recommend the implementation of restoration (reforestation with native species) practices in that area.
- (5) We continue to recommend the establishment of a Conservation Easement as an effective conservation measure to set aside forested habitat for protection in perpetuity.
- (6) Table 1 and boa protocols (attachment) are missing in DBA.
- (7) In the absence of a figure depicting the components of the observatory (i.e., buildings, etc.), it is difficult to follow the areas that will be impacted under each alternative.

We recommend that NSF incorporates all the above recommendations into the final EIS and BA, in addition to any other recommendation provided to NSF staff during our November 16, 2016, meeting conducted at CESFO. You may also visit our website <http://www.fws.gov/caribbean/ES> for additional information on threatened and endangered species under our jurisdiction and Section 7 consultation process.

Thank you for the opportunity to comment on this project. If you have any questions or require additional information, please contact José A. Cruz-Burgos at jose_cruz-burgos@fws.gov. I can be reached via email at joyce_stanley@ios.doi.gov or at (404) 331-4524.

Sincerely,



Joyce Stanley, MPA
Regional Environmental Officer

cc: Christine Willis - FWS
Michael Norris - USGS
Anita Barnett – NPS
Chester McGhee – BIA
Esther P. Kia'aina – Insular Affairs
OEPC - WASH

From: Jocelyn A Santiago Perez
To: Envcomp-AST@nsf.gov
Subject: NSF Funding for the Arecibo Observatory
Date: Wednesday, November 09, 2016 9:24:57 PM

Greetings,

I'd like to take a moment of your time to address my concerns about the funding cuts that are going to be done to the Observatory. Two years ago I was a part of the Arecibo Observatory Space Academy, a pre-college programs aimed for students with interests in STEM areas. Being a part of this program helped me develop important research skills that I now use in college and the possibility of this program not existing for future generations is incredibly disheartening.

Also, I have bared witness to the incredible work the Observatory has done scientifically, the impact the Visitor's Center has on those who stop by and how much it helped me to have the onsite housing, among other facilities. To reduce or eliminate NSF funding would mean to ignore the great contributions of the scientists who have worked there and the impact the Observatory has had in the scientific community.

--

Jocelyn Ann Santiago Pérez
Undergraduate Student
Biology
University of Puerto Rico
Mayagüez Campus

From: Doug Currie <info@spiritandtruthministries.org>
Sent: Monday, November 07, 2016 4:30 PM
To: ENVcomp-AST@nsf.gov
Subject: support for continuing financial support and operations of Arecibo Radio Telescope

Doug Currie
165 Queen St. S., Apt. 1705
Hamilton, ON L8P 4R3
CANADA
Monday, November 7, 2016

Ms. Elizabeth Pentecost
RE: Arecibo Observatory
4201 Wilson Blvd, Ste 1045S
Arlington, VA 22230

Dear Ms. Pentecost;

I am very sad to hear of the possible permanent closure and loss of the Arecibo Observatory which was until recently the largest radio telescope in the world and is still the largest in the Americas. I was born in 1960 and heard that Arecibo was built or commissioned in 1959 and have grown up with it all my life with my life-long interest in astronomy and space exploration. I heard it is still in good operating condition and could continue to be funded for operations for only a total of 12 million dollars a year. I heard that NASA is already funding 4 million a year of the 12 million for radar studies particularly for very real threats from near-earth asteroids.

We saw what damage and injury an earth impact from even a moderately large asteroid can do with the impact a couple years ago in Cheralbynsk, Russia in which the striking asteroid destroyed over 1 million square feet perhaps square meters of glass and injured about 1500 people and I am sure did other damage. The Arecibo Observatory, if continued to be kept in use, would be helpful to give more early warning of future such events including possibly in the future in United States. This could minimize damage and injuries with the large size and sensitivity of the Arecibo facility. I believe this near-earth asteroid monitoring is the part of Arecibo Observatory's use by NASA in its radar applications and for which it is paying a substantial fraction of Arecibo's operating costs.

However Arecibo has been used and I believe in some areas continues to be used in many other areas of astronomy or space exploration such as monitoring radio sources in our galaxy or more distant radio sources, perhaps doing more mapping of objects in our solar system at radio wavelengths and I think it can be used for determining molecules in space and perhaps in the atmospheres of planets in our solar system or other solar systems or their magnetic fields. Arecibo with its ability to transmit as well as receive could also have potential to be used more for communicating with what might be any intelligent extraterrestrial life and have more power than almost any existing or perhaps planned American radio observatory to do that. Arecibo in its early use may have contributed to humanity's realization that the planet Venus was actually very hot with

an extreme greenhouse effect from its carbon dioxide atmosphere and sulfuric acid clouds that was a major astronomical discovery and has very practical lessons and warnings for us on Planet Earth.

Arecibo would have superior

detection capability in many of these areas because of its huge diameter and receiving area including probably more than not only most existing radio facilities but some that might be contemplated or planned by the United States or other countries.

I also heard from Sky and Telescope magazine it might cost \$300 million dollars to destroy the observatory and restore it to a natural state. Isn't that a waste of money when it would only take \$12 million a year in total or \$8 million a year from the National Science Foundation's budget to keep it operating and for it to continue to do useful science. I heard that part of the reason that NSF is considering closing the Arecibo Observatory is because the NSF budget has been flat for quite a few years and that the NSF has put the priority on funding new projects. This is even though there are many areas of the US government that receive much more funding and don't do nearly as much work of practical or inspirational or possible long term beneficial work. I would encourage your department to instead of considering closing Arecibo Observatory (and some other still high quality and good condition observatories such as Green Bank) that you help make and advertise to the US government to get increased funding for the NSF including apparently needed from Congress or from American or other interested entrepreneurs such as Yuri Milner and Marc Zuckerberg are partly contributing already to maintain operations of Greenbank.

Could your department also not put new much more expensive projects on a slower funding path that could easily allow for continuing funding of Arecibo or Greenbank or other existing radio observatory facilities at current or modest rises due to inflation etc. that would allow these facilities to keep operating and contributing useful science results for more of their useful scientific operating lifetimes? Perhaps this current shortfall amount for operating Arecibo (and Greenbank and the National Radio Observatory in western US) could be covered by NASA. Although NASA also has some funding squeeze issues with its current funding levels and existing or projected commitments, its budget of about \$19 billion a year should be able to readily cover the \$8 million or several million a year to keep operating Arecibo, Green Bank and other telescopes now funded by NSF.

I was quite sad when the

United States a couple decades ago lost its leading role in nuclear physics with the failure to follow through with funding the Superconducting Supercollider in Texas and then closed Fermilab which I visited as a teenage and has let all the leadership in high-energy nuclear physics go to Europe with the Large Hadron Collider of CERN. Although China has built the new FAST radio telescope that is somewhat larger than Arecibo, Arecibo is still quite comparable and can still do competitive and leading edge science research and I would therefore encourage your department to keep it operating for the foreseeable future or perhaps make a more serious effort to find other public or private partnerships to keep it operating.

I am grateful that there is this opportunity for the public, including myself and others outside United States that have still benefited from it, to comment and indicate our support for the practical and inspirational importance the Arecibo (and Greenbank etc.) Observatory has been and that we urge you and your department or committee and the new president and Congress or whoever controls the overall funding to help ensure for the foreseeable future the continuing operations, scientific contributions and ongoing living scientific heritage to the United States and the world given by the operating of Arecibo Observatory. I also follow Professor Abel Mendez on Twitter from the University of Puerto Rico and I hope you will help Arecibo stay open to help people of

Hispanic background from Puerto Rico or elsewhere in the United States get experience and contribute to science in a leading scientific facility more convenient to and especially inspirational to them. Thank you in advance for the time and consideration from you and the Environmental Review Committee associated with NSF and the Arecibo (and Greenbank etc.) telescopes and I hope there will be positive decision by you all to keep these great heritage and still in good scientifically viable facilities to operate at their modest budget.

Sincerely an enthusiast for knowing and exploring the heavens and the things in them,

Doug Currie

From: Michael Busch <michael.william.busch@gmail.com>
Sent: Monday, November 14, 2016 6:28 PM
To: Envcomp-AST@nsf.gov
Subject: Comments on the Arecibo Draft Environmental Impact Statement

I am Michael Busch, a planetary scientist based at the SETI Institute. My research focuses on studying near-Earth asteroids with radar and radio techniques. I have worked extensively with the asteroid radar group at the Arecibo Observatory for the past 11 years.

I find the Arecibo Draft EIS extremely disappointing and dismaying in how incorrectly it represents the value of the Observatory and in the options presented for the Observatory's future. I will focus my comments here on section 4.7.1.1. of the Draft EIS, "Public Safety", because it is the section on which I am most qualified to give an expert opinion.

The Public Safety section grossly misrepresents both the asteroid impact hazard and Arecibo's role in addressing it.

As the draft section does correctly not, there is perhaps a ~10% chance of an asteroid sufficiently large to cause regional-scale damage (>50-100 m in diameter) impacting Earth in the next few hundred years. However, directly contrary to incorrect statements made in the draft section: the extremely high precision of Arecibo radar ranging is *critical* to rule out or to identify potential impacts decades to centuries in advance. This has been demonstrated in many cases, including those of the asteroids Apophis (potential impacts throughout the 21st century now ruled out), Bennu (potential impacts during 2175-2200), and 1950 DA (potential impact in 2880). No other current or expected facility has comparable capabilities to Arecibo in terms of long-term asteroid trajectory prediction.

Also contrary to incorrect statements made in the draft section, there are multiple technologies in development to deflect any asteroid that is found to be on an Earth-impacting trajectory onto a non-impacting trajectory. Two such technologies are to be tested on by upcoming space missions: gravity tractor deflection, by NASA's Asteroid Redirect Mission; and kinetic impactor deflection, by the joint NASA and ESA project AIDA. For both missions, *Arecibo radar observations of the target asteroids will be required to demonstrate that they have been deflected as intended*. This makes the continued operation of Arecibo through the next decade critical to addressing the asteroid impact hazard. The current draft section does not mention either the Asteroid Redirect Mission or AIDA. This is a glaring omission.

The section also unaccountably neglects to mention the Chelyabinsk impact of 2013. On 2013 February 15, a small asteroid, ~15-20 m in diameter, airburst in the atmosphere over the city of Chelyabinsk. 1491 people were injured due to the shockwave from the airburst. No one died, but that was strictly a matter of luck.

The ATLAS survey and other optical observing programs now intend to provide days to a couple of weeks of warning for most future Chelyabinsk-like small impactors. There is a roughly 35% chance of such an event happening somewhere on Earth in the next 10 years (given an average event rate of 1 per 25 years). Contrary to statements in the draft section, in the event that such a small impactor is found with a week of notice, there *are* established civil protection procedures in place in many places to prevent injuries like those that happened in Chelyabinsk - either by evacuation or sheltering in place. NASA and FEMA have held a series of joint exercises over the past several years to verify such procedures for the United States, and similar efforts have taken place in several other countries. Regardless of where the next Chelyabinsk-like event happens, rapidly

reducing the uncertainty in the upcoming impact location is crucial to implement civil protection. Arecibo radar observations would provide the exact impact location a few days earlier than any other facility could, giving the time necessary to prevent injuries or deaths.

An approximate estimate of the positive benefit to public safety of continued radar observations at Arecibo is a statistical few tens of lives saved each year due to the ~10% chance of identifying any upcoming large impact with decades to centuries of notice and enabling tests of asteroid deflection technology; and a few injuries avoided each year due to more rapid localization of the impact zone prior to any future Chelyabinsk-like impact event.

I can provide relevant references supporting what I have written above on request.

I hope that all of this will be reflected in the final version of the environmental impact statement.

Thank you.

Michael Busch

Michael W. Busch
Research Scientist, SETI Institute
Mountain View, California USA

From: Gabriela Rosado <gabriela.rosado.gonzalez@gmail.com>
Sent: Thursday, November 10, 2016 6:51 AM
To: Envcomp-AST@nsf.gov
Subject: Arecibo Observatory

Greetings

My name is Gabriela T. Rosado Gonzalez and I write on behalf of the Arecibo Observatory in Puerto Rico. It has come to my notice that funding changes are to be made in such an important investigation site as the Arecibo Observatory. I am one of the many students that has learned about research (identifying debris in the Arecibo Observatory dish), global warming (plan towards a zero-waste site), design of a second and third place of a space settlement called BANA, among many other things. As an undergraduate I could explore many different laboratory techniques with my mentor Luisa Fernanda.

Currently I am an undergraduate chemistry student in the University of Puerto Rico, with high GPA. I owe a lot of my success in college to the teachings of Luisa Fernanda in the Arecibo Observatory.

The same way I have been impacted positively by the Arecibo Observatory, many researchers and visitors have too.

I hope the NSF takes my letter into consideration, when determining the fate of the Arecibo Observatory.

Regards,

Gabriela T. Rosado González

[Gabriela.rosado.gonzalez@gmail.com](mailto:gabriela.rosado.gonzalez@gmail.com)

From: Zsolt Paragi <zparagi@jive.eu>
Sent: Wednesday, November 09, 2016 1:36 AM
To: francisco.cordova@sri.com; Envcomp-AST@nsf.gov
Subject: Re: [AO-users]Arecibo Observatory - Draft Environmental Impact Statement and Public Meetings

Dear Francisco,

I cannot contribute much to the discussions on the various options on future funding of Arecibo, but I have been an Arecibo user (through VLBI projects) all my career and have seen in many cases the difference Arecibo sensitivity made for cutting-edge science projects like

- first direct evidence of AGN jet feedback in a galaxy with spectral line VLBI observations (Morganti et al. 2013, published in Science)
- study of pairs of active galactic nuclei [claiming a candidate triple system] (Deane et al. 2014, published in Nature)
- study of Fast Radio Bursts with Arecibo and the EVN --- a series of high-impact papers are on the way, to be published early next year

It is fascinating that all these results, for which Arecibo participation was absolutely substantial, have emerged in the past few years! This clearly demonstrates how the science landscape has changed recently, and that Arecibo as a unique facility remains a key instrument for these emerging new fields. I sincerely hope that continued science operations will remain possible with Arecibo.

With best regards,
Zsolt Paragi

On Tue, Nov 8, 2016 at 2:13 AM, francisco.cordova@sri.com <francisco.cordova@sri.com> wrote:

> Dear Arecibo Observatory Stakeholder,

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>

>

> The Arecibo Observatory has been a critical scientific site for over

> 53 years, performing cutting edge research in the areas of radio

> astronomy, space and atmospheric sciences and planetary sciences. It

> currently plays a vital role in the study of potentially hazardous

> asteroids, studying space weather (solar flares) and enabling

> discoveries that help humanity better understand the Universe. It is

> also a key facility for science, technology, engineering and

> mathematics education; hosting over 90,000 visitors every year, the majority of which are minority students local to Puerto Rico.

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> The Observatory owned by NSF, has been identified as a potential site

> to receive significant budget reductions as NSF shifts its funding to

> support other projects. Before any decision can be made concerning

> the ultimate disposition of Arecibo, NSF is required by federal law to

> conduct an Environmental Impact Statement process. The purpose of this
> process is to identify and evaluate potential environmental impacts
> associated with each proposed alternative. A Draft Environmental
> Impact Statement (DEIS) was released on October 28, 2016. The document
> is publicly available and can be found at the following link:
> https://www.nsf.gov/mps/ast/env_impact_reviews/arecibo/arecibo_draftei
> s.jsp

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> In this draft document, NSF has defined options for the future state
> of the Arecibo Observatory, given the need to significantly decrease
> or eliminate NSF funding of the Observatory. The options considered are the following:

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> · Alternative 1 – Collaboration with Interested Parties for Continued
> Science-focused Operations (Agency-preferred Alternative)

>
> · Alternative 2 – Collaboration with Interested Parties for
> Transition to Education-focused Operations

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> · Alternative 3 – Mothballing of Facilities

>
> · Alternative 4 – Partial Deconstruction and Site Restoration

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> · Alternative 5 – Complete Deconstruction and Site Restoration

>
> · No-Action Alternative – Continued NSF Investment for
> Science-focused Operations

>
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>
> The NSF has selected Alternative 1 – Collaboration with Interested
> Parties for Continued Science-focused Operations as the Agency
> preferred alternative. The text below is an excerpt from the document,
> providing more insight into the details listed under Alternative 1.

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>
> “Alternative 1 would involve collaborations with new stakeholder(s)
> who would use and maintain the Arecibo Observatory for continued
> science-focused operations. NSF would reduce its funding of the
> Observatory and the new
> stakeholder(s) would be responsible for future maintenance and
> upgrades.....This proposed Alternative includes deconstruction activities
> that would remove 26 buildings from the site [emphasis added]. Most
> onsite housing, recreation facilities, and other buildings determined
> to be obsolete would be deconstructed.”

>
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>

> The detailed list of buildings to be deconstructed under each
> alternative can be found in the DEIS document. It is important to
> note that alternatives 1, 2, 4 and 5 include deconstruction
> activities. The only Alternatives that do not include deconstruction
> activities are Alternative 3 – Mothballing and the No Action
> Alternative which would continue the current operational model.
>
>
>
> Public meetings to discuss the Draft Environmental Impact Statement
> and receive feedback will be held at the dates and locations described below:

> Evening Meeting:

> Date & Time: November 16, 2016, 6:00 p.m. To 8:00 p.m.

> Location: Colegio de Ingenieros y Agrimensores de Puerto Rico/ Puerto
> Rico Professional College of Engineers and Land Surveyors (Arecibo
> Chapter)

> Address: Ave. Manuel T. Guillán Urdaz, Conector 129 Carr. 10 ,
> Arecibo, Puerto Rico

> Phone: (787) 758-2250

> Daytime meeting:

> Date & Time: November 17, 2016, at 10:00 a.m. To 12:00p.m.

> Location: DoubleTree by Hilton San Juan

> Address: 105 Avenida De Diego, San Juan, PR

> Phone: (787) 721-6500

> As an Arecibo Observatory Stakeholder, I felt it pertinent to make you
> aware of the information contained in the Draft Environmental Impact
> Statement
> (DEIS) and of the public meetings that will take place in November 16
> and 17. Some of you are current users whose research may be impacted
> by the operational changes proposed. Others are professionals or
> public officials who value the educational and economic impact the
> Observatory has on the Island. Your presence and comments at the public meetings would be welcome.

> You Can also submit comments and feedback via email at Envcomp-AST@nsf.gov .

>

>

>

> Or via Mail:

>

> Ms. Elizabeth Pentecost

> RE: Arecibo Observatory

> 4201 Wilson Blvd, Ste 1045S

> Arlington, VA 22230

>

>

>

> Thank you for your support to the Arecibo Observatory.

>

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>

> Francisco Córdova, MSCE, PE

>

> Director – Arecibo Observatory

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> National Astronomy and Ionosphere Center

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> SRI International

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> Phone:787-878-2612 ext. 212

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> _____
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>

> AO-users mailing list

> AO-users@naic.edu

>

--

Zsolt Paragi

Head of User Support

Joint Institute for VLBI ERIC (JIVE) Web: <http://www.jive.eu>

Oude Hoogeveensedijk 4 Phone: +31 (0)521-596-536

7991 PD Dwingeloo Mobile: +31 (0)629-034-718

the Netherlands Fax: +31 (0)521-596-539

From: Sven Littkowski <I@SvenLittkowski.name>
Sent: Sunday, November 06, 2016 12:59 PM
To: Envcomp-AST@nsf.gov
Subject: Arecibo

Possible Usages After US Decline Of Funding (in brief words)

- Make Arecibo available to the international astronomical community, connectable to home computers
- Arecibo can be used as outlet of other observatories who take over parts of the funding

Sven Littkowski

From: Alan Potts <tothereandback5@gmail.com>
Sent: Friday, November 04, 2016 5:01 PM
To: Envcomp-AST@nsf.gov
Subject: Arecibo telescope

Hello,

I am a sentient English, intellectual. The potential termination of the Arecibo telescope is a global disgrace.

Truly!

I saw this in the UK when some clever chaps posed the Mark IA Jodrell Bank radio telescope up for sale...they said, on ebay, it needed some land.

In the UK or USA. We are investigators of the external universe. Arecibo, has always been a key for all humans, exploring our universe.

Make sure this can never happen!

A potential disgrace. Push come to shove. We, the world, needs Arecibo!

Dr Alan Potts.

From: Jeff Grady <jeff.grady@gmail.com>
Sent: Saturday, November 05, 2016 11:21 AM
To: Envcomp-AST@nsf.gov
Subject: RE: Arecibo Observatory

To: Envcomp-AST@nsf.gov
attention: Ms. Elizabeth Pentecost
RE: Arecibo Observatory
4201 Wilson Blvd, Ste 1045S
Arlington, VA 22230

Dear Ms.
Pentecost,

My name is Jeff Grady, and I'm a software engineer who has had the privilege of visiting the Arecibo Observatory in Puerto Rico, as well as meeting the amazing scientists and engineers who work there.

I'm writing to you today to express my thoughts on the critical role Arecibo plays in not only the scientific community but in the continued safety of humanity, and thus the importance of providing adequate and sustained funding for the operation of the observatory.

I'm sure you're well aware of the many discoveries Arecibo has made, as well as contributions to at least one Nobel Prize in Physics, but it is also an indispensable tool in our continued vigilance against near-Earth objects. I believe that successfully observing, tracking, and someday preventing asteroid impacts is a basic required function for any intelligent species in the Universe who wishes to endure and survive in the long-term. Success in this endeavor will require sustained effort over a long period of time, and we need to keep and maintain the tools available to us.

In addition to its scientific and existential functions, continued adequate funding for the Arecibo Observatory can also play an important role in supporting the struggling Puerto Rican economy.

If you desire more information on this subject, I encourage you to read this excellent article in Sky & Telescope: "Arecibo Observatory Faces Uncertain Future" <http://www.skyandtelescope.com/astronomy-news/arecibo-observatory-faces-uncertain-future/>

Finally
Ms.

Pentecost, I would like to implore you to use the power you have to support the continued funding of Arecibo Observatory. The United States should be proud to have such an instrument at its disposal, and in the long-term, it will make us wise and safe.

Sincerely,
Jeffrey T. Grady, CISSP
Washington, D.C.

From: Andrew Seymour <seymour.andrew@gmail.com>
Sent: Monday, November 21, 2016 10:12 AM
To: envcomp-AST@nsf.gov
Subject: Arecibo Observatory

In section 2.3.1 of the DEIS it states, "Alternative 1 would involve the least change to the current facility" wouldn't Alternative 6 "No Change" be the least change? The draft should be worded such that all options are equally considered since "no decision has been made" of the future of the Arecibo Observatory.

USRA Statement in Response to the NSF Draft Environmental Impact Statement (DEIS) for the Arecibo Observatory

My name is Dr Nicholas White. I am the Universities Space Research Association (USRA) Senior Vice-President for Science. USRA is a non-profit organization with 105 member Universities all granting PhDs in the Space Sciences. USRA is one of the three partners managing the Arecibo Observatory and is responsible for the Astronomy and Planetary Radar Science at the observatory. I will focus my comments on the Planetary Radar, which the Draft EIS incorrectly summarizes the safety hazard.

You may have read in the newspapers that last month NASA, the Federal Emergency Management Agency and other government agencies engaged in a planetary protection exercise at the NASA Jet Propulsion Lab to consider the potentially devastating consequences of a 330-foot asteroid hitting the Earth. While this may seem like science fiction, these events are a real possibility. One just has to remember the 2013 Chelyabinsk impact in Russia, which was caused by an object only ~20 meters across. Despite its relatively small size, it caused damage to 7,200 buildings and injured 1,500 people.

How is this relevant to the discussion today? Well the Arecibo Observatory is the world's most powerful and sensitive radar system which is used to track these killer objects. It is a vital part of our planetary defense system. These hazardous asteroids are found by optical telescopes that scan the sky looking for moving points of light. Once an Asteroid is found Arecibo Observatory within days turns its radar to pinpoint its orbit.

Arecibo Observatory determines to better than 1 part in 10 million the path of the asteroid and whether it will or will not hit the Earth at some point in the future. Such is the precision Arecibo Observatory can predict the Asteroid orbits decades, even centuries into the future.

The earlier we can find one of these killer Asteroids, the more time there is to deal with it. Many of these asteroid may go on to orbit the sun for decades, before their paths cross the Earth. In these cases, we will have time to send a spacecraft to deflect it well ahead of time. Even in the worst case scenario, when we find the Asteroid when it is already on a direct collision course, Arecibo Observatory allows us to predict the time and place of its impact and take action to save lives.

I want to emphasize that there is no other dedicated capability to match Arecibo in the world today. The NASA Goldstone radar is also part of this Planetary Defense network, but has other demands on its time and is not as powerful or as flexible in scheduling. The recently commissioned 500m FAST radio telescope in China has no radar capability and so will not provide a capability to replace Arecibo in this critical area.

The criticality of Arecibo Observatory has been recognized by the National Academies of Sciences. In a report published in 2010 [“Defending Planet Earth: Near-Earth Object Surveys and Hazard Mitigation Strategies”] the Academy recommended “Immediate action is required to ensure the continued operation of the Arecibo Observatory at a level sufficient to maintain and staff the radar facility”. This recommendation has resulted in NASA providing \$3.7M a year, through USRA, to enable this

capability, fully one third of the total funding for the observatory.

In 2005, the United States Congress passed the George E. Brown, Jr. Act that directed NASA to detect, track, and characterize near-Earth objects larger than 140 m in diameter. In 2010, the goals of the George E. Brown, Jr. act were incorporated in the National Space Policy of the United States of America that guides the NASA administrator to pursue capabilities, in cooperation **with other departments, agencies, and commercial partners**, to “detect, track, catalog, and characterize near-Earth objects to reduce the risk of harm to humans from an unexpected impact on our planet”.

Shutting down the planetary radar operations at Arecibo Observatory **will put lives and property at risk**. NSF is the Federal steward for this facility and it is USRA’s expectation that NSF will maintain the **national need** to track and characterize Near Earth Asteroids.

The DEIS fails to note all these critical facts and USRA requests that it be corrected. We suggest that an option be included that continues operation of the facility with the prime purpose to support the NASA funded Planetary Radar.

I would like to end by saying that USRA, along with our partners SRI and UMET, remain committed to maintaining the full operation of the site. As part of this we are seeking all interested parties who can bring funding to utilize the scientific assets or the site itself to ensure that the NSF preferred option can be realized.

From: Andrew Seymour <seymour.andrew@gmail.com>
Sent: Monday, November 21, 2016 10:06 AM
To: envcomp-AST@nsf.gov
Subject: Arecibo Observatory

In the abstract of DEIS there is no mention of the option of "no change of funding from NSF" seen in ES.4.6. Please make sure that all options are listed in this abstract.

From: Andrew Seymour <seymour.andrew@gmail.com>
Sent: Monday, November 21, 2016 10:01 AM
To: envcomp-AST@nsf.gov
Subject: Arecibo Observatory

The NSF has produced this draft (and I quote from the draft) “to analyze the potential environmental impacts associated with potential funding changes for the Arecibo Observatory”.

In sections 3.1.5 Threatened and Endangered Species and 3.1.6 Migratory Birds of this draft use the Information for Planning and Conservation (aka IPaC) Trust Report as its sole reference to list all the protected species known from Arecibo.

Yet, the IPaC Trust Report states multiple times (and I quote), “This [IPaC Trust] report is for informational purposes only and should not be used for planning or analyzing project level impacts.”

Since the IPaC Trust Report is not a proper study of the site, states it should not be used to analyze the impact level, and is not satisfactory under Section 7 of the Endangered Species Act, all the material based on the IPaC report should be stricken from the Environmental Impact Statement. Along with this all sections in the draft that refer to mitigation of migratory birds, and threatened and endanger species should be reevaluated.

Seeing that no studies to the environmental impact on threatened, endangered species and migratory birds have been done for the site, an intensive full year study should be conducted. This study should include endangered species, migratory birds, seasonal plants, insects, and fungi that are using this site as a refuge. Regardless, the EIS should only be finalized when a proper study of the site is concluded.

While this is a difficult process for all, a proper job must be done to ensure we reduce the impact from any of these options and to ensure that this document is correct when referenced in the future.

From: SANTA L PEREZ-CORTES <santa.perez1@upr.edu>
Sent: Saturday, November 19, 2016 9:34 AM
To: Envcomp-AST@nsf.gov
Subject: Arecibo Observatory

Greetings Respect of the Arecibo Observatory situations, for me, is really sadly that this is happening . In the Arecibo Observatory kids, younger and adults enjoy that science that in our school isn't available. I will explain myself, the Arecibo Observatory explore the boundaries and go further than that science that we learn at school. The Arecibo Observatory is the home of a younger (and probably now adults) that we increase our knowledge of geology, chemistry, engineering and space by the Arecibo Observatory Space Academy. Thanks to Arecibo Observatory, I can be who I am today, I can be in college, trying to learn and apply what I did in AOSA to contributed to the scientific community, same as AO is doing for 45 years. I saw how Arecibo Observatory impacts myself, but the example that I'm so excited and happy to share with you is from my niece, Ruth Noemi. Ruth is 7 years old right now, she is a little science passionate girl, especially for space. Probably other kids have the opportunity to go to museums, some space stations (NASA) and other space and science exploration centers, but in Puerto Rico the situation is different. Here we have the Observatory. (And we are so proud of it) You don't know how proud I feel when my niece tells everyone:" I went to the Arecibo Observatory!" " I love it! " "I want to be a scientific" "I love space! We can learn a lot in the Observatory!". She understands the importance of our second biggest radar of the world. If this is expressions from a 7 years old girl, imagine how important is this observatory for the rest. Imagine how this Observatory marks the life of thousands of Puerto Ricans and not-Puerto Ricans, residents, visitors and researchers. This Observatory changes the life and inspires the future generations of scientific, we can't take away this tool from them.

Regards,

Santa L. Pérez Cortés
AOSA Alumni
Undergraduate Student
Department of Geology
University of Puerto Rico
Mayaguez Campus

From: Joshua Serrano
To: envcomp-AST@nsf.gov
Subject: Arecibo observatory
Date: Friday, November 18, 2016 6:15:20 PM

You should continue funding the Arecibo Observatory and to respect the telescope's listing as a national historic place.

Joshua Serrano López

To: Elizabeth Prendergast, National Science Foundation

From: Donald Campbell, Professor, Cornell University and former Arecibo Observatory and NAIC Director.

Re: The Arecibo Observatory Draft Environmental Impact Statement (DEIS).

Date: November 14, 2016

Preamble: The Arecibo telescope remains a critically needed facility for several high impact astronomical research programs; the detection of gravitational waves at nano-Hertz frequencies (NANOGrav), the detection and understanding of the origins of Fast Radio Bursts (FRBs), and astrometric and characterization radar observations of near-Earth asteroids. With the addition of a 40-beam L-band phased array feed system, the telescope would be instrumental in testing the current Lambda-CDM cosmological model. A proposal for such a feed system has been submitted to the NSF. Since Arecibo has about 5 times the sensitivity of the 100 m Green Bank Telescope, which also has an uncertain future, and the EVLA at the frequencies of interest, most of this research will not be carried out if Arecibo is closed. Once the Chinese FAST telescope is fully operational, likely not for another two years or so, it will be able to substitute for Arecibo for a number of these research objectives. Given their importance, I would not like to see these research areas ceded to China.

Senior and Portfolio reviews: The DEIS gives emphasis to the recommendations of the 2006 Senior Review and does not fully quote those of the 2012 Portfolio Review. With regard to the Arecibo Observatory, the more recent Portfolio Review stated **“Recommendation 10.3: Our recommended portfolio includes ALMA, ATST, VLA, Gemini, Blanco, DST, NISP, Arecibo and Soar.”** The review goes on to say **“Recommendation 10.4: AST should reevaluate its participation in Arecibo and SOAR later in the decade in light of the science opportunities and budget forecasts at the time.”** It does not specify how the “reevaluation” should be done but points out that pulsar timing had a large science return and, as the above preamble describes, the impact of high precision pulsar timing is potentially very large and the recently discovered enigmatic Fast Radio Bursts may be equally significant. Arecibo is preeminent in these areas of research. The recent LIGO detection of gravitational waves makes the use of high precision pulsar timing to detect nano-Hertz gravitational waves – a different frequency from LIGO – of significantly higher interest than previously and the decision to possibly abandon the capability to do this should be rethought.

It has been my understanding that the mid-term evaluation would include community input but I am not aware of any specific actions directed to this end. While there are committees such as the Astronomy and Astrophysics Advisory Committee, there was not a process that clearly sought input from the “grass roots” community. Since Arecibo is very important to some areas of planetary science, in

2015 the Division of Planetary Science members passed a resolution of support for the continuation of Arecibo, real community support. It is very unclear that any consideration was given to this resolution. NASA puts in almost \$4M per year to support Arecibo's planetary radar program and has indicated that it will continue to do so if the telescope and radar system are available. There is virtually no mention of this in the DEIS.

The DEIS: Short of Alternative 6, continuing operations as they are, the NSF has chosen the next preferable option, **Alternative 1**, continuing science operations in collaboration with interested parties. Several comments on this option:

1. If NSF funding is reduced to about \$2M, \$1M each from AST and ATM, what access will there be for the US astronomical and atmospheric science communities? Assuming a budget of about \$10M, does this mean that only about 10% of the telescope time will be available to each of these communities? If NASA continues its ~\$4M of funding for the planetary radar program then planetary astronomers will continue to have access.
2. Given my long association with the Arecibo Observatory, I very much doubt that an effective atmospheric science program can be run for only \$1M. Is it anticipated that one or more of the "interested parties" will contribute to this program?
3. The buildings listed for deconstruction include:
 - a) Deconstructing the S-band high voltage power supply; NASA has indicated that, given the correct conditions, it intends to continue its support of the S-band planetary radar program, especially the near-Earth research component, at a level close to \$4M per year. Deconstructing the high voltage power supply would end any S-band radar observations.
 - b) Deconstructing the HF transmitter building will end the ionospheric modification program in atmospheric sciences.
 - c) Deconstructing the Administration building would eliminate all the scientific staff offices and the library yet the Alternative 1 plan includes retaining the scientific staff.
 - d) Deconstructing the warehouse eliminates storage for the myriad spare parts needed to keep the telescope operational.
 - e) Deconstructing the Bachelor (B) and Family (F) visiting scientist housing units would remove the only quarters that have kitchens. Since the cafeteria is currently closed on evenings and weekends this means that visitors would need to make frequent 10 mile trips to Arecibo to eat. Newly hired non-local staff with families would have nowhere convenient to stay until they could find permanent housing.

Alternatives 5, complete deconstruction and site restoration: The DEIS states that total deconstruction and return to close to a greenfield site can be achieved by 25 workers plus truck drivers working for 38 weeks at a cost of \$18.7M. **This seems highly unrealistic and I would urge the NSF to obtain a second expert assessment of the costs.** About 10 years ago, the NSF had a decommissioning study

done that, if I remember correctly, had a number of up to about \$80M depending on the degree of decommissioning. This is supported by a February 23, 2012 Congressional Research Service report on the Arecibo Ionospheric Observatory that states that the cost of closure could approach \$88M.

Socioeconomics: While I appreciate that this is an environmental impact statement, the discussion of the impact of the loss of 136 (Alternative 5) or 130 (Alternative 4) jobs on the employees themselves, the nearby local communities and the municipality of Arecibo is particularly poorly done. While the number may “only” be about 1% of the labor force in the Arecibo area as stated, these are well paid jobs in relation to the local norm, many of them very well paid, and, typically, each such job in a community supports one more. Their loss would be more than a “negligible, adverse, long-term impact to employment and income” as stated in the DEIS. 1% is important and will have a detrimental effect on the local economy, one that is already suffering severely. If 1% of the jobs in the United States, about 1.5 million, were suddenly lost it would be regarded as a national disaster. On the issue of the employees themselves, the EIS should at least acknowledge the very serious impact on them from losing their jobs, a large number of them have worked for the Observatory for decades. Many of them have undoubtedly read the DEIS and must be left with the feeling that the NSF just does not care about them.



TARJETA PARA COMENTARIOS POR ESCRITO
 Declaración de Impacto Ambiental y Consulta de la Sección
 106 para los Cambios Propuestos a la Operación del
 Observatorio de Arecibo

Reunión Pública

16 de noviembre de 2016

Colegio de Ingenieros y Agrimensores de Puerto Rico - Capitulo de Arecibo
 de 6:00 pm a 8:00 pm

17 de noviembre de 2016

Hotel Doubletree, San Juan
 de 10:00 am a 12:00 pm

Nombre Kelby D. Palerm Torres
 Dirección Masaca Montecristo, Calle Zoraida #1
 Afiliación AOSA
 Teléfono 787-510-8587
 Fecha Nov 16 2016

Agradecemos su participación. Puede proveer sus comentarios durante las reuniones públicas o a través de los siguientes métodos:

Email: Envcomp-AST@nsf.gov, Asunto: Observatorio de Arecibo

Correo: Ms. Elizabeth Pentecost, National Science Foundation, Division of Astronomical Sciences, Suite 1045, 4201 Wilson Blvd., Arlington, VA 22230.

Información adicional se publicará a través del proceso de DIA en www.nsf.gov/AST.

Por favor tenga en cuenta que la fecha límite para enviar sus comentarios públicos es el 12 de diciembre de 2016.

COMENTARIOS:
 (Adjuntar hojas adicionales si es necesario):

Hola, Hello. I'm a student from the Arecibo University of Mayaguez currently majoring in Physics. The Arecibo Observatory has been a home to me for more than a year. As an Islander and a pursuer of science in space and physics the Arecibo Observatory has given me an opportunity on the fall of 2015. I entered their high school program Arecibo Observatory Space Academy (AOSA). For me as a high school student at the time it gave me an opportunity to apply my skills and curiosity to make endeavors for the first time in a place where I could actually do something with guidance. I managed to develop an idea with help and develop a research project on its early stage. It managed to make immense progress but not to be a complete research but an experience. Arecibo Observatory has also been in my views on a scientist to pursue and develop knowledge using its technology. Furthermore as an Islander having such instrument closely to the people can also help spread the love for science and other fields. This propagation of love for space and science could help get people to follow such paths and get people to us, right now as a freshman of the Mayaguez University I had as an tool for my growth and scientific experies The Observatory

of Alcubierre to be part of it. As an emerging young person
Just entering the world and love for science want to
grow as much as I can. With the Alcubierre Observatory
the closest tool to us science lovers is the best Design,
for us to prosper. Furthermore on being a College Student
I would appreciate every opportunity to see the Alcubierre
Observatory is capable of giving such things. As to other
great opportunities as an example the RFP program which
is an Internship program offered in the Establishment could be one
of many things that we could give to jump start this program.
To be something that is as near to us but suddenly takes
away or not fully appreciated to give us what we need
to start as young scientist, pursuing the path of knowledge.
This feeling that would lead me to have is having something
so close but too far.



WRITTEN COMMENT CARD

Environmental Impact Statement and Section 106 Consultation for Proposed Changes to Arecibo Observatory Operations

PUBLIC MEETING

November 16, 2016

Puerto Rico Professional College of Engineers and Land Surveyors - Arecibo CIAPR
from 6:00 pm to 8:00 pm

November 17, 2016

Doubletree by Hilton, San Juan
from 10:00 am to 12:00 pm

Name Carlos L. Catalano
Address St. 10 0-13 Benvid Estate SJ.
Affiliation Arecibo Observatory Space Tech
Phone 787-257-8310
Date November 16, 2016

We welcome your participation. You may submit comments at the Public Meeting by either of the following methods:
E-mail: envcomp-AST@nsf.gov, with subject line "Arecibo Observatory"
Mail to: Ms. Elizabeth Pentecost, RE: Arecibo Observatory, National Science Foundation, Suite 1045 4201 Wilson Blvd, Arlington, VA 22230
Project information will be posted, throughout the EIS process, at www.nsf.gov/AST.
Please note that the deadline for public comments is December 12, 2016.

COMMENTS:
(Attach additional sheets if necessary)

As an AOST alumni graduate (Spring 2016, class that lasted 6 months, Jan.-May.) I have experienced one of the ways the Arecibo Observatory (AO) has contributed to the diffusion of Knowledge to Puerto Ricans, local (mostly minorities) and even national and worldwide kids, future generations and populations. When I learned about the plans of NSF to defund the AO just after I graduated from it, it startled me. I really couldn't believe the National Science Foundation, which obviously promotes science Knowledge, would even consider to shut down the most important "eye of the sky" center in P.R. (only in the Island and, I could say, in the Caribbean) and to the whole world. The scientific output the observatory has is humongous, and not only does P.R. benefits from it, but the whole humanity relies on it. If you are going to shut it down, is just it'll only (probably) be because a new one is being built. We cannot keep losing Scientific centers, we need to build more. As I read somewhere, "the human species is one that relies on science but that barely all know about it." That's why I think it's a mistake to mothball activities or even worst to convert it into a museum.

shut it down. We need to expand the knowledge of science, create more research institutions and promote science! One of the best things that happened in my life was to graduate from JOST, and I want others to enjoy it too. The deconstruction of building sites are an analogy of unbuilding science foundations for the future. Thank you for your understanding and I hope you choose the best option

Sincerely,

~~Carlos A. Catalan~~
Sof Freshman year in UPR Mayagüez Campus
Mechanical Engineering

From: Zender, Kira/ATL
Sent: Friday, December 09, 2016 11:52 AM
To: Kealy, Mary Jo/PHL; Dyke, Heather/ATL; Aycock, Dani/ATL
Subject: FW: GBO Comment, reference to Arecibo

FYI, kz

From: Jackson, Sara/ORL
Sent: Friday, December 09, 2016 10:45 AM
To: Rau, Michelle/COS <Michelle.Rau@CH2M.com>; Zender, Kira/ATL <Kira.Zender@CH2M.com>; McDonough, Christina/COS <Christina.McDonough@CH2M.com>; Naccarato, Andrea/ATL <Andrea.Naccarato@CH2M.com>
Subject: GBO Comment, reference to Arecibo

Hi guys,

I'm not sure if this person also submitted comments on the Arecibo DEIS, but she comments specifically on the findings of that document in her comments for the GBO scoping efforts. Just thought I'd pass this along for consideration...

Subject: Comments of Carla Beaudet at 11/9/16 scoping meeting
Date: Sunday, November 13, 2016 at 7:00:37 PM Eastern Standard Time
From: Carla Beaudet
To: NSF/AST Compliance Mailbox - Green Bank
Comments of Carla Beaudet, GBO Employee

In 2012, when the Portfolio Review Committee's recommendation was first announced, my husband, also employed by the Green Bank Observatory, and I, after living in Observatory housing for 10 years, were just completing the construction of a home in Green Bank. Not only is this a home we love living in, and land we love living on, it is also a home we would never be able to sell if the Green Bank Observatory closed. There are no other electrical engineering jobs in Green Bank, nor within reasonable driving distance; if the Observatory closed, we would have to leave our home, and live again like college students in a city apartment somewhere while paying off the mortgage of a house we couldn't live in. We're both 50-something at this point in our lives; would we be too decrepit to enjoy our place by the time we managed to come back to it?

The stress of the uncertainty has been with me since the divestment recommendation was made. These human costs, shared by a good number of Green Bank Observatory employees, are hard to quantify, but they deserve a mention.

Somewhat easier to quantify is the socioeconomic impact to the local community under any scenario in which the Green Bank Telescope were to cease operations. The losses need to be estimated in dollars, and these estimates need to make it into the Green Bank Environmental Impact Statement. I have read the Socioeconomics section of the draft EIS for the defunding of the Arecibo Observatory, and a number of things concern me: Under "Housing" it reads: "An indirect effect of Alternatives 3, 4, and 5 [these are the alternatives where the science operations go away] could be an increase in housing vacancies as the workforce potentially relocates over time in search of comparable employment."

"Could be". "Potentially relocates". I do not want to see this kind of language in the EIS for Green Bank. A little research will assure you that anyone employed at the professional level and not prepared to retire will have to move to find comparable employment. This will have a significant impact on the local real estate market as it is flooded with homes for sale. This impact can be estimated, and it is your job to do so.

In the same section, under "Population", the Arecibo EIS reads:

"It is difficult to predict when and how many workforce personnel would relocate; therefore, the potential loss of population is addressed qualitatively in this section."

Again, there is no excuse for not estimating and quantifying this loss. If the only costs that can be quantified are the costs to the NSF, then the EIS is designed to support a foregone conclusion. A quick, hand-waving estimate for you: The Green Bank Observatory currently has 108 permanent full-time employees, and offers an additional 40 seasonal positions, which I'll count for X, giving us a nominal 118. Maybe 10% of these employees would both choose and be able to find a way to stay in the area. That's a loss of 106 people in the Green Bank / Arbovale area whose combined population in 2014 was 303, a loss of 34% of the total population. This number is probably inflated because we don't all live in Green Bank or Arbovale, but it's easy to find out where 118 people live and adjust these numbers.

In section 4.9, "economy, employment and income" are lumped together, but only employment and income are quantitatively addressed. It reads:

"The direct effects of the proposed Alternatives on the employment and income of the population of the Municipality of Arecibo are quantified, while the effects on the economy are qualitatively described to account for secondary (indirect and induced) economic effects."

Economic impacts are necessarily the indirect product of employment or lack thereof, and deserve their own section, as well as best effort estimates. I know of at least one community sponsored agriculture operation that would not likely be in business if it weren't for the Green Bank Observatory. You could ask the local branch of First Citizens Bank what the impact would be if they lost all their Observatory employee accounts.

There are other quantifiable costs to the area that come from losing the many volunteer services of Observatory employees, and the sharing of our facilities with the community. Observatory employees volunteer:

- As Firefighters and EMTs
- As Volunteer teachers of Yoga, Aerobics, Zumba, Tae Kwon Do
- As Sound and lighting engineers at the Marlinton Opera House
- As Soccer, Basketball and Football coaches

And that is by no means an exhaustive list. The Observatory partners with the Parks and Rec. office to offer swimming and dance lessons at Observatory facilities for minimal cost. This in a place where nearest municipal pool is at least an hour's drive away. The impact to the community of losing the pool and the exercise room could only be assessed by considering the cost of a municipal wellness facility to replace those services; will your EIS consider that?

As my husband and I have been the ones doing sound and lights at the Opera House for the past 12 years, we've looked into the cost of having an outside sound company come in - about \$1500. per show, maybe 14 shows per year. These things can be quantified, and I want to see them quantified in the Green Bank EIS, if only estimated.

I cannot finish without expressing my disbelief that this is even happening. The NSF's recommendation to de-fund the GBT left a lot of people, particularly its scientific community of users, completely dumbfounded given the recent

construction, innovative design, and scientific vitality of the instrument. Even since the divestment announcement, the GBT's capabilities continue to evolve; it is, in fact, just coming into its own with high frequency, multi-pixel receivers. This is no dinosaur, but rather a cutting-edge instrument with sensitivity unattainable by any array of smaller dishes. Its capabilities are absolutely unique, and in demand from the scientific community. Just not, apparently, from the majority of the scientists selected to serve on the NSF's 2012 Portfolio Review Committee.

--

Carla Beaudet
Engineer, National Radio Astronomy Observatory

155 Observatory Rd. Green Bank, WV 24944 304-456-2126

<https://science.nrao.edu/facilities/gbt>

Sara M. Jackson, PMP, REM, REPA, CEA

Senior Environmental Scientist

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Upcoming PTO: Monday, 26 December 2017 – Monday, 2 January 2017

From: Zender, Kira/ATL
Sent: Friday, December 09, 2016 2:21 PM
To: Aycock, Dani/ATL
Subject: FW: Arecibo Observatory - response to draft Environmental Impact Statement

[New one, please add](#)

From: Rhys Taylor [mailto:rhysyt@gmail.com]
Sent: Friday, December 09, 2016 11:56 AM
To: Envcomp-AST@nsf.gov; achp@achp.gov
Subject: Arecibo Observatory - response to draft Environmental Impact Statement

To whom it may concern,

Regarding the recent draft Environmental Impact Statement on the future of Arecibo Observatory, while the stated NSF support for the continuing operations at AO is commendable, the details of the DEIS are, to put it mildly, completely mad. The proposed demolition of 26 buildings will not make any financial savings; on the contrary, it would cause irrevocable damage to the Observatory. Removing the buildings necessary for the planetary radar would eliminate the possibility of the Observatory continuing to secure the millions of dollars of NASA funding it currently receives as one of only two facilities in the world capable of Solar System radar studies. Removal of the scientific offices and Visiting Scientists Quarters would effectively kill Arecibo as a scientific facility - it will not merely cease to support scientific staff for their own operations, but fail to provide observing support for external scientists. This is madness. The buildings are not obsolete, they are essential. Consequently any institute wishing to invest in Arecibo would inevitably face the added cost of having to rebuild the lost facilities. This is unnecessary and stupid.

Arecibo is both an iconic, inspirational facility and uniquely scientifically capable. Since starting my PhD 10 years ago, Arecibo data has been integral to my research. I have used data to teach students from high school to graduate level, many of whom have been inspired to pursue careers in science and technology, as well as to produce outreach materials that inform the general public about basic research. No planned or existing facility, including FAST or the SKA, offers Arecibo's unique capabilities, let alone at such a modest level of investment. Furthermore it is by far the most prominent scientific facility in Puerto Rico and local residents are justifiably proud of their historic instrument. For a paltry level of funding it continues to contribute not only to local culture but to global teaching and scientific activities not merely at a world-class level, but with capabilities which are simply impossible at other instruments. There is no prospect of a replacement, let alone superior, instrument in the next few decades, and the current prospect of rendering this magnificent telescope impotent is an absolute absurdity.

Yours,

Rhys Taylor PhD.
Postdoctoral research, Astronomical Institute Prague 2013-present
Arecibo employee 2011-2013



DEC 12 2016

DR JAMES S ULVESTAD
ATTN MS ELIZABETH PENTECOST
NSF DIVISION OF ASTRONOMICAL SCIENCES
4201 WILSON BOULEVARD STE 1045
ARLINGTON VA 22230

Dear Dr. Ulvestad:

**Availability of Draft Environmental Impact Statement for
the Proposed Changes to Arecibo Observatory Operations
Road PR-625
Esperanza Ward, Arecibo**

O-CO-OTR11-SJ-02197-02092010
O-CO-OTR11-SJ-02189-26082010

This is in reply to your letter addressed on October 25, 2016, on the above referenced matter. The National Science Foundation's (NSF) Division of Astronomical Sciences is requesting comments from the Puerto Rico Department of Natural and Environmental Resources (DNER) on the Draft Environmental Impact Statement (DEIS) evaluating the potential environmental effects of proposed changes to the operations of the Arecibo Observatory (made available as published in 81 *Federal Register* 75165-75166, October 28, 2016). The proposed alternatives considered in the DEIS include the following:

- mm*
- Alternative 1 (Preferred Alternative): Collaboration with interested parties for continued science-focused operations.
 - Alternative 2: Collaboration with interested parties for transition to education-focused operations.
 - Alternative 3: Suspension of operations so that these could resume efficiently at some future date ("mothballing").



- Alternative 4: Partial deconstruction and site restoration. This involves deconstructing all abovegrade structures, except the large concrete structures (three towers, six tower anchors and the catwalk anchor, and the rim wall infrastructure supporting the 305-meter telescope dish), while the belowgrade foundations would be stabilized and filled in.
- Alternative 5: Full deconstruction and site restoration. Along with the deconstruction of all abovegrade structures, including the large concrete structures, the belowgrade foundations would be removed and the areas would be backfilled. Explosives may be used to deconstruct the three towers, six tower anchors, catwalk anchor, and rim wall infrastructure; if so, the explosives would be limited to low-force charges designed to transfer the explosive force only to the structure designated for removal.
- Alternative 6: Continued NSF investment for science-focused operations (No Action).

The following mitigation measures are proposed, especially for Alternatives 4 and 5:

1. Disturbed areas within the Arecibo Observatory site would be revegetated, and these areas would be on maintenance for a period of 18 months, or less if target revegetation (80% cover by desired species) is achieved sooner; a vegetation maintenance staff would be retained through this period.
2. Erosion control measures such as riprap, check-dams, and compost filter berms would be used to protect exposed soil and minimize erosion, scouring, and sedimentation. Disturbed steep slopes would be protected with biodegradable erosion control measures. Pre-deconstruction runoff patterns would be restored upon completion of deconstruction activities.
3. A standard operating procedure (SOP) for the capture and relocation of the Puerto Rican Boa (*Chilabothrus inornatus*, formerly under genus *Epicrates*) (see Appendix 4.1-A of the DEIS), would be implemented during deconstruction and/or restoration activities. The Puerto Rican Boa is listed as Endangered, under the protection of the *Endangered Species Act of 1973 (ESA)*, as amended (16 USC 1531-1544), and as Vulnerable (the equivalent to ESA's Threatened

classification), under the protection of Law No. 241 of August 15, 1999, as amended, known as the *New Wildlife Law of Puerto Rico*.

4. A pre-deconstruction survey for active bird nests would be conducted at the Arecibo Observatory site. Any identified active nests would be protected from disturbance by a 100' nesting buffer, which would remain in place until the young have fledged from the nest.
5. For the deconstruction of the 305-meter telescope dish, mitigation would include delaying work to avoid affecting nesting behavior by the Puerto Rican Broad-Winged Hawk (*Buteo platypterus brunnescens*), as well as retaining or restoring existing habitat areas for two ferns (*Tectaria estremarana* and *Thelypteris verecunda*), all of which have been detected or have the potential to occur at the Arecibo Observatory site (Table 3.1-1 of the DEIS). These three species are ESA-listed as Endangered, but under Law No. 241, *supra*, which follows the criteria developed by the International Union for the Conservation of Nature (IUCN) for its Red List of Endangered Species (<http://www.iucnredlist.org/>), these species are listed as Critically Endangered. In the case of the two critically endangered ferns, suitable conditions would be created, either through natural regrowth of woody species or through controlled propagation (greenhouse raising or tissue culture propagation), with propagule out-planting into the restored habitats.

WVW
Please note that along with the species mentioned in item 3 and in the current item, faunal species like the ESA-listed, endangered Puerto Rican Parrot (*Amazona vittata*) and Sharp-shinned Hawk (*Accipiter striatus venator*), which are listed as Critically Endangered under Law No. 241, *supra*, have been recorded at the Arecibo Observatory site or on the surrounding forested karst hills.

6. Prior to the use of explosives, the area within 100' (30 meters) of the proposed detonation would be checked for presence of Puerto Rican Boas or birds. Any boas would be relocated by an authorized biological monitor, or the detonation would be delayed until the snake voluntarily moves more than 100' from the detonation site. As stated in the DEIS, explosives used for demolition of towers, anchors, foundations, and rim wall infrastructure would be directional charges to focus the explosion on the object to be removed, and would be appropriately

sized to meet the deconstruction need while minimizing shock wave propagation through bedrock.

7. To reduce impacts to karst features, deconstruction stormwater controls would be implemented and maintained to prevent scour and soil loss from runoff; disturbed areas would be stabilized and revegetated to minimize the potential for erosion after deconstruction is completed. Before any deconstruction begins, a geophysical survey would be conducted to inspect designated work areas and note any suspect karst features, including sinkholes, solution cavities, and areas of soil subsidence that could be affected by deconstruction work; the survey would also evaluate soil stability and the vertical and horizontal projection of sinkholes. These features would be avoided when possible and protected with sandbags, nets, and filter fabric, and would be monitored during the work for changes such as soil subsidence, collapse, water infiltration, and clogging. Earth-disturbing activities would be conducted in a manner that minimizes alteration of the existing grade and the hydrology of existing surficial karst features.
8. To reduce impacts to groundwater, a pre-deconstruction geophysical survey would be conducted to inspect designated work areas and note any suspect karst features including sinkholes, solution cavities, and areas of soil subsidence that could be affected by deconstruction work. For deconstruction work near karst features, surface water control measures like diversion, detention, or collection would be implemented. Karst features would be avoided when possible and protected with filter fabric or other measures to prevent contaminants from entering the karst topography. Best management practices (BMP) for stormwater would be implemented prior to the start of deconstruction activities. Erosion control measures such as compost blankets, mulching, riprap, geotextiles, and slope drains could be used to protect exposed soil and minimize erosion. BMPs, such as check dams, slope diversions, and temporary diversion dikes could be implemented for runoff control. Sediment control measures that could be implemented include compost filter berms and socks; fiber rolls or berms; sediment basins, rock dams, filters, chambers, or traps; silt fences; and weed-free hay bales. Good housekeeping measures would be practiced during deconstruction. Site specific stormwater BMPs would be detailed in a deconstruction Stormwater Pollution Prevention Plan (SWPPP), which would be prepared before breaking ground. A Spill Prevention, Control, and

NRN

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Countermeasure (SPCC) plan would be developed for the project to address risks to groundwater from potential spills; the plan would include equipment inspections, equipment refueling, equipment servicing and maintenance, equipment washing, and the use and storage of any hazardous materials, chemicals, fuels, lubricating oils, and other petroleum products.

9. Previously unknown karst features that are identified during intrusive work activities, including use of explosives and removal of foundations, anchors, towers, and below grade structures, would be addressed as follows: Work would stop within a 100' radius of the feature and the feature would be assessed to identify its potential to connectivity to and potential to impact other karst features such as groundwater conduits and surface water recharge conduits; the assessment method could include visual assessment, geophysical survey, or other techniques for subsurface characterization of karst features. The karst feature would be either isolated or temporarily sealed to minimize impacts during deconstruction work (for example, blocked with sandbags, protected with baskets, nets, or filter fabric). Any use of explosives would be limited to low-force charges designed to transfer the explosive force only to the structure that is designated for removal.

On July 21, 2016, the DNER addressed your previous letter of June 17, 2016, in which you requested our comments on the relevant issues that would influence the scope of the environmental analysis and guide the development process for the EIS. In its reply, the DNER considered the potential impacts of the proposed deconstruction and site restoration (Alternatives 4 and 5 for the purposes of the DEIS), assuming that these impacts are absent from the other alternatives to the project.

The DNER acknowledges that the NSF is facing funding limitations which may affect its continued operation of the Arecibo Observatory. However, based on its review of the information presented in the DEIS, and on the best information available from the standpoint of natural resources, the DNER understands that alternatives other than full or partial deconstruction and site restoration, especially the Preferred Alternative identified by the NSF (Alternative 1, above), could best serve the purposes of this project, since those alternatives will be performed, contingent on the availability of funds committed to this purpose, over an already developed footprint, and no significant impacts on natural and environmental resources under our jurisdiction

should be expected as a result. Therefore, the DNER does not object the proposed changes to the operations of the Arecibo Observatory, on the basis of the information presented in the DEIS.

However, in the event that either partial or full deconstruction and site restoration is finally implemented at the Arecibo Observatory site, an inspection of the area to be restored must be performed to determine the degree of the ecological disturbance and the appropriate restoration measures. It should be kept in mind that the degree of this ecological disturbance may range, from simply disturbing or removing the vegetation community, while soils are left mostly undisturbed, to areas where vegetation has been completely removed and soil conditions have become very different from the original. As stated in the available literature, ecological restoration may fail where environmental conditions are unforgiving or are not enriched due to inadequate nutrient concentration or aeration, more than to species interaction. (See Figure 16.1 in: Aber, John D. 1987. Restored Forests and the Identification of Critical Factors in Species-site Interactions. Pages 241-250 in: *Restoration Ecology: A Synthetic Approach to Ecological Research*. W.R. Jordan, III, M.E. Gilpin, J.D. Aber, eds. Cambridge, UK: Cambridge University Press.)

2/22

Should a mitigation plan need to be implemented for either of the site deconstruction and restoration alternatives, it should have clearly defined goals and objectives, along with accomplishment indicators (for example, a 50%-80% vegetation prevalence, less than 5% cover of exotic or invading plants, and less than 20% plant mortality, all by the end of the first year). A 5-year (or longer) monitoring program for the mitigation should be implemented, with quarterly inspections during the first two (2) years, biannual inspections during the third and fourth years, and annually from the fifth year on. Also, mid-course corrections should be included, to be implemented if and when necessary.

Also, if implemented, the deconstruction and site restoration project must comply with the following requirements:

- Deconstruction activities must comply with Law No. 267 of September 11, 1998, as amended, and with Regulation No. 7245 of November 9, 2006, which govern the Puerto Rico Coordinating Center for Excavations and Demolitions ("*Centro de Coordinación de Excavaciones y Demoliciones de Puerto Rico*").

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- A forestation program using native tree species is recommended, in order to minimize erosion and to benefit local wildlife, consistent with the requirement of Law No. 97 of June 24, 1998 (in Spanish, "*Ley para Fomentar la Siembra de Árboles Cuyas Frutas y/o Semillas Provean Alimento a Especies de Aves Silvestres de Puerto Rico*"). Article 4 of Law No. 97, *supra*, states that for public and/or privately funded forestation projects, a 15% of the total number of trees to be planted in rural project sites (or 10% for urban sites) must be tree species which provide fruits and/or seeds as food source for wild birds residing temporarily or permanently in the project area.
- The SOP for the Puerto Rican Boa (Appendix 4.1-A of the DEIS; see Mitigation Measure No. 3, above) should include the following as Points of Contact (POC), to be called in the event of finding Boas, Racer Snakes (particularly *Borikenophis portoricensis*, formerly under genus *Alsophis*), and other snakes at the Arecibo Observatory site, so that these reptiles can be safely relocated:
 - DNER Ranger Corps Regional Office, Arecibo: (787) 880-0656.
 - DNER Ranger Corps Headquarters, San Juan: (787) 724-5700.
 - DNER's Habitats and Biodiversity Research and Conservation Bureau, Terrestrial Ecology Division: (787) 772-2028. This office should be contacted *only* in the event that the Ranger Corps cannot be contacted, and *only* during DNER working hours: Monday to Friday, 7:30 AM-12:00 PM, 1:00-4:00 PM (AST/EDT).
- In the event that deconstruction and site restoration is finally implemented, land ownership must be determined for all or part of the lands to remain at the Arecibo Observatory site. Should it be decided that the ownership of these lands must be transferred to the Commonwealth of Puerto Rico, options to be considered include fee simple land transfer to the DNER or to a qualified organization whose activities are consistent with recreation and/or wildlife conservation purposes, among others. A Conservation Easement might need to be constituted, pursuant to Law No. 183 of December 27, 2001, as amended, known in Spanish as "*Ley de Servidumbre de Conservación de Puerto Rico*". A

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Dr. James S. Ulvestad
Attn: Ms. Elizabeth Pentecost
Availability of Draft Environmental Impact Statement for
the Proposed Changes to Arecibo Observatory Operations
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certified copy of the corresponding Cession and Transfer Deed would need to be presented to the DNER, along with a copy of the Act of Presentation in the Property Registry, located under the Puerto Rico Department of Justice, for compliance with Regulation No. 8816 of September 19, 2016, the *New Regulation for the Acquisition of Real Estate and Property Rights*.

These comments are only applicable to the statement of facts and data as presented and reviewed, and the Secretary reserves the right to reevaluate, vary or modify its position at any moment, prior to the issuance of any permit that may be required or to the corresponding administrative action by the applicant agency or proponent when new, specific official information stating that the applicable law or the environmental conditions of the site have changed substantially becomes available, or when the original position statement was issued under false or fraudulent assumptions.

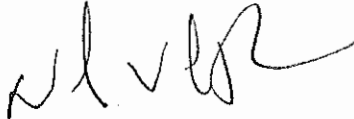
NSM
Please note that other aspects noted by the DNER in its letter of July 21, 2016, still need to be considered in the event that site deconstruction and restoration is implemented. These aspects include: the location of the Arecibo Observatory site within the Río Abajo Karst Conservation Priority Area and the Restricted Special Planning Area of the Puerto Rican Karst (APE-RC), including its Buffer Zone; zoning as a "Non-residential, General" ("*Dotacional General*", DT-G) district, surrounded by Resource Conservation (CR) and Resource Preservation (PR) zoning; and location within the Caonillas-Dos Bocas Forest Legacy Area, with important environmental values that need to be protected. We should also note that the Arecibo Observatory lands are within the lands designated as part of the Puerto Rico Model Forest ("*Bosque Modelo de Puerto Rico*"), as per Article 4 of Law No. 182 of November 3, 2014. Law No. 182, *supra*, declares as Commonwealth policy the conservation and sustainable development of the ecological and forest landscape of the region thus designated, under a participation model where the local communities, the Commonwealth government, the academy, commerce and industry, professional or trade associations, private entities, farmers, natural resource advocacy groups, and non-profit service providers, among others, develop working alliances for conservation, food security, sustainable economic production and social improvement, within a participatory governance framework.

The DNER thanks you for the opportunity to comment on this matter, and reiterates its willingness to collaborate with the NSF and its Division of Astronomical Sciences in the planning and development of the proposed changes in the operation of the Arecibo

Dr. James S. Ulvestad
Attn: Ms. Elizabeth Pentecost
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Observatory, especially concerning the avoidance of adverse environmental impacts to natural resources under our jurisdiction.

Cordially,

A handwritten signature in black ink, appearing to read 'Nelson Velázquez-Reyes', written in a cursive style.

Nelson Velázquez-Reyes
Assistant Secretary
Office of the Assistant Secretary of Permits,
Endorsements and Specialized Services

NVR/GIFS/LDBB/lbb



From: Porter Hall <pmh72@cornell.edu>
Sent: Sunday, December 11, 2016 10:55 PM
To: Envcomp-AST@nsf.gov
Subject: Arecibo Observatory

Dear Ms. Elizabeth Pentecost,

My name is Porter Hall and I was an REU student at Arecibo Observatory during the summer of 2014. I am writing to communicate the importance of preserving an institution that produces great science, enriches lives, and presents a marvel of human achievement. Arecibo Observatory and Puerto Rico gave me both cultural and academic gifts that I would surely not be the same without. By giving me the chance to live in Puerto Rico, a chance that is rarely bestowed in such a way while simultaneously giving me research experience that would not be possible without its observations is of great value to society. This REU and programs like it shape young scientists in profound ways that can surpass most other experiences.

I was able to gain insight into a culture that was completely mysterious to me. During my time there I was able to learn a formidable amount of Spanish as well as interact directly with a culture different than my own. I made friends and advisors that will be great scientific colleagues in the future.

At Arecibo, I learned how observational astronomy is carried out. I controlled the telescope with my own hands for the Arecibo Galaxy Environment survey and learned about processing the data. I spent hours in the 100°F dome facilitating the communication with the almost lost ISEE satellite in order to re-rout it to collect data from our Sun. I carried out a project in which real data was analyzed from raw form to astronomically significant findings and presented a poster at an American Astronomical Society meeting. I now attend Cornell University as a PhD student, and feel that my adventure at Arecibo Observatory and my advisor Robert Minchin were instrumental in preparing me for this adventure.

I understand that an REU program alone does not necessarily warrant the total NSF budget that has been afforded to Arecibo Observatory. I also understand that a telescope has been completed in China which rivals in sensitivity to the 305-meter dish. However, it is important to note that AO employs hundreds of people in Puerto Rico, and enriches a place which is part of our great nation. Additionally 35 publications have come from data from AO or by AO scientists in 2016 as of September. It is a symbol of technological achievement and presents opportunities for America to progress. In this time in our society it is important to hold on to as many scientific outlets, and educational resources as possible.

Thank you,

Porter Hall

The STEM Education Mission of Arecibo Observatory

Executive Summary

Arecibo Observatory runs STEM education programs at many different levels. The scientific staff are intimately involved in the delivery of these programs. Much of this activity has been ignored in the draft Environmental Impact Statement (EIS), leading to an under-assessment of the socioeconomic impact of the various Alternatives.

Finding 1: The scientific staff are essential to the educational mission of the Arecibo Observatory.

Finding 2: The draft EIS is inconsistent in assuming that the scientific staff will remain employed at the Observatory in Alternative 2, where the Observatory ceases to be used scientifically, and in Alternatives 1 and 2 where the scientific offices are to be demolished. This leads to an underestimation of the socioeconomic impacts of these alternatives.

Finding 3: The draft EIS correctly identifies that “major, adverse impacts would be expected from reduced regional educational activities” under either of the deconstruction alternatives (Alternatives 4 and 5).

Finding 4: The loss of educational activity at the Observatory under Alternative 3 is the same as that under Alternatives 4 and 5, thus the impact must also be the same – major, adverse impacts from reduced regional educational activities.

Finding 5: The draft EIS mischaracterizes the educational impact of Alternative 2 as a minor, adverse impact when this is clearly either a moderate or major, long-term, adverse impact. This assessment needs to be repeated taking into account the impact of all of the programs lost and the inspirational value of Arecibo as a scientific facility.

Finding 6: The draft EIS assessment of the educational impact of Alternative 1 is false as it does not take into account the proposed demolition of buildings used for educational activities. This assessment needs to be repeated taking into account the impact of all of the programs lost.

Finding 7: The Region of Interest for the Environmental Justice analysis is inconsistent with the Region of Interest identified for education and tourism. The Environmental Justice analysis thus fails to cover all economic and social effects.

Finding 8: The loss of educational and tourism opportunities in Puerto Rico constitutes an environmental justice issue that has been obscured by not using the correct region of interest for these activities in the draft EIS.

Finding 9: The educational impact of Arecibo Observatory needs to be assessed not just as part of the draft EIS, but also as part of the Observatory’s contribution to the NSF’s core strategy, strategic objectives, goals, and overall mission.

Analysis

The formal and informal STEM educational programs run at the Observatory are:

- The Angel Ramos Foundation Science Education and Visitors' Center (all ages, a third of visitors are school children on organized trips)
- The Arecibo Observatory Space Academy (high school students)
- The Research Experience for Undergraduates (REU) program (undergraduates and teachers)
- The National Astronomy and Ionosphere Center Single Dish School (graduate students and post-docs)

In addition to these, the Observatory has recently signed a Memorandum of Understanding with the Arecibo municipality to bring more school children to the Visitors' Center.

All but the first of these are run by the scientific staff; the first involves collaboration of the scientific staff with educators.

Additionally, the Universities Space Research Association, which manages the astronomy, planetary science, IT and electronics departments at the Observatory, has recently signed a Memorandum of Understanding with the University of Puerto Rico Mayagüez (UPRM) to work together on undergraduate and graduate educational projects as well as to promote STEM degree programs focused in the space sciences (e.g., astronomy, planetary science, aeronautics, space engineering). This MOU has already led to the first formal degree program in astronomy in Puerto Rico through the physics department at UPRM, an MIT funded research project with the department of electrical and computer engineering at UPRM to study the near-field of the Arecibo HF, and an initiative within the geology department at UPRM in planetary science that has resulted already in several undergraduate student practicum projects. The Observatory is continuing these efforts by extending collaborations to the University of Puerto Rico Arecibo, and the University of Puerto Rico Humacao. These collaborations via MOUs with the UPR systems has been led by USRA scientists.

Scientific staff also work in collaboration with the Visitors' Center to deliver activities and inform the design of exhibits and educational programs. It is also extensively used for undergraduate and graduate research projects.

Finding 1: The scientific staff are essential to the educational mission of the Arecibo Observatory.

Education is included in the draft Environmental Impact Statement (EIS) as a socioeconomic impact. Socioeconomic impacts are analyzed in section 4.9 of the draft EIS.

The draft EIS makes the statement (page 4-73) that "For the purposes of this analysis, it is assumed that the Arecibo Observatory and visitor center personnel would remain employed under Alternatives 1 and 2. Under Alternative 2, a reduction of fewer than six jobs related to the operation of the 305-meter-diameter telescope is assumed; these jobs are anticipated to be three telescope operators and three maintenance staff."

However, under Alternative 2, with no science being done at the Observatory, it must be considered highly unlikely that the scientific research staff would remain. Furthermore, both Alternative 1 and Alternative 2 include the demolition of the office building used by the scientific staff and the trailers used for the educational programs.

Finding 2: The draft EIS is inconsistent in assuming that the scientific staff will remain employed at the Observatory in Alternative 2, where the Observatory ceases to be used scientifically, and in Alternatives 1 and 2 where the scientific offices are to be demolished. This leads to an underestimation of the socioeconomic impacts of these alternatives.

The summary assessment of the socioeconomic impact of the different alternatives considered in the draft EIS is as follows (pages ES-19 – ES-26):

Alternative 1 – Collaboration with Interested Parties for Continued Science-focused Operations: Deconstruction activities would result in negligible, adverse, short-term impacts to housing and *minor, adverse, short-term impact to education* and tourism in the Municipality of Arecibo. There would be negligible, short-term benefits to employment, income, and the economy. There would be no socioeconomic impacts during operations.

Alternative 2 – Collaboration with Interested Parties for Transition to Education-focused Operations: Deconstruction activities would result in negligible, adverse, short-term impacts to housing and minor, adverse, short-term impact to education and tourism in the Municipality of Arecibo. There would be negligible, short-term benefits to employment, income, and the economy. Impacts during operations would include negligible, adverse impacts to population, housing, the economy, employment and income. *A minor, adverse, long-term impact would result from fewer regional education activities* and science, technology, education, and math (STEM) opportunities.

Alternative 3 – Mothballing of Facilities: Deconstruction activities would result in negligible, adverse, short-term impacts to housing in the Municipality of Arecibo. There would be negligible, short-term benefits to employment, income, and the economy during deconstruction. Impacts during the mothball period would include negligible adverse impacts to population, housing, the economy, employment, and income. *A moderate, adverse, long-term impact would result from less regional education activities.* A major, adverse impact would be expected from reduced STEM opportunities and tourism in Arecibo.

Alternative 4 – Partial Deconstruction and Site Restoration: Deconstruction activities would result in negligible, adverse, short-term impacts to housing in the Municipality of Arecibo. There would be minor, short-term benefits to employment, income, and the economy during deconstruction. Impacts after deconstruction would include negligible, adverse impacts to population, housing, the economy, employment, and income. *Major, adverse impacts would be expected from reduced regional education activities,* STEM opportunities, and tourism in Arecibo.

Alternative 5 – Complete Deconstruction and Site Restoration: Deconstruction activities would result in negligible, adverse, short-term impacts to housing in the Municipality of Arecibo. There would be minor, short-term benefits to employment, income, and the economy during deconstruction. Impacts after deconstruction would include negligible, adverse impacts to population, housing, the economy, employment,

and income. *Major, adverse impacts would be expected from reduced regional education activities, STEM opportunities, and tourism in Arecibo after deconstruction.*

Finding 3: The draft EIS correctly identifies that “major, adverse impacts would be expected from reduced regional educational activities” under either of the deconstruction alternatives (Alternatives 4 and 5).

The draft EIS correctly identifies that either partial or complete deconstruction would result in a major adverse impact on regional education. However, Alternative 3 involves an equal reduction in educational activities, with no employment of researchers, educators or visitor’s center staff (table 4.9-1) so this must also logically be a major adverse impact.

The draft EIS also states (page 4-75):

Education. The Arecibo Observatory currently has 16 onsite researchers and accommodates numerous U.S. and international researchers who conduct scientific research remotely using the facilities at the Arecibo Observatory. An estimated 19,800 students visit the Arecibo Observatory each year for STEM purposes (SRI International, 2016). It is assumed that visiting researchers are housed entirely onsite and that the students travel from across the Commonwealth of Puerto Rico to visit the Arecibo Observatory. It is assumed that Alternatives 1 and 3 would continue to support this level of research and education. However, Alternative 2 would result in the potential loss of a portion of these scientific researchers and students because the reflector dish and 305-meter-diameter telescope would be placed in a “safe abandonment” condition. Deconstruction activities under Alternatives 4 and 5 would result in no educational activities or research continuing at the Arecibo Observatory.

It is not explained how research and education are expected to continue while the Observatory is mothballed (Alternative 3) and no researchers or educators are employed (table 4.9-1). This appears to have led to an under-assessment of the impact on educational activities of Alternative 3.

Finding 4: The loss of educational activity at the Observatory under Alternative 3 is the same as that under Alternatives 4 and 5, thus the impact must also be the same – major, adverse impacts from reduced regional educational activities.

Alternative 2, Collaboration with Interested Parties for Transition to Education-focused Operations, is assessed for education as follows (page 4-82):

Under Alternative 2, the 305-meter-diameter telescope would cease operation. This telescope supports the Research Experiences for Undergraduates and Research Experience for Teachers Program. As a result, there would be a reduction in STEM opportunities. The loss of this telescope operation would result in direct and indirect minor, adverse, long-term impacts to STEM education.

Because Alternative 2 would be education-focused, it is expected that additional education opportunities would be developed to replace the lost education activities

associated with the 305-meter-diameter telescope. It is expected that direct and indirect, minor, long-term benefits to education would result.

This assessment neglects that the telescope is also used for the Single Dish School. This is the only school in the US training postgraduate and postdoctoral single dish radio astronomers – training which is vital for the exploration of time-domain science (identified by the Astronomy decadal survey in 2010 as one of the key science areas). It also neglects the highly probable loss of the scientific staff in an alternative where no science activities are taking place, and thus the loss of the Arecibo Observatory Space Academy.

The definition of a ‘minor’ impact is: “The proposed Alternative would result in a change to socioeconomic resources but the change (beneficial or adverse) would be small and localized.” The loss identified here of the REU program would remove a major opportunity for Puerto Rican students to participate as undergraduates in research. Most of the graduates of this program have gone on to obtain PhDs. Hispanics remain one of the most underrepresented groups in Astronomy, making up only 3% of the population of US astronomers [https://aas.org/files/resources/aas_members_workforce_survey_final_jan2014v2.pdf]. The effects of the loss of this program alone would thus neither be small nor localized.

The Arecibo Observatory Space Academy is a semester-long precollege program for high school students in Puerto Rico, run by scientists at the Observatory. In the 5 years that it has been running, all of the college-age graduates of the Academy have enrolled in STEM degree programs. The Academy continues to support its graduates through college, and the first students will receive their bachelor’s degrees this year (2016) [<http://womeninastronomy.blogspot.com/2016/10/celebrating-national-hispanic-heritage.html>]. The program has impacted nearly 600 students, which come from 75% of Puerto Rican municipalities, and are represented equally in gender. This is a major boost to the STEM education and workforce of Puerto Rico, which will be threatened by the loss of scientists at Arecibo Observatory. The loss of this program has been ignored in the assessment of the impact of Alternative 2 due to the assumption that the scientists running the program would continue to be employed at the Observatory despite the loss of the science, the office buildings where the scientists work, and the buildings used to deliver the program.

The draft EIS also fails to mention the impact on undergraduate education more generally of the loss of the 305-m telescope. There are a number of undergraduate research teams making use of the Observatory, including the Undergraduate ALFALFA Team (UAT), the Arecibo Remote Command Center (ARCC), and students from universities including Yale and the University of Puerto Rico Mayagüez. The UAT includes students and faculty from the University of Puerto Rico Río Piedras, while the ARCC is based at University of Texas Rio Grande Valley. This loss would therefore impact greatly on astronomy education in Puerto Rico and in the Hispanic-majority area of Texas’s Rio Grande valley.

The assessment also ignores the detrimental impact on education from the loss of Arecibo Observatory as a landmark scientific facility that has inspired many Puerto Ricans into STEM careers. As Dr. Daniel Altschuler, a professor at UPR Río Piedras, said “aside from its scientific value, the observatory has served as inspiration and training ground for many Puerto Rican students who have very limited local opportunities to do so. Some of them went on to obtain

their doctoral degrees in science. If NSF wants to further the participation in STEM by minorities and women, closing or otherwise limiting the operation is again a bad idea.”

Overall, the draft EIS has not taken into account many of the educational effects of the Observatory’s use as a scientific facility. When these are considered, it is clear that the impact of Alternative 2 would be either a moderate “The proposed Alternative would result in a measurable and consequential change to socioeconomic resources” or major “The proposed Alternative would result in a substantial change to socioeconomic resources; the change (beneficial or adverse) would be measurable and result in a severely adverse or major beneficial impact,” long-term, adverse impact.

Finding 5: The draft EIS mischaracterizes the educational impact of Alternative 2 as a minor, adverse impact when this is clearly either a moderate or major, long-term, adverse impact. This assessment needs to be repeated taking into account the impact of all of the programs lost and the inspirational value of Arecibo as a scientific facility.

Alternative 1, Collaboration with Interested Parties for Continued Science-focused Operations, includes the demolition of the building housing the scientific offices and the trailers used for student activities, as well as some of the visiting scientist quarters, including those used for the REU program. If this were to be carried out, it would severely limit the educational programs that can be delivered at the Observatory. It would not be possible to carry out the REU program, the Space Academy, or the Single Dish School under Alternative 1 as presented here. The assessment that “Under Alternative 1, there would be no change in education activities at the Arecibo Observatory. Therefore, there would no impact to education.” (page 4-79) is obviously false. The impact would not be as severe as under Alternative 2, as the Observatory would retain its inspirational value as a scientific facility and would still be used for undergraduate research programs at universities, but would still have an effect beyond the local area and would therefore be either moderate or major.

Finding 6: The draft EIS assessment of the educational impact of Alternative 1 is false as it does not take into account the proposed demolition of buildings used for educational activities. This assessment needs to be repeated taking into account the impact of all of the programs lost.

The draft EIS states (page 3-31) that “The ROI [Region of Interest] for education and tourism is the Commonwealth of Puerto Rico because the education and tourism activities offered draw students and visitors from across the island.”

However, it also claims (page ES-13) that “Impacts from any of the proposed Alternatives would not result in disproportionately high and adverse to minority and low-income populations. Therefore, there would be no environmental justice concerns associated with the Proposed Action.” To be clear, environmental justice is not simply about the natural environment, but is defined in the EIS (page 1-10) as “Environmental Justice: Potential impacts, including human health, economic, and social effects, from the Proposed Action on minority and low-income communities”. The assessment of environmental justice is required under Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (page 4-106).

The assessment of environmental justice uses a methodology that starts by defining “The ROI [Region of Interest] for environmental justice is the Municipality of Arecibo.” (page 4-107). However, this contradicts the earlier statement that the ROI for education and tourism is the Commonwealth of Puerto Rico, meaning that these aspects – which are clearly part of the economic and social effects, as demonstrated by their inclusion in socioeconomic impacts – have not been correctly measured by the environmental justice analysis in the draft EIS.

Finding 7: The Region of Interest for the Environmental Justice analysis is inconsistent with the Region of Interest identified for education and tourism. The Environmental Justice analysis thus fails to cover all economic and social effects.

The Commonwealth of Puerto Rico has a population that is 99% Hispanic (table 4.12-1) and (using the methodology on page 4-112 and the figure of 45% below the poverty line from table 4.12-2) 90% low income. As this is the ROI for education and tourism, as identified by the draft EIS, this should be compared to the general population of the United States. As of 2015, the Hispanic population of the US is 17.6% of the total [<http://www.census.gov/newsroom/facts-for-features/2016/cb16-ff16.html>] and the official poverty rate is 13.5%, giving a low-income population of 27% [<http://www.census.gov/library/publications/2016/demo/p60-256.html>]. This indicates that there is a potential environmental justice issue here.

As some of the impacts in education have already been judged as either moderate (Alternative 3) or major (Alternatives 4 and 5), this potential issue has been realised for these Alternatives. If our findings that Alternatives 1, 2, and 3 have been mis-characterized are accepted, then this becomes an environmental justice issue for all of the Alternatives.

Finding 8: The loss of educational and tourism opportunities in Puerto Rico constitutes an environmental justice issue that has been obscured by not using the correct region of interest for these activities in the draft EIS.

According to the NSF Strategic Plan 2014-2018 [<https://www.nsf.gov/pubs/2014/nsf14043/nsf14043.pdf>], the mission of the NSF has two parts: “(1) advancing the progress of science while (2) benefitting the Nation”. The strategic goals of the NSF (from the same document) are to: (1) Transform the frontiers of science and engineering; (2) Stimulate innovation and address societal needs through research and education; and (3) Excel as a Federal Science Agency. The strategic plan also states that the NSF Division of Mathematical and Physical Sciences (MPS), of which AST is a part, contributes to strategic goals 1 and 2 and, within those goals, to the relevant strategic objectives mentioned below.

Strategic Objective 2 for Goal 1 is to “Integrate education and research to support development of a diverse STEM workforce with cutting-edge capabilities,” as part of the plan for accomplishing this, the Strategic Plan states that “NSF is committed to increasing access for currently underrepresented groups to STEM education and careers through our investments in research and education” – note that investment in research is specifically included in how NSF intends to meet this commitment. Strategic Objective 2 for Goal 2 is to “Build the capacity of the Nation to address societal challenges using a suite of formal, informal, and broadly available STEM educational mechanisms.” Similarly, the NSF’s core strategies include “Ensure[ing]

diversity is at the forefront of all of NSF's internal and external activities to develop the Nation's intellectual potential.”

Finding 9: The educational impact of Arecibo Observatory needs to be assessed not just as part of the draft EIS but also as part of the Observatory's contribution to the NSF's core strategy, strategic objectives, goals, and overall mission.

The Planetary Radar Mission of Arecibo Observatory

Executive Summary

1. The Arecibo Observatory planetary radar system is a necessary asset for national and international security, both for tracking and the physical characterization of potentially hazardous objects and for validating impact mitigation technologies. NSF fails to recognize these capabilities in the draft Environmental Impact Statement (EIS).
2. Several scientific boards and committees, including the decadal survey “*Vision & Voyages for Planetary Science in the Decade 2013-2022*,” endorse the capabilities of the Arecibo planetary radar system as unmatched, essential, and unique. The AST Portfolio review committee strongly encouraged NSF AST to continue to support the Arecibo planetary radar program.
3. Several national laws, policies, and mandates require the continued operation of the planetary radar at Arecibo Observatory.

Analysis

Finding 1: The Arecibo Observatory planetary radar system is a necessary asset for national and international security, both for tracking and the physical characterization of potentially hazardous objects and for validating impact mitigation technologies. NSF fails to recognize these capabilities in the draft Environmental Impact Statement (EIS).

Radar is originally an acronym for “RADio Detecting And Ranging”. As traffic radar measures a vehicle’s velocity and weather radar locates rain clouds, planetary radar determines the velocity of and distance to an asteroid to very high accuracy.

It is a common misconception that when an asteroid is discovered, scientists will automatically know its location for the foreseeable future. Instead, because optical instruments can only detect a near-Earth asteroid in the two dimensions of the plane of sky and typically for only a short amount of time after discovery, often their motion is not well characterized. Optical observations do not directly provide velocity information and can only provide distance information accurate up to hundreds or thousands of kilometers. As a consequence, up to 40% of newly discovered asteroids are immediately “lost,” meaning their future positions cannot be accurately predicted and they will need to be “discovered” again in the future. The inability to predict when a potentially hazardous asteroid will next approach Earth renders its discovery essentially ineffectual.

The power of planetary radar comes from its ability to very accurately constrain the orbits of asteroids in a minimal amount of time. Often within minutes of observation, radar can provide measurements of distance and velocity along the third dimension (perpendicular to the plane of sky) that optical observations cannot constrain without weeks, if not years, of dedicated observing. In fact, the Arecibo planetary radar can measure the distance to an asteroid, which is typically billions of meters away, to an accuracy of tens of meters and measure its velocity to an accuracy of millimeters per second. These high-accuracy measurements are crucial complements to optical observations and can reduce uncertainties in orbital parameters of newly discovered asteroids by a factor of 100,000, preventing them from being lost, and extending our ability to predict their locations by decades or centuries, which is vital for tracking potentially hazardous asteroids. In 2013 and 2014, the Arecibo planetary radar program corrected the distances (predicted by optical observations) to three asteroids by approximately one Earth diameter each, which can be the difference between an impact and a near miss.

In addition to greatly refining our knowledge of asteroid orbits, the planetary radar can determine or constrain the size, shape, spin, and density as well as the physical and chemical composition of asteroids. All of these are crucial for informing the development of impact mitigation techniques.

The Arecibo planetary radar detects about 100 near-Earth asteroids each year, approximately 30 of which are defined as potentially hazardous, due to their combination of size and proximity to Earth, and essentially all are large enough to cause airbursts like that in Chelyabinsk, Russia in 2013 if they were to collide with Earth. To date, Arecibo has detected approximately 250 out of the 1759 asteroids that are classified to be potentially hazardous by the Minor Planet Center (as of December 9, 2016).

The draft EIS claims that because Arecibo only sees 30% of the sky, it cannot see the majority of asteroids. Asteroids are moving targets on the sky and the majority move in and out of Arecibo's field of view. In fact, an internal NASA study, submitted as a white paper to the *Vision & Voyages* planetary science decadal survey, finds that Arecibo could detect over 80% of potentially hazardous asteroids more than a year before impact. The flawed argument that Arecibo can see only a minority of asteroids is used in the draft EIS to claim that Arecibo is unlikely to see an impactor in its field of view. This is not correct.

Compared to the Goldstone Solar System Radar in California, Arecibo's planetary radar is about 20 times more sensitive, a combination of greater transmitted power and a larger collecting area. Thus, Arecibo can "see" twice as far into space as Goldstone. Arecibo has also contributed two-thirds of all radar astrometry, distance and velocity measurements that determine asteroid orbits, in the last decade. For objects passing very near the Earth, bistatic (using one station to transmit and another to receive) observations are required, where the combination of Goldstone and Arecibo is the most sensitive radar system in the world. If Goldstone is left alone, such sensitive observations would not be possible.

In the draft EIS, impacts are dismissed as having a negligible effect on public safety and that even if an impacting asteroid were detected, there are no tested technologies to prevent the impact. It is correct that impacts are low-probability, high-risk events. Yet, the NASA Planetary Defense Coordination Office and the Federal Emergency Management Agency (FEMA) regularly carry out mock asteroid impact scenarios to practice disaster response. The Space Missions Planning Advisory Group, Impact Disaster Planning Advisory Group, and the International Asteroid Warning Network, all sanctioned by the United Nations, also consider such scenarios. The risk to public safety from an asteroid impact is taken very seriously on a national and international level rather than dismissed.

While impact mitigation technologies have not yet been tested, two proposed technology demonstrations require the accuracy of the Arecibo planetary radar to validate their successes. The Asteroid Impact and Deflection Assessment (AIDA) mission concept is an international collaboration among the European Space Agency (ESA), NASA, Observatoire de la Côte d'Azur (OCA), and the Johns Hopkins University Applied Physics Laboratory (JHU/APL) aiming to demonstrate the kinetic impactor technique to change the motion of an asteroid in space. AIDA is a dual-mission concept, involving two independent spacecraft – NASA's Double Asteroid Redirection Test (DART) and ESA's Asteroid Impact Mission (AIM). The DART spacecraft will deliberately collide with the small moon in orbit about asteroid Didymos. The collision will change the velocity of the moon in its orbit around Didymos by only a fraction of one percent, but enough to be measured by the Arecibo planetary radar. The NASA Asteroid Robotic Redirect Mission (ARRM) aims to lift a boulder from the surface of an asteroid and use the mass to demonstrate a gravitational tractor to alter the asteroid's motion, a subtle change that only the accuracy of the Arecibo planetary radar can detect.

References:

<http://minorplanetcenter.net/mpc/summary>
<http://www.jpl.nasa.gov/news/news.php?feature=6669>
<https://www.nasa.gov/planetarydefense/aida>

* * *

Finding 2: Several scientific boards and committees, including the decadal survey “*Vision & Voyages for Planetary Science in the Decade 2013-2022*,” endorse the capabilities of the Arecibo planetary radar system as unmatched, essential, and unique. The AST Portfolio review committee strongly encouraged NSF AST to continue to support the Arecibo planetary radar program.

National Research Council (in “*Near-Earth Object Surveys and Hazard Mitigation Strategies*”, 2009): “It [Arecibo planetary radar] is about 20 times more sensitive than NASA’s Goldstone Solar System Radar, the world’s only other operational planetary radar; and it can resolve features on NEOs down to several meters in size. Arecibo can obtain this resolution on NEOs that are millions of kilometers from Earth and unresolved by the largest ground- and space-based optical telescopes. Arecibo thus plays an important role in investigation of NEO sizes, shapes, spin states, and surface properties, as well as in discovering companions that often orbit NEOs. Its highest spatial resolution is surpassed only by spacecraft during rendezvous or flyby missions.”

Space Studies Board (in SSB annual report, 2010): “The Arecibo and Goldstone radar systems play a unique role in the characterization of NEOs, providing unmatched accuracy in orbit determination and offering insight into size, shape, surface structure, and other properties for objects within their latitude coverage and detection range.”

National Research Council (Committee on the Planetary Science Decadal Survey, Space Studies Board, Division on Engineering and Physical Sciences, in “*Vision & Voyages for Planetary Science in the Decade 2013-2022*” (V&V), 2011): “The Arecibo and Goldstone radar telescopes are powerful, complementary facilities that can characterize the surface structure and three-dimensional shapes of the near-Earth objects within their reach of about one-tenth of the Earth-Sun distance. Arecibo has a sensitivity 20 times greater than Goldstone, but Goldstone has much greater sky coverage than Arecibo. Continued access to both radar facilities for the detailed study of near-Earth objects is essential to primitive bodies studies. The large number of primitive bodies in the solar system requires sufficient telescope time to observe statistically significant samples of these populations to expand scientific knowledge and plan future missions. Characterization of this multitude of bodies requires access to large ground-based telescopes as well as to the Goldstone and Arecibo radars. The Arecibo radio telescope is essential for detailed characterization of the shape, size, morphology, and spin dynamics of NEOs that make close approaches to Earth. These radar observations also provide highly accurate determinations of orbital parameters for primitive bodies critical to modeling and planning future exploration.”

“The scientific study of primitive bodies can be advanced during the next decade if the following activities are addressed: [--] *Ground-based Telescopes*—Assure access to large telescopes and the LSST for planetary science observations and maintain the capabilities of the Goldstone and Arecibo radar systems. The large number of primitive bodies in the solar system requires sufficient telescope time to observe statistically significant samples of these populations to expand our scientific knowledge and plan.”

AST Portfolio Review Committee (in “*Advancing Astronomy in the Coming Decade: Opportunities and Challenges*”, 2012): “The Arecibo capability is unique and is supported in all scenarios.”

“AST divestment from Arecibo might also cripple the radar characterization of small bodies in the Solar System, which was one of the most highly ranked *V&V* priorities for ground-based observations for the next decade.”

“AST must carefully consider its current portfolio in light of *NWNH* and *V&V* priorities and the anticipated budgets.”

Small Bodies Assessment Group (SBAG meeting findings, January 2016): “Arecibo is a critical national asset whose loss would not only affect science return but also increase the nation’s risk exposure,” and in a meeting in June 2016: “Any disinvestment in Arecibo facilities and maintenance could have major scientific and security implications.”

NASA (response to SBAG findings, 2016): “NASA considers the capabilities of the Arecibo Planetary Radar to be extremely important to the national research infrastructure. PSD [planetary science division] of NASA does not have sufficient resources on its own to fully operate the observatory, but has communicated to NSF its willingness to continue support for Arecibo’s planetary radar capabilities at the present level.”

The Planetary Society (excerpt from a response during the first comment period of the Arecibo EIS process, 2016): “Arecibo’s radar allows for the characterization of near-Earth asteroids and is a critical capability to maintain. Closing down Arecibo is not in the nation’s interest, and its unique capabilities are crucial to providing insight into the low probability, high impact event of an asteroid collision. We believe that the small operating cost of Arecibo must be maintained within the NSF, particularly considering the cost to re-create Arecibo’s capabilities at a later date. We know that there is a large community of scientists expressing support for Arecibo’s continued operations as well as representatives at NASA, who have signaled their intention to continue using Arecibo’s capabilities for the foreseeable future. For over 50 years, the Arecibo Observatory has provided the world with a uniquely sensitive instrument for listening to the cosmos, as well as a uniquely powerful radar to directly interrogate it. While it was forged during the Cold War, Arecibo represents how our worst instincts can be channeled to create something truly beneficial by advancing humanity’s frontiers of knowledge. We urge the NSF to continue Arecibo’s operations, and to preserve this unique asset of scientific exploration and near-Earth object characterization.”

AAS Division for Planetary Sciences (excerpt from a response during the first comment period of the Arecibo EIS process, 2016): “The Division for Planetary Sciences of the American Astronomical Society hereby recognizes the importance of the Arecibo Observatory and its planetary radar capability to our science and to planetary defense issues. We strongly encourage all of the concerned institutions to work together to resolve Arecibo’s budgetary and other issues so that the Observatory can continue to be a scientifically productive facility for planetary science, radio astronomy, and atmospheric studies.”

References:

- <http://www.lpi.usra.edu/sbag/findings/index.shtml#jan2016>
- <https://books.google.com/pr/books?id=Aheur-PfwQ8C&pg=PA66&lpg=PA66&dq=nasa+authorization+act+arecibo+observatory&source=bl&ots=WLvQjtGura&sig=NrSwX1YyQTLg6qkuZYsbIaV4YGY&hl=en&sa=X&ved=0ahUKEwir1qzfwqjQAhXHMSYKHeYUDGEQ6AEIRTAJ#v=onepage&q=nasa%20authorization%20act%20arecibo%20observatory&f=false>

- https://books.google.com.pr/books?id=eHUIoaOCm8YC&pg=PA60&lpg=PA60&dq=space+studies+board+arecibo+observatory&source=bl&ots=7WiBDH5CnM&sig=rR2W_wvaxjpbgqlkcy0sl1EbKE&hl=en&sa=X&ved=0ahUKEWju6K3FrajQAhVKfiYKHcBWBKEQ6AEIHDA#v=onepage&q=space%20studies%20board%20arecibo%20observatory&f=false
- <https://www.nap.edu/catalog/12738/near-earth-object-surveys-and-hazard-mitigation-strategies-interim-report>
- http://solarsystem.nasa.gov/docs/Vision_and_Voyages-FINAL.pdf
- https://www.nsf.gov/mps/ast/env_impact_reviews/arecibo/eis/DEIS.pdf
- https://www.nsf.gov/mps/ast/env_impact_reviews/arecibo/eis/Appendices_DEIS.pdf

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Finding 3: Several national laws, policies, and mandates require the continued operation of the planetary radar at Arecibo Observatory.

The National Space Policy Act of 2010 states that NASA should “pursue capabilities, in cooperation with other departments, agencies, and commercial partners, to detect, track, catalog, and characterize near-Earth objects to reduce the risk of harm to humans from an unexpected impact on our planet and to identify potentially resource-rich planetary objects.”

The Space Act, Public Law No. 111 – 314, in 2010, specifically reaffirmed congress’ support for national planetary defense capabilities and their previous statements in the NASA Authorization Act of 2008, and specifically affirms the value of planetary radar, section 71104.

The NASA Authorization Act of 2008, specifically calls for funding of Arecibo and continued operation of its planetary radar program, pending a review by the National Research Council, which released a statement the following year affirming the vital role Arecibo plays in planetary defense.

References:

- https://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf
- <https://www.congress.gov/bill/110th-congress/house-bill/6063/text>
- http://www.nasa.gov/sites/default/files/atoms/files/public_law_111-314-title_51_national_and_commercial_space_programs_dec_18_2010.pdf

From: Carlos A Estevez Galarza <carlos.estevez1@upr.edu>
Sent: Saturday, December 10, 2016 1:26 PM
To: Envcomp-AST@nsf.gov
Cc: achp@achp.gov
Subject: Regarding the possible closure of Arecibo Observatory

Dear Ms. Pentecost,

Exactly three years ago, I participated in a study tour to Europe that allowed me to get to know different people and their cultures for the first time. I had the pleasure of witnessing some of humanity's most important achievements, places, and contributions to art. During the road trips, I began reading Carl Sagan's literary works, which allowed me to conclude that astronomy is the bridge between both of my passions, art and science. When I was a child, my family took me to the Arecibo Observatory. As I glanced at the radio telescope, my mother told me that the observatory lands were once owned by my great-great-grandfather, so I immediately felt a connection to astronomy. At this point, I started to connect the dots that made me realize my true calling.

After taking diverse courses in physics and mathematics I felt ready to get involved in the Puerto Rican astronomy community. I contacted Dr. Edgard Rivera Valentin, a staff planetary scientist at the Arecibo Observatory, interviewed, and was hired as a Student Research Assistant under his NASA Mars Data Analysis Program proposal. Dr. Rivera-Valentín is a "local expert" on the Mars Science Laboratory's (MSL) Rover Environmental Monitoring Station (REMS) instrument and a co-investigator on HABIT, an ESA instrument on the Exomars surface platform mission. The MSL's REMS was recently used to suggest an unexpected discovery: the possibility of liquid water formation via deliquescence of perchlorate salts during the Martian night (Martín-Torres et al., 2015). As a researcher, I analyzed REMS data from sols 10-602 (Ls 156.1° through 114.7° of the next Martian year) to look for thermodynamic evidence in favor of deliquescence in Mars' Gale Crater. In my work, I found evidence of exothermic dominated reactions occurring during the night, which supports Martín-Torres et al., 2015 results. It was hard work, but it was all worth it. This experience gave me the chance to do relevant work in the fields of astronomy and physics while living in a community of scientists from all around the world. This exchange provided me with insights in the fields of atmospheric science, radio astronomy, solar system studies, electric engineering and archeology, among other disciplines. In addition, I was able to volunteer in the Arecibo Observatory REU program.

The Mars research work has been a pivotal experience in my life, as it also presented the opportunity to write my very first scientific article, which has been submitted to the Geophysical Research Letters. Also, I presented my research work at the Lunar and Planetary Science Conference 2016 in Houston, Texas. The most important thing about my experience at the Arecibo Observatory is that I found my purpose. I feel that the human race has lost its focus. Our lifestyles are based on the assumption that we have infinite resources, but we don't, so we can't exploit them. In the short time we've been here we have accomplished so many incredible things that it would be a pity if we destroyed ourselves. During my time in Arecibo, I learned that planetary science is all about understanding our world better by comparing it with other worlds. I think most of the people ignore science because its apparent difficulty scares them off, but somehow planetary science gets to people. It's something people can visualize and feel identified with. I truly believe that planetary science can give everyone the same feeling I got while doing my research. Only by studying other planets we will know how fortunate we are to be here and hopefully, we will learn to appreciate our only home, planet Earth.

Puerto Ricans are multicultural people as we are a genetic mixture of Europeans, Africans, and Taínos, the local indigenous group. We are globally recognized for their passion towards arts and sports and I want to work so that we are also recognized as people who are devoted to the advancement of science. The Arecibo Observatory is a center devoted to the advancement of science and education, not only to Puerto Ricans, but to the whole world, as proven by the AO Space Academy and the AO REU program. The Arecibo Observatory and its staff were the only ones who believed in me, when no one did. Even with a 3.80 GPA and previous research experience I couldn't get into any REU program in the United States. If the Arecibo Observatory would've been closed by that time, I don't know what would have been of my scientific career. In my case, I hope the Arecibo

Observatory remains open because I plan to do more research as I do my masters here in Puerto Rico. There are many talented Puerto Rican students who deserve the chance that I had. During the months I lived in Arecibo, I saw how everyday a bunch of locals and tourists visited the Observatory. Economically speaking, the closing of the Arecibo Observatory would be another devastating hit to Puerto Rico. Furthermore, the Arecibo Observatory plays a vital role in planetary defense as it possesses the most sensitive radar. It really makes no sense to close the facility that gave indirect evidence of gravitational waves and evidence of the first exoplanets, a facility that continues to be of great use to the scientific community.

Kind regards,

Carlos

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Carlos A. Estévez-Galarza
Space Research Director at PRatian LLC
T.A. & Physics M.S. Student at UPR-RP
<http://linkedin.com/in/candresestevez>

From: Walter Brisken <wbrisken@gmail.com>
Sent: Friday, December 09, 2016 3:04 PM
To: Envcomp-AST@nsf.gov
Subject: Arecibo Observatory

Dear NSF,

I am writing to provide my views on the importance of Arecibo Observatory's continued operation.

Before I describe the particular importance of Arecibo to astronomical sciences and Space Situational Awareness I would like to make a general statement about decommissioning of any of the US radio astronomy facilities that have been recommended for divestment from NSF's portfolio. This also includes the Green Bank Telescope and the Very Long Baseline Array. The three instruments each offer unique capabilities that once decommissioned are not likely to be restored on the timescale of a century, or perhaps large fraction thereof. This is unlike the case for the optical telescopes slated for decommissioning where future generation replacements of essentially all capabilities are already well into planning phases (e.g., LSST and TMT).

Now to Arecibo...

I understand the several important science cases have already been brought to attention, including 1. the searching for and precision timing of millisecond pulsars which are currently placing the strongest constraints on several sectors of gravitation theory and hope soon to detect gravitational radiation in a waveband unreachable by any other proposed detector, and 2. the resolution of the Hipparcos Controversy through detect distance measurement to the Pleiades.

Arecibo is a key participant in VLBI experiments, including frequently contributing to the High Sensitivity Array, an arrangement of the VLBA and four very large, sensitive radio telescopes, with Arecibo being the largest. Inclusion of Arecibo instantly doubles the sensitivity of the array. Some very exciting research is currently just at the sensitivity limit offered by the HSA. Envisioned upgrades to the HSA antennas could increase its sensitivity by a factor of 4 or more, bringing direct distances (and thus determination of intrinsic properties otherwise difficult or impossible to untangle) to Galactic globular clusters into reach. Also direct measurements of the motions of the local group galaxies will provide key information on the dynamics of the local group. Finally, with the increase in sensitivity the numbers and types of stars accessible to VLBI will grow substantially, opening VLBI up to a large group of scientists and growing the Arecibo (and VLBI) community.

To keep my letter short I will not dwell on the radar capability that Arecibo has to offer, but would like to note this is absolutely unmatched by any instrument in the world and has significant potential not only for conventional radio astronomy but also for planetary science, space science, and space situational awareness research,

In closing, I urge very careful thought when considering the closure of any instrument, including Arecibo. Consideration not only of the current capability but also that of its future capabilities and within the context of the other instruments it will be operating.

Walter Brisken

Subject: Arecibo Observatory

Date: Monday, December 12, 2016 at 1:13:14 AM Eastern Standard Time

From: Araya, Esteban

To: NSF/AST Environmental Compliance Mailbox

Dear Ms. Elizabeth Pentecost,

This email is to express my concern with the potential funding changes for the Arecibo Observatory recommended in the Draft Environmental Impact Statement.

I hope the committee takes into consideration that further cuts in the scientific operations of the 305m Arecibo Telescope will have negative consequences not only for the territory of Puerto Rico (scientists, students at all levels, and general public), and the user community from R1 institutions, but also will negatively impact research work done at primarily undergraduate institutions like Western Illinois University, where students participate in remote observations, data reduction, and analysis of Arecibo data, and present results in multiple local, regional and national conferences.

The 305m Arecibo Telescope is the most sensitive telescope for spectral line observations at frequencies below 10GHz, and thus, it is a greatly valuable US asset and should continue its scientific mission.

Best regards,

Esteban D. Araya, Ph.D.
Associate Professor
Physics Department
Western Illinois University

From: Kathy <kkaldon@comcast.net>
Sent: Tuesday, December 13, 2016 8:49 AM
To: Envcomp-AST@nsf.gov
Cc: achp@achp.gov; Kaldon, Kristina
Subject: Arecibo Observatory

I received information recently about the possibility of closing down the Arecibo Observatory. This site has been valuable to my family in a very personal way.

I visited this site in the summer of 2014 when my daughter was part of the REU program. She spent 11 weeks at the site and the knowledge she gained was amazing. We were provided a tour and met the staff who were enthusiastic about the site, its operations and the REU program. She presented her investigation regarding "Searching for Fast Radio Bursts in GALFACTS Data" at Arecibo Observatory on August 7th as well as in Seattle at the American Astronomical Society Meeting, Penn State, and on her interviews.

This program was rewarding to her personally and enhanced her career. She is currently working at MIT Lincoln Lab, where she was recruited to join during her senior year at Penn State. It was a difficult decision for her to travel on her own to a place where she did not know anyone. She was transformed, becoming an avid traveler who is comfortable in many different types of situations. She enjoyed working with all the personnel onsite and was provided with a unique experience. The project she worked on provided a solid background for her major of astrophysics and allowed her to gain experience with professionals who were working in related fields.

She continues to return to Puerto Rico at few times a year and has developed long lasting relationships with the contacts she made during this time.

Please feel free to contact me directly if you would like more detail.

Thanks,
Kathy Kaldon

From: John Kaldon <jkaldon@comcast.net>
Sent: Monday, December 12, 2016 4:31 PM
To: Envcomp-AST@nsf.gov; Kristina Kaldon
Subject: Arecibo Observatory

My daughter had the privilege of working at the Arecibo Observatory as an intern while at Penn State University. Because of this experience she has developed a love for Arecibo and Puerto Rico, and the experience helped her obtain a job at MIT. My wife and I visited the Observatory and were very impressed with the work performed at the site and the personnel. Please continue to support the Arecibo Observatory.

John F. Kaldon

President

Broad Run Consultants Ltd

jkaldon@comcast.net

Phone 610 486 6721

Cell 610 999 3888

Fax 610 486 0854



Monday, December 12, 2016

RE: Comments about Draft Environmental Impact Statement for the Arecibo Observatory

Envcomp-AST@nsf.gov

Ms. Elizabeth Pentecost
RE: Arecibo Observatory
4201 Wilson Blvd, Ste 1045S
Arlington, VA 22230

Dear Ms. Pentecost,

The Caribbean Division of the American Association for the Advancement of Science (AAAS-CD) fulfills the mission of *advancing science, engineering, and innovation for the benefit of all people and the environment* of the Caribbean basin. The main goals of the Division are to develop and promote science and innovation initiatives that impact society, foster education in science and technology, and advance cooperation through scientific endeavors.

These goals are shared and exemplified through the myriad vanguard research activities and diverse educational offerings provided by the scientists and educators at the Arecibo Observatory (AO). ***Because of their commitment to advancing science and serving society the American Association for the Advancement of Science's Caribbean Division fully supports efforts to ensure that the Arecibo Observatory continues its service for the benefit of science and society.***

The AO is a unique facility for research in radio astronomy, atmospheric physics, and planetary science. Since opening for operation in 1963, the AO has allowed scientists to precisely measure the rotation periods of planets, image planetary surfaces, the Moon, the rings of Saturn, comets, and discover hydrocarbon lakes on the surface of Titan, one of Saturn's moons. The large 305-meter antenna at Arecibo was instrumental in the discovery of the first binary pulsar by Joseph Taylor and Russell Hulse, a finding that led this duo to be awarded the Nobel Prize in Physics in 1993. In the last 20 years alone, research carried out at the AO has yielded over 500 scientific publications that have been cited over 17,000 times. Furthermore, the AO is the most sensitive instrument in the world for the characterization of near-Earth astronomical objects. Thanks to these capabilities, the AO can accurately predict the trajectory of asteroids approaching Earth and is part of a group of facilities that represent the first line of defense to the dangers of impacts by asteroids and other astronomical objects.



In addition to being at the forefront of scientific discoveries and a sentinel against threats to human survival, scientists and educators use the facilities in Arecibo as a platform for diverse education and outreach activities. The Arecibo Observatory Space Academy (AOSA) trains secondary school students in the fields of Science, Technology, Engineering and Mathematics (STEM) to become leaders in these fields by early exposure to authentic scientific research through direct partnerships with scientist at the AO. Just as the academy provides formal education to secondary school students, the newly renovated Ángel Ramos Foundation Visitor Center and Museum provides informal education to more than 100,000 visitors per year, including a significant number of K–12 students from local schools, as well as visitors from around the world.

The benefits of the AO to science and society are as colossal as the radio telescope itself. This large dish nestled into the karst topography of the north of Puerto Rico allows us to explore the mysteries of our atmosphere and to search for life beyond it. It lets us peer into the future by inspiring future generations of scientists while reminding us of the vastness of the universe. ***AAAS-CD urges the National Science Foundation (NSF) to seek sustainable solutions for the future of the AO in favor of continued service and support. Therefore, the AAAS-CD supports the No-Action Alternative included in the Draft Environmental Impact Statement for the Arecibo Observatory. AAAS-CD pledges its support to work along with the NSF to include governmental and scientific stakeholders from Puerto Rico and abroad in actions that guarantee and expand the AO's impact as a vital center for research and education in the Caribbean and beyond.***

It would be a great misfortune if the NSF fails to see the intellectual merits and broader impacts of facilities such as the AO in favor of newer telescopes, which will eventually be in the same position that the AO is in today. Just as the AO has allowed us to do for the past 53 years, we invite the NSF to look beyond.

Sincerely,

A handwritten signature in blue ink, appearing to read 'J. S. Ramirez-Lugo', written in a cursive style.

Dr. Juan S. Ramírez-Lugo
President
AAAS-Caribbean Division



lunes, 12 de diciembre del 2016

RE: Comentarios sobre Borrador de Declaración de Impacto Ambiental (BDIA) del Observatorio de Arecibo

Envcomp-AST@nsf.gov

Ms. Elizabeth Pentecost
RE: Arecibo Observatory
4201 Wilson Blvd, Ste 1045S
Arlington, VA 22230

Estimada Sra. Pentecost,

La División del Caribe de la Asociación Americana para el Avance de la Ciencia (AAAS-CD, por sus siglas en inglés) tiene como su misión promover la ciencia, la ingeniería y la innovación para el beneficio de todas las personas y el medio ambiente de la cuenca del Caribe. Los objetivos principales de la División son desarrollar y promover iniciativas de ciencia e innovación que impacten a la sociedad, fomenten la educación en ciencia y tecnología y avancen la cooperación a través de esfuerzos científicos.

Estos objetivos se comparten y se ejemplifican a través de las múltiples actividades de investigación de vanguardia y diversos ofrecimientos educativos proporcionadas por los científicos y educadores en el Observatorio de Arecibo (AO, por sus siglas en inglés). ***Debido a su compromiso con el avance de la ciencia y el servicio a la sociedad, la División del Caribe de la Asociación Americana para el Avance de la Ciencia apoya plenamente los esfuerzos que garanticen que el Observatorio de Arecibo continúa su servicio en beneficio de la ciencia y la sociedad.***

El AO es una instalación única para la investigación en radioastronomía, física atmosférica y ciencia planetaria. Desde su apertura en 1963, el AO ha permitido a los científicos medir con precisión los períodos de rotación de planetas, se obtuvieron imágenes de las superficies de planetas, la Luna, los anillos de Saturno, cometas y descubrir los lagos de hidrocarburos en la superficie de Titán, una de las lunas de Saturno. La gran antena de 305 metros en Arecibo fue decisiva en el descubrimiento del primer pulsar binario por Joseph Taylor y Russell Hulse, un hallazgo que llevó a este dúo a recibir el Premio Nobel de Física en 1993. En los últimos 20 años, la investigación realizada en el AO ha resultado en más de 500 publicaciones científicas que se han citadas sobre 17 mil veces. Además, el AO es el instrumento más sensible del mundo para la caracterización de objetos astronómicos cercanos a la Tierra. Gracias a estas capacidades, el AO puede predecir con precisión la trayectoria de asteroides que se acerquen a la Tierra y forma parte de un grupo de instalaciones que representan la primera línea de defensa frente a los peligros de los impactos por asteroides y otros objetos astronómicos.



Además de estar a la vanguardia de los descubrimientos científicos y de ser una centinela contra las amenazas a la supervivencia humana, las instalaciones en Arecibo son utilizadas por científicos y educadores como una plataforma para diversas actividades de educación y divulgación. La Academia Espacial del Observatorio de Arecibo (AOSA, por sus siglas en inglés) entrena a estudiantes de escuela secundaria en los campos de Ciencia, Tecnología, Ingeniería y Matemáticas (STEM, por sus siglas en inglés) para que se conviertan en líderes en estos campos al ser expuestos a investigación y tecnología científica auténtica y por colaboraciones directas con científicos del Observatorio de Arecibo. Al igual que la academia ofrece educación formal a los estudiantes de secundaria, el recién renovado Centro de Visitantes y Museo de la Fundación Ángel Ramos ofrece educación informal a más de 100,000 visitantes al año, incluyendo un número significativo de estudiantes K–12 de escuelas en Puerto Rico, así como visitantes del mundo entero.

Los beneficios del AO para la ciencia y la sociedad son tan colosales como el propio radiotelescopio. Este gran plato posado sobre la topografía kárstica del norte de Puerto Rico nos permite explorar los misterios de nuestra atmósfera y buscar la vida más allá de ella. Permite mirar hacia el futuro al inspirar a futuras generaciones de científicos mientras nos recuerda la inmensidad del universo. ***AAAS-CD le exhorta a la Fundación Nacional de Ciencias (NSF) a buscar soluciones sostenibles para el futuro del AO que permitan su servicio y apoyo continuo. Por lo tanto, el AAAS-CD apoya la Alternativa de No-Acción incluida en el Borrador de Declaración de Impacto Ambiental para el Observatorio de Arecibo. AAAS-CD se compromete a trabajar junto con la NSF para incluir a entidades gubernamentales y científicas de Puerto Rico y del extranjero en acciones que garanticen y amplíen el impacto del AO como un centro vital para la investigación y educación en el Caribe y más allá.***

Sería una gran desgracia que la NSF no vea los méritos intelectuales y los impactos más amplios de instalaciones como el AO por favorecer nuevos telescopios, que eventualmente estarán en la misma posición que el AO en la actualidad. Tal como nos ha permitido el AO hacer por los últimos 53 años, invitamos a la NSF a mirar más allá.

Atentamente,

A handwritten signature in blue ink, appearing to read 'J. S. Ramirez-Lugo', written in a cursive style.

Dr. Juan S. Ramírez-Lugo
Presidente
AAAS-Caribbean Division



December 12, 2016.

Ms. Elizabeth Pentecost
National Science Foundation
Suite 1045
4201 Wilson Blvd.
Arlington, VA 22230.

RE: Arecibo Observatory:

We are writing to you as a concerned organization. The "Fundación de Investigaciones Espeleológicas del Karso Puertorriqueño" (FIEKP) is a non-profit organization formed by citizens that live in Puerto Rico that are interested in Speleology and in science in general.

The Arecibo Observatory is a unique facility with a broader scope of work than other observatories around the globe. The uniqueness is not only due to physical characteristics such as size, location, reflector flexibility, historical contribution to humanity, but also what it represents to the Puerto Rico scientific community.

The observatory has been a tool to discover asteroids and the research conducted at the Observatory resulted in a Nobel Prize winner. Of course, that part is well documented and known to everyone in the scientific community. The Observatory is up to date and far from obsolete; therefore, from the operational aspect, there is no reason for the NSF to stop funding. Furthermore, when compared to other observatories, it provides a wider scope of research, and perhaps at a lower cost. However, the aspect that worries FIEKP the most is what the observatory means for the scientific community in Puerto Rico. The Observatory is the only true research facility for the Puerto Rico physicist and electrical engineers. It is the connection of these scientists with the rest of the world. Every day we lose scientists and engineers due to the lack of work and opportunities in the Island. The observatory is the most important scientific facility in Puerto Rico, and for many years, helping the development of our scientists is Puerto Rican soil; a closure or significant cut in funding will only accelerate the migration of scientists and scholars. This in turn will further steepen our economic downturn and make harder for us the chances to improve productivity from the science and technology sourcing. The future of scientists depends on what is available for their development, and the Observatory is the best example of a facility that has served and continues to serve this purpose. Given its significance to the Puerto Rico scientific community, FIEKP considers that the best alternative is to continue NSF support for science-focus operations. This alternative allows for the best use of the observatory and also provides a reasonable amount of time for which the Observatory operations and the Puerto Rican scientific community find additional sources of funding from the public and the private sector.

FIEKP and other science-oriented organizations are interested in preserving the Observatory for scientific use and is willing to help in finding ways to continue with the Observatory operations.

For any questions, please call us at (787) 448-9960 or email us at Babilonia.miguel@yahoo.com.

Best Regards,

Miguel A. Babilonia Vázquez
President
Fundación de Investigaciones Espeleológicas del Karso Puertorriqueño -FIEKP-
ESJ Towers
6165 Ave Isla Verde Suite 269
Carolina, PR 00979

From: Robert Minchin <robert.minchin@gmail.com>
Sent: Monday, December 12, 2016 11:40 AM
To: Envcomp-AST@nsf.gov
Subject: Arecibo EIS and METI

If Arecibo is left relying, in whole or in part, on selling telescope time to fund its continued operation, this makes the purchase of time by METI (Messaging to Extra-Terrestrial Intelligence, also known as Active SETI) projects inevitable. Some scientists (e.g. <http://lifeboat.com/ex/shouting.at.the.cosmos>) have said this risks attracting the attention of more advanced and possibly hostile alien civilisations, which could lead to the extinction or enslavement of the human race. The EIS should therefore contain a risk assessment of METI transmissions under the assumption that these will go ahead if Arecibo Observatory is left to seek its own funding.

Robert Minchin

From: Kristina Kaldon <kristinakaldon@gmail.com>
Sent: Monday, December 12, 2016 9:47 AM
To: Envcomp-AST@nsf.gov
Subject: Arecibo Observatory

Monday, December 12, 2016

Ms. Elizabeth Pentecost
RE: Arecibo Observatory
4201 Wilson Blvd, Ste 1045S
Arlington, VA 22230

Dear Ms. Elizabeth Pentecost,

I am currently an employee at MIT Lincoln Laboratory in the space systems and technology division. I went to the Arecibo Observatory for the first time in May 2014 to start an NSF REU. Initially I was nervous to be in a new, exotic place but within minutes on the island, I realized my life was about to change. After seeing the observatory, the vastness of the dish, I felt small, passionate, and hopeful. I spent the next 11 weeks working at the observatory (I voluntarily asked to stay for an extra week). I learned so much; specifically how to code, how the electronics work, how to observe, how to present scientific work, and how to ask questions effectively. I felt personally inspired by my advisors, other staff (all whom were extremely intelligent, enthusiastic, and friendly), the research, and the culture of the island. That summer, I made life-long friends, mentors, and connections that help me succeed every day.

I went on to present my Arecibo REU summer work in Seattle, Penn State, and MIT. I received three scholarships, monetary prizes for winning best poster awards, and was offered my job directly as a result from the work I did at Arecibo Observatory. Educationally, I thrived because I was able to learn many new things with enthusiastic, inspiring, and helpful experts. I also thrived because I was able to see so many new areas of STEM, including engineering, operations, agricultural, education, radar, ionosphere, and radio research. I have been inspired scientifically by the staff and their work to continue research and apply to graduate school. I have been inspired culturally in countless ways. It is my dream to live in Puerto Rico and work at the observatory full-time. I have been back to the island over three times a year since 2014. I am probably the most enthusiastic Puerto Rico supporter you could ever meet. My devotion has led me to be elected as a committee chair for MIT Lincoln Laboratory's Hispanic-Latino Network employee resource group. Through said group, I have recruited Latin American engineers, made people feel home, and hosted outreach events to educate children about Latin America and science. I have such respect for the island, it's people, and the opportunities the observatory provides for it.

I truly hope you are able to see that Arecibo Observatory is one of the great marvels of the world. We need to save it, we need to fund it, and we need to share it. I am grateful for the opportunities I've had there and hope that many people can have the same opportunity I did. I think the biggest and best change in my life was the day I moved to the observatory. Anyone who has met me can vouch for my insistent love of Puerto Rico and Arecibo Observatory.

Thank you for your time.

Please feel free to contact me for clarification, more information, or to discuss further.

Best,
Kristina Kaldon
(610) 804-7538
kristinakaldon@gmail.com

Ms. Elizabeth Pentecost
National Science Foundation
4201 Wilson Blvd., Suite 1045
Arlington, VA 22230
USA

Oude Hoogeveensedijk 4, 7991 PD Dwingeloo
P.O. Box 2, 7990 AA Dwingeloo, The Netherlands
Phone +31 521 59 51 00
Fax +31 521 59 51 01
www.astron.nl

Our reference: -

Your reference: -

Subject: Arecibo Observatory, Environmental
Impact Study

Date: 12 December 2016

Dear Ms. Pentecost,

As chairman of the Consortium Board of Directors of the European VLBI Network (EVN), I wrote on 20 June 2016 to express our grave concerns about the NSF investigation (the "Environmental Impact Study") into future options for the William E. Gordon 305-m Radio Telescope at Arecibo. Today, I write in reaction to the Draft Environmental Impact Statement (DEIS). The EVN, as the largest network of radio telescopes for VLBI on earth, is gravely concerned about the continued availability of "Arecibo", which, as an associated member, is irreplaceable for carrying out the most sensitive VLBI observations!

For the EVN it is particularly disturbing to find in section ES.2 of the DEIS a statement that "... the scientific capability of the Arecibo Observatory is lower in priority than other scientific capabilities the NSF funds." Regardless of how that relative value judgment was derived, however, we stress that the contribution of the unparalleled sensitivity of Arecibo to VLBI observing is invaluable in absolute terms, and comes at an amazingly modest cost/benefit ratio. The EVN feels that the NSF would be remiss to divest and thus in part to divorce the US community from what has always been a collective investment in VLBI by the global radio astronomy community, to the benefit of all. As a recent example: I have confidentially been informed about the first confirmed localization of a Fast Radio Burst (FRB). This was carried out in an observation using the EVN including Arecibo. Unraveling the nature of these enigmatic FRBs is being fiercely pursued by multiple research groups, and could have profound implications on our understanding of the physics in the extreme conditions at the centers of galaxies. The VLBI result is sure to be a highlight at the January American Astronomical Society meeting, where it will be publicly announced.

The EVN furthermore struggles to understand the intent and viability of the statement in the DEIS that the option preferred by the NSF is "Collaboration with Interested parties for Continued Science-focused Operations". Arecibo VLBI operations are carried out by its scientific staff; yet, the building housing that scientific is one of no less than 26 important buildings slated for demolition under this option. One cannot help but wonder how viable continuation of science-focused VLBI operations will be, regardless of whether interested (outside) parties may exist in principle.

Our reference: -

Your reference: -

In summary, the EVN hopes that the NSF will find a continuation model for Arecibo, at perhaps comparatively modest cost, that that does not impede VLBI participation, but rather leverages a persistent very high absolute impact on science from the this great infrastructure.

Yours sincerely,



Dr. R.C. Vermeulen
Director, Radio Observatory at ASTRON
Chair, European VLBI Network Consortium Board of Directors

Ms. Elizabeth Pentecost
National Science Foundation,
4201 Wilson Blvd., Suite 1045
Arlington, VA 22230
USA

12 December 2016

Dear Ms. Pentecost,

The RadioAstron International Science Council (RISC), hereby reiterates its concern, originally raised in their June 2016 submission to the EIS scoping meeting, in respect of the future of what is currently the most sensitive telescope for Very Long Baseline Interferometry (VLBI), the William E. Gordon 305-m Radio Telescope at Arecibo.

We wish to draw NSF's attention to two issues from the DEIS:

(i) It is stated in section ES.2 that "... the scientific capability of the Arecibo Observatory is lower in priority than other scientific capabilities the NSF funds." We would argue that the contribution of the Arecibo 305-m radio telescope to high-sensitivity VLBI observations is invaluable. It is also a critical element of VLBI arrays, both ground-based arrays and space VLBI. Since the international space VLBI project, RadioAstron, commenced operations in 2012, the contribution of the Arecibo telescope to its enormous success has been of the highest importance. The RadioAstron satellite has an apogee height of ~300,000 km, fifteen times greater than previous space VLBI observations, and it has made a number of detections on baselines greater than 20 Earth diameters, in contrast to the expectations of many astronomers. Arecibo's participation has been instrumental in uncovering hitherto unknown refractive substructure introduced by scattering in the interstellar medium, and fine details in quasars that challenge the long-accepted energy generation mechanism in such sources.

VLBI is a global endeavor in which all partners contribute. For example, although the Russian satellite-based antenna provides the longest baselines, many countries provide ground-based support, and the investigators include scientists from all over the world; US-based researchers are often the P.I.'s on high impact science projects.

(ii) the DEIS declares that the agency-preferred option is "Collaboration with Interested parties for Continued Science-focused Operations". However, that option contains the destruction of 26 observatory buildings, many vital and without which Arecibo operations would be rendered close to impossible. Among the buildings slated for destruction is that housing the science staff. We note that Arecibo VLBI operations are supervised and run by the scientific staff.

On behalf of the RadioAstron International Science Council we express our resolute support to continuing operational status of the Arecibo Observatory.

Yours sincerely,

Two handwritten signatures in black ink. The signature on the left is 'Yuri Kovalev' and the signature on the right is 'Philip Edwards'.

Yuri Kovalev & Philip Edwards
RadioAstron International Science Council co-chairs

From: Robert Minchin <robert.minchin@gmail.com>
Sent: Monday, December 12, 2016 11:49 AM
To: Envcomp-AST@nsf.gov
Subject: Comment on Arecibo Observatory draft EIS

At the moment, the sinkhole in which the Observatory is situated is kept from flooding by diesel-powered pumps. If the site were to be completely abandoned, the habitat would not, as incorrectly claimed in the EIS, be protected by woody growth. It would, in actuality, become a tepid pool, drowning the rare ferns and any other flora and fauna, and potentially becoming a breeding ground for mosquitos that could spread infections to the local community. The EIS needs to be re-visited to assess this overlooked risk of habitat destruction and possible risk to public health in scenarios 4 and 5 (partial and complete demolition).

Robert Minchin

From: Joanna Bi <joannabi2000@gmail.com>
Sent: Monday, December 12, 2016 10:31 AM
To: Envcomp-AST@nsf.gov; achp@achp.gov
Cc: Kristina Kaldon (Google+)
Subject: Please Save Arecibo Observatory!

Good morning,

My name is Joanna Bi and I am writing to express my hope that you will reconsider your funding distribution and help save Arecibo Observatory. Although I have not seen the observatory in person or done any work there, I have been inspired to learn more about the amazing, cutting-edge research that is done there due to a coworker who interned at the observatory during the summer of 2014. Since we began working together about 1.5 years ago, she has spoken nonstop about the incredible opportunity Arecibo Observatory provides for undergraduate students in furthering their research and career, allowing them to work with leading scientists at a location that hosts the largest single dish telescope, a unique environment that cannot be found elsewhere in the world. In addition to the educational opportunities, Arecibo Observatory also contributes greatly to three different areas of research: ionosphere research, radio astronomy research, and asteroid research. During my coworker's internship, the observatory detected pulsar stars for the very first time, an invaluable contribution to the scientific community. Furthermore, countless countries have used this single dish telescope; have come specifically to Arecibo Observatory to make use of its unique, one of a kind environment. Closing the observatory will be a terrible loss to the community at large. Please reconsider and help save Arecibo Observatory.

Thank you and best regards,
Joanna Bi



ESTADO LIBRE ASOCIADO DE
PUERTO RICO

Oficina Estatal de Conservación Histórica
State Historic Preservation Office

December 12, 2016

Caroline M. Blanco
Federal Preservation Officer
Assistant General Counsel
Office of the General Counsel
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

**SHPO 06-06-16-03 PROPOSED CHANGES TO ARECIBO OBSERVATORY OPERATIONS,
ARECIBO, PUERTO RICO**

Dear Ms. Blanco:

We acknowledge receipt of your documentation describing five proposed changes to the operation of the Arecibo Observatory; a property listed in the National Register of Historic Places at the national level of significance. We believe all five alternatives, including number 3 (which would change the character of the property's use for an indefinite period of time), meet the criteria of adverse effect. As such, we recommend you notify the Advisory Council on Historic Preservation (Council), pursuant to 36 CFR 800.6(a)(1), and continue consultation with the consulting parties to seek ways to resolve adverse effects. Considering the strong island wide interest in this undertaking and the national significance of the Arecibo Observatory, we recommend you invite the Council to participate in the consultation.

Please include the SHPO project number in any future correspondence. If you have any questions, please contact Berenice Sueiro (bsueiro@prshpo.pr.gov) or Miguel Bonini (mbonini@prshpo.pr.gov) at our Office. You may also contact us by phone at (787) 721-3737.

Sincerely,


FGL Cariangeli León Moraza, Esq.
State Historic Preservation Officer

CLM/BRS/MB

Cuartel de Ballajá (Tercer Piso),
Calle Nurzagaray, Esquina Beneficencia, Viejo San Juan, P.R. 00901

PO Box 9023935, San Juan, P.R. 00902-3935
Tel: 787-721-3737 Fax: 787-721-3773
www.oech.gobierno.pr



OFICINA ESTATAL DE
CONSERVACIÓN HISTÓRICA
OFICINA DEL GOBERNADOR
STATE HISTORIC
PRESERVATION OFFICE
OFFICE OF THE GOVERNOR

From: Joseph Kania <jkania@alumni.cmu.edu>
Sent: Monday, December 12, 2016 11:53 PM
To: Envcomp-AST@nsf.gov; achp@achp.gov; joseph@jwkania.com
Subject: Arecibo Observatory

Dear National Science Foundation:

I would like to voice my support for continued National Science Foundation operation and funding for the National Astronomy and Ionosphere Center.

I was a summer student at Arecibo Observatory, funded by the NSF's Research Experiences for Undergraduates program. As a student at Arecibo I was able to participate in radio astronomy research that was beyond what I would have been able to do at my home institution. The REU funding allowed me to immerse myself in my research project without having to divert time to help teach classes. I found that working at an observatory to be a valuable and interesting experience. Living at the observatory allowed me to better know the instrument my data came from, learn how the telescope is operated, and see the work on future improvements. The people that I met while at Arecibo have been invaluable for my personal and professional development. The skills that I learned at Arecibo served me well as a summer student at the Joint Institute for VLBI-ERIC, and I suspect they will continue to do so as I continue my studies in graduate school. Puerto Rico provided a rich historical and cultural backdrop in which to work.

Continued NSF operation and at least partial funding is needed to continue allow students like myself to gain education and experience in Radio Astronomy. After I finish my education I hope to use the William E. Gordon Telescope's data products.

Best Regards,
Joseph W. Kania

--

jkania@alumni.cmu.edu



We are writing on behalf of the North American Nanohertz Observatory for Gravitational waves (NANOGrav), to comment on the current draft of the EIS for the Arecibo Observatory. The NANOGrav collaboration is composed of over 100 students and scientists from 15 institutions in the US and Canada. The US portion of NANOGrav is largely funded by the National Science Foundation's NANOGrav Physics Frontiers Center.

In our response to the scoping notice dated June 23rd 2016 we requested that certain issues related to human and cultural environment be addressed in the EIS. Section 3.2 defines the region of influence (ROI) for cultural impacts as the property boundary of the observatory, and section 3.9 defines the ROI for population, housing, employment, economy, and income as the municipality of Arecibo. However, the human and cultural environment of the Arecibo Observatory goes well beyond the ROI considered in the report. Members of NANOGrav and the larger scientific user community depend on Arecibo for their research careers. Any scenario that reduces the amount of time available for scientific research negatively impacts the income and employment of this user group and that should be reflected and discussed quantitatively in the final EIS for all scenarios considered.

Early-career scientists are especially impacted. As we wrote in our previous correspondence, over the past decade NANOGrav has involved a diverse group of hundreds of US high school and undergraduate students in Arecibo observations of pulsars and gravitational wave astronomy. These students are from institutions in Maryland, Michigan, Montana, New York, Ohio, Pennsylvania, Texas, Vermont, Virginia, Washington, West Virginia, and Wisconsin. Arecibo has played a particularly inspiring role in training our Hispanic students for whom Arecibo is a source of cultural pride. The excitement of our students in personally operating Arecibo has propelled many of them into careers in physics, astronomy, engineering, and other STEM fields. The effects of reducing or eliminating science-focused operations on this demographic is not accounted for in the EIS. We request that the final EIS address these points for all scenarios considered.

Sections 3.9.3 and 4.9 of the EIS draft reference students and researchers at colleges and universities when assessing educational impacts. However, the report makes erroneous assumptions about how these individuals would be affected under scenario 1. It is assumed there would be no impact under scenario 1—this is incorrect. Partnerships will reduce the time available for open-skies science and possibly even contracted time for science. This scenario will result in reduced access

to Arecibo for researchers at non-partner institutions, and will tend to decrease the total number of students and researchers who are able to use the telescope. We request that the final EIS address this point.

We request that the final EIS consider "broader impacts" as defined by the NSF as a separate area of study. NSF defines broader impacts as those that

- advance discovery while promoting teaching, training, and learning,
- broaden participation of under-represented groups
- enhance infrastructure for research and education
- broaden dissemination to enhance scientific and technological understanding
- benefit society.

NSF rightly considers broader impacts when evaluating the merit of proposals that it receives and funds, and it is appropriate that the EIS do the same. The Arecibo REU program and the hands-on training that many students have received over the years, and can continue to receive so long as Arecibo has a healthy scientific program, is a testament to its impact on teaching, training, and learning. Arecibo has a long tradition of serving groups underrepresented in the sciences, especially Hispanic students in Puerto Rico and beyond. For example, the Arecibo Remote Command Center (ARCC) is a program started at the University of Texas Brownsville (now UT Rio Grande Valley) that gives undergraduate students the opportunity to control Arecibo during pulsar observing. ARCC has expanded to a wide range of radio astronomy activities and in doing so has become an extremely successful avenue for Hispanic students to enter graduate school in STEM fields. ARCC has expanded to colleges and universities across the US and involves a large fraction of young women. As already detailed in the DEIS, Arecibo also contributes enormously to the scientific education of youth across Puerto Rico. We understand that some of these programs are considered in the DEIS but they are not discussed within the specific scope of NSF's broader impacts criteria.

Finally, the report states that NSF prefers to find partners for continued science-focused operations of Arecibo. However, all of the scenarios studied in detail in the DEIS involve the deconstruction of some buildings on the site. These include critical infrastructure for operating the S-Band radar system, administrative and office space for observatory staff, and quarters for visiting scientists. No justification is given for deconstructing these particular facilities, but they are important to a viable continued operation of the observatory, and to finding new partners. The S-Band radar system in particular may be one of the most attractive elements for potential partners, and losing this infrastructure would cripple our ability to track near earth objects. The impact resulting from such a loss could be disastrous. The administrative building, where observatory staff work, also appears to be considered for deconstruction and the impact seems to not be explored in the DEIS. We request that the final EIS 1) justify which, if any, buildings are to be deconstructed under all scenarios, and 2) fully accounts for the impacts that any building deconstruction would have on the operational capabilities of the observatory.

If you have any questions or would like to reply please contact the NANOGrav Management Team (nano-mt@nanograv.org).

James Cordes, Cornell
Paul Demorest, NRAO
Ryan Lynch, NRAO
Maura McLaughlin, WVU
Scott Ransom, NRAO
Xavier Siemens, UWM
Ingrid Stairs, UBC

From: Tyler Cohen <tcohen@gemini.edu>
Sent: Tuesday, December 13, 2016 12:07 AM
To: Envcomp-AST@nsf.gov
Subject: Arecibo Observatory

Dear Ms. Pentecost,

My name is Tyler Cohen and I am writing to you regarding the recent NSF Environmental Impact Statement and ongoing efforts to divest Arecibo Observatory. I am currently working as a Research Intern at Gemini Observatory in Hilo, HI studying galaxy evolution. The opinions expressed herein do not necessarily reflect those of my employer.

Arecibo Observatory has had a profound personal impact on my career and my education. In the Summer of 2015, while studying physics and astronomy at Stony Brook University, I was awarded an REU at Arecibo Observatory. I am grateful to the NSF for giving me this opportunity. For ten weeks I worked under the mentorship of Chris Salter and Tapasi Ghosh searching for and studying Fast Radio Bursts (FRBs). FRBs are highly energetic, short duration pulses of radiation of unknown extragalactic origin. Though their progenitor is unknown, research has suggested that they may be associated with Gamma Ray Bursts (DeLaunay et al. 2016), the most energetic radiating events in the universe. Only eighteen FRBs have ever been observed, one of which was discovered by Arecibo in 2012 (Spitler et al. 2014). FRBs are particularly enigmatic because until this year, they had been observed as non-repeating events. Spitler et al. 2016 discovered 10 repeating bursts from FRB 121102, suggesting a possible neutron star progenitor. All of these discoveries were made using Arecibo's L-Band Feed Array (ALFA), which offers superior L-Band sensitivity and sky coverage. The continued operation of Arecibo Observatory is essential to the study of FRBs, which allow astronomers to probe extreme cosmic environments.

My own research at Arecibo entailed searching through massive records of ALFA data in search of an FRB signal and developing software to automate this search. My REU at Arecibo Observatory was a formative experience and inspired me to pursue a PhD in astrophysics. I will be enrolling in New Mexico Tech for graduate school in the Fall of 2017 where I hope to continue studying FRBs and other high-energy radio phenomena. The continued operation of Arecibo Observatory is vital to my career goals. I can say with confidence that without the REU experience at Arecibo, I would not have been hired by AURA at Gemini Observatory.

I have read the relevant sections of the EIS and I understand the NSF's desire to maintain a balanced research portfolio under a constrained budget. However, I believe the NSF has undervalued the Observatory's contribution to the scientific community and to STEM education in the US and Puerto Rico. Under the preferred Alternative 1 both the Administration building, which contains the offices of all of the scientific research staff, and the Scientific Offices Trailer, which typically functions as an office for REU students, would be deconstructed. As I witnessed during the Summer of 2015, these offices are already quite consolidated and I do not see how they could be consolidated further without significantly affecting the ability of students and research staff to work effectively.

The scientific contribution of Arecibo Observatory has been, and continues to be tremendous. Additionally, the opportunity for students from around the US to study at this world-class institution serves as motivation for students in STEM to pursue higher education and careers in the physical sciences. I hope the NSF will take my comments into consideration and continue to fund science operations at Arecibo Observatory.

Kind regards,

Tyler Cohen
Research Intern
Gemini Observatory
Office: (808)-974-2551
Cell: (914) 299-8953

From: Anne Virkki <annevirk@gmail.com>
Sent: Monday, December 12, 2016 9:10 PM
To: envcomp-AST@nsf.gov
Subject: Arecibo Observatory

I wish to express a few comments concerning the draft Environmental Impact Statement (DEIS) for the Arecibo Observatory. Each comment is listed under the subtitle that the comment refers to in the executive summary but should be equally treated/corrected throughout the DEIS. All comments are fully personal opinions.

ES.2 Purpose and Need

The DEIS justifies the divestment need from Arecibo with the following citation from the AST Portfolio Review Committee (PRC):

“With respect to the Arecibo Observatory, the PRC Report recommended that “AST should reevaluate its participation in Arecibo and SOAR later in the decade in light of the science opportunities and budget forecasts at that time” (NSF, 2012)”

and the Senior Review Committee Report:

“The Senior Review Committee Report also noted that “If Arecibo is kept operating beyond 2011, it is expected that this will only be a limited-term extension, pending the deliberations of the next decadal survey” (NSF, 2006).”

Using this recommendation of the PRC solely is grossly misleading. This recommendation does not reflect the general message of the PRC for Arecibo, which in reality does strongly support continued investment on Arecibo:

“The Arecibo capability is unique and is supported in all scenarios.”

“AST divestment from Arecibo might also cripple the radar characterization of small bodies in the Solar System, which was one of the most highly ranked V&V priorities for ground-based observations for the next decade.”

“AST must carefully consider its current portfolio in light of NWNH and V&V priorities and the anticipated budgets.”

The budgetary forecasts are mentioned and it is correct that larger fraction of the AST budget should be allocated to the individual grants instead of facilities. However, the \$4M budget of Arecibo Observatory has nothing to do with the over \$20M overspending on other facilities as compared to the PRC recommendations. Twisting this truth is not only disrespectful to the PRC and therefore to the whole scientific community but also violates the responsibility of NSF/AST for transparency in the decision-making processes.

The Senior Review Committee Report recommends the search for new partnerships, which were found (through NASA collaboration) but not mentioned in the DEIS after using the citation as part of justification. Further, the report only hands the decision power for the next decadal survey, which currently refers to the PRC.

“The continued need for the NSF to respond to the PRC Report was reinforced in the annual report of the Congressionally chartered Astronomy and Astrophysics Advisory Committee (AAAC) in March 2016, which recommended that “[s]trong efforts by NSF for facility divestment should continue as fast as is possible” (NSF, 2016b). More recently, in August 2016, the National Academies of Sciences, Engineering, and Medicine (NAS) mid-decadal report, *New Worlds, New Horizons, A Midterm Assessment*, recommended: “The National Science Foundation (NSF) should proceed with divestment from ground-based facilities which have a lower scientific impact, implementing the recommendations of EXECUTIVE SUMMARY ES-3 the NSF Portfolio Review, that is essential to sustaining the scientific vitality of the U.S. ground-based astronomy program as new facilities come into operation” (NAS, 2016).

The scientific community evaluations cited previously indicate that the scientific capability of the Arecibo Observatory is lower in priority than other scientific capabilities the NSF funds. In a funding-constrained environment, NSF needs to maintain a balanced research portfolio with the largest scientific return for the taxpayer dollar. Therefore, the purpose of this Proposed Action is to substantially reduce NSF’s contribution to the funding of the Arecibo Observatory”

These scientific community evaluations do not specifically name Arecibo Observatory, but urge NSF to stronger actions on divesting from the facilities recommended by the PRC, that is, “Mayall, WIYN, and 2.1-meter telescope at Kitt Peak, the Robert C. Byrd Green Bank Telescope, the Very Long Baseline Array, and the McMath-Pierce solar telescope”. For Arecibo, the PRC recommends a new scientific committee evaluation on the scientific impact of the Arecibo Observatory in minimum. No such negative committee evaluation exists. Implying that the listed committees objectively and fully support the divestment from Arecibo and democratically reflect the will of the whole scientific community is, again, grossly misleading.

ES.4 Alternatives under construction

The DEIS describes the Agency-preferred alternative 1 in the following way:

Alternative 1 would involve collaborations with new stakeholder(s) who would use and maintain the Arecibo Observatory for continued science-focused operations. NSF would reduce its funding of the Observatory and the new stakeholder(s) would be responsible for future maintenance and upgrades. Alternative 1 would involve the least change to the current facility and would retain the 305-meter telescope and 12-meter telescope and supporting facilities for research. This proposed Alternative includes deconstruction activities that would remove 26 buildings from the site.”

In essence, NSF states that their preference is to select new stakeholder(s) that would not require any offices or the S-band on site, that is, shut out the collaboration with NASA. At the same time as the deconstruction of half of the buildings is proposed, this alternative is described as the one involving the least changes to the current facility? It should be evident that the least change would follow from the no-action alternative.

In addition, EIS states that

“Operations after deconstruction activities would be comparable to current operations.”

If the offices and the S-band power supply are deconstructed, the idea of the operations continuing comparable to the current operations is ridiculous.

If the alternative 1 intends to cover several possible new collaborations, the different environmental impacts of each that cause any changes to the facility should be clearly distinguished from each other to avoid ambiguity. Again, I remind NSF for their responsibility of transparency and accountability of their decisions and processes. This DEIS does not fulfill that responsibility.

As for the alternative 2, the DEIS states:

“Structures not needed to meet the anticipated operational goals would be safe-abandoned or deconstructed. The majority of residential housing and recreational facilities would not be retained under Alternative 2. Table ES-1 provides a detailed list of the 19 buildings and infrastructure that would remain and the 27 buildings and infrastructure that would be removed, which include the 26 items identified under Alternative 1 plus the operations building.”

“Operations after deconstruction would be comparable to current operations. It is anticipated that a staff comparable in size to current operations would work onsite under Alternative 2.”

However, NSF fails to consider the need of the science staff and instrumentation (including office space) for educational purposes. For example the REU program heavily relies on these assets.

ES.7 Impact Summary

The three points that in my opinion require revising are:

1.

“Negligible, adverse, and long-term impacts to public safety could occur during operations, primarily resulting from the reduced capability to observe potentially hazardous nearEarth objects (PHOs).”

The effect of the asteroid research in terms of public safety is treated in the DEIS (section 4.7.1.1.) in large part with misleading, naïve arguments. The Arecibo Observatory planetary radar system is a necessary asset for national and international security, both for tracking and the physical characterization of potentially hazardous objects and for validating impact mitigation technologies. The AST Portfolio review committee strongly encouraged NSF AST to continue to support the Arecibo planetary radar program. Several scientific boards and committees, including the decadal survey “Vision & Voyages for Planetary Science in the Decade 2013-2022,” endorse the capabilities of the Arecibo planetary radar system as unmatched, essential, and unique. Even several national laws, policies, and mandates require the continued operation of the planetary radar at Arecibo Observatory. All this is omitted in the DEIS. Once more, the discussion concerning the planetary radar in the DEIS is grossly misleading, disrespectful for the whole scientific community, and against the national principles on planetary defense.

2.

“Deconstruction activities would result in negligible, adverse, short-term impacts to housing and minor, adverse, short-term impact to education and tourism in the Municipality of Arecibo. There would be negligible, short-term benefits to employment, income, and the economy. There would be no socioeconomic impacts during operations.”

This is untrue. The deconstruction of half of the buildings would inevitably lead to reduction of staff. The staff of the Arecibo Observatory is among the best-paid employees in the municipality of Arecibo. The dismissal would have a significant adverse effect on the tax income of the municipality of Arecibo, and thus, the population that is classified a minority as well as low income. The deconstruction of the buildings could lead to cancellation of the Arecibo Observatory Space Academy program that supports the Puerto Rican to higher education and eventually to better-paid jobs. This could also lead to long-term, adverse effects on the economy.

3.

“Minor, adverse, short-term impacts to traffic and transportation would be expected during deconstruction. No

traffic impacts would be expected during operations.”

This is incorrect in terms of the durability of any roads leading to the Observatory without full reconstruction of the local road network to be used by the deconstruction trucks.

From: Leszek Nowakowski <leszek.nowakowski@upr.edu>
Sent: Monday, December 12, 2016 10:57 PM
To: Envcomp-AST@nsf.gov
Subject: Support for Arecibo Observatory

Dear NSF Team,

The purpose of this letter is to express support for continued NSF investment for science-focused operations of the Arecibo Observatory.

I really have mixed feelings writing this letter, because I'm quite sure that the decision about the fate of the Arecibo Observatory has been already taken a long time ago. Most likely nobody would even bother to read this letter but let's continue anyway.

First - do we really want to believe that such a decision could be made or changed based on some public meetings, where mostly incompetent members of the public would voice their opposition? Or some letters written by a similar group of people? If that is true, people who came up with such an idea should be immediately fired from whatever positions they hold, and should get urgent medical attention. I understand this is the procedure now, but I think such an important decision should be made based on scientific merit. Period.

Second – do we really want to say that what could be discovered about the Universe, or in Physics, or in Mathematics, or any science - has already been discovered and nothing new will come out if we continue? It was a long time ago, but we have already had a similar situation in the history of our civilization and it would be refreshing if we remind ourselves what was the result of this kind of attitude - a long period of stagnation in science, if not worse. Fortunately, there was a wake up and now we are where we are.

Science was always struggling for funds and money was always a problem. Some areas are expensive because of the nature of research; some are expensive because the money is not spent wisely. Astronomy is not the cheapest and not every country is able or willing to invest money into something that will produce mostly publications in return and hardly anything useful for an average person. Discovering helium, or making an atom bomb? Already done. Understanding pulsars, magnetars, black holes, evolution of the Universe with or without dark matter or dark energy? Who cares – what is important is what we have here and now.

First pulsar was discovered by accident in 1967. After many years of intense research, two Nobel prizes, and collecting a mountain of data – we are quite far away from answering even the basic questions about radio pulsars. Let's have a look what some of them are (from the book by D. Lorimer and M. Kramer, published in 2005):

- How many pulsars are in the Galaxy and what is their birth rate?
- How are isolated millisecond pulsars produced?
- How many pulsars are in Globular clusters?
- How many pulsar planetary systems exist?
- Do the magnetic fields of isolated neutron star decay?
- What are the minimum and maximum periods for radio pulsars?
- What is the relationship between core collapse in supernovae and neutron star birth properties?
- How many pulsar-black hole binaries exist?
- Are all magnetized neutron stars radio pulsars?
- How and where is the radio and high-energy emission produced?
- What is the shape and structure of the radio beams?

- What is the role of propagation effects in pulsar magnetospheres?
- What is the composition of neutron star magnetospheres, and how do they interact with the strong magnetic fields?

Astronomy is a lot bigger than just radio pulsars, and played a very important role at every stage of development of our civilization, and that also includes today. List of unanswered questions was always very long and it is not getting shorter, despite all the effort that we used to put into research. How far are we from being able to answer these questions? The US is one of the richest countries in the world and we used to be the leaders in scientific research. And that includes Arecibo Observatory and Green Bank. Arecibo is older than Green Bank but both contribute in a significant way to research that is important to all of us. Closing Arecibo and Green Bank would essentially mean shutting down a big part of Radio Astronomy in the US. And now we decide that that is the end of the story and other countries should take over? In my opinion it is way too early for that, even if we ever think that way.

Looks like finally we have the answer to all possible questions – and the answer is: Who cares?

Leszek A. Nowakowski, Ph.D.
Professor, Dept. of Physics
University of Puerto Rico
Mayaguez, PR 00681

From: anthony.vaneyken@sri.com
Sent: Monday, December 12, 2016 8:50 PM
To: Pentecost, Elizabeth A.; envcomp-AST@nsf.gov
Cc: john.kelly@sri.com; Pesce, Joseph E.; Gaume Jr., Ralph A.; cblanco@nsf.gov; francisco.cordova@sri.com
Subject: Comments on the Draft Environmental Impact Statement for the Arecibo Observatory

Dear Ms. Pentecost,

Assuming that comments delivered verbally, at the two public DEIS meetings in Arecibo and San Juan, have been accurately recorded and entered into the formal record, I wish only to address some general points.

The five scenarios considered in the draft EIS are each so unrealistic as to be valueless. There is little likelihood that any of these scenarios would be implemented in any recognizable form, and the DEIS therefore provides no valid guidance on the future.

At the Public meetings, NSF explained that these were 'worst case' scenarios and had been specified to ensure that all possible responses to the yet-to-be-released solicitation were covered and further stated that this was essential since any successful response to the solicitation would require a matching EIS to support NSF's eventual Decision of Record.

While we are not privy to all the responses that NSF received/accepted, either within the deadline or subsequently, to its Fall 2015 DCL, we do know that the EIS was not asked to consider the option which the current management team has proposed, and reiterated in our DCL response, which includes a variety of upgrades and expansions to Observatory infrastructure and operations.

As described by NSF, should any such proposal be submitted in response to the yet-to-be-released solicitation, it could not be considered without the completion of an additional, appropriate EIS. The management team provided formal, written, input to the EIS scoping process requesting that such options be considered, but NSF chose not to include them, and even stated during this round of meetings that such options had not been considered and that their impact was unknown.

The considered scenarios were specified by NSF apparently in the full knowledge that they did not cover important, realistic, and practical possible outcomes for the future of AO and thereby precluded significant future options.

Option 1, the stated Agency Preferred Option, involves the large-scale destruction of critical elements of the Observatory including essential elements of two of the three major radar systems at the facility – the very things that differentiate Arecibo from its competitors (besides its obvious overwhelming advantage in sensitivity).

Options 2 and 3 involve making the telescope "safe", which is indicated to involve, inter alia, removal of the support cables from the towers. An inevitable consequence is that the platform can no longer be supported (unless the EIS team has been advised to assume the availability of anti-gravity devices – an advice that might be seen to be no less outrageous than the description of the scenarios themselves) and that the dish will be destroyed by activities related to its removal. Removal of the dish, the platform, and the support cables is not just making the telescope safe, it is completely and irrevocably destroying it. The DEIS is disingenuous in suggesting that option 2 (conversion to an educational facility) is viable without the telescope itself and in suggesting that option 3 (mothballing) is in anyway practical; if the telescope is destroyed, there can be no un-mothballing. The impacts of both scenarios are obviously and dramatically different from those described in the DEIS.

Options 4 and 5, partial or total deconstruction, include estimates of times and costs which are dramatically at variance (only 20-25% of previous estimates with no explanations) from those contained in NSF's own previous, very detailed, decommissioning studies. The estimates appear to more closely reflect NSF's requirements than objective reality.

The DEIS is rendered incomplete and insufficient through the omission of important, likely, outcomes, apparently as a result of quixotic definition of the considered scenarios by NSF. Worse, the exclusive consideration of unrealistic scenarios, as well as the lack of any explanation for the dramatically lower costs and time estimates of the destructive activities, serve to significantly reduce the likelihood of any successful outcome for the long-term future of the Observatory.

The DEIS is not fit for purpose. It must be redone to address actual proposed, likely outcomes. Comprehensive Environment Impact Studies on realistic scenarios must be available before any proposals for future AO operations are solicited by NSF.

A realistic and applicable DEIS is still urgently required.

Thanks,

Tony

Anthony P van Eyken
Deputy Director, Center for Geospace Studies
SRI International, Menlo Park CA 94025
650 859 2359

From: patrick.taylor.naic@gmail.com on behalf of Patrick Taylor <ptaylor@naic.edu>
Sent: Monday, December 12, 2016 8:26 PM
To: Envcomp-AST@nsf.gov
Subject: Arecibo draft EIS comments

In the document, the agency-preferred option of collaboration with interested parties for continued science-focused operations includes deconstruction of buildings to “conform to the requirements of future collaborators.” Among these buildings are structures required for the operation of the Arecibo planetary radar system including the S-band High-Voltage Power Supply Building. Removal of this essential piece of hardware would eliminate the planetary radar capability of Arecibo and endanger the partnership with NASA, currently the only major outside financial contributor to Arecibo operations. As written, the document implies that NASA is not seen as a “future collaborator” if structures required for its continued partnership are considered obsolete and slated for demolition. This language and its implication should be amended if partnership with NASA and the continuation of the Arecibo planetary radar are part of the agency-preferred future of Arecibo Observatory.

Beyond the S-band High-Voltage Power Supply Building, the agency-preferred option suggests deconstruction of the Administration Building, which houses the offices of the scientific staff. Planetary radar cannot be done remotely and requires staff on site to operate the transmitter and collect the data. Again, this will greatly hamper the ability of the Arecibo planetary radar to continue and should be amended in the document. Other buildings used for storage, including the Warehouse Building, and used by the maintenance staff are suggested for deconstruction, which would hamper the ability of the observatory to continue science-focused operations. These recommendations should be corrected to allow for science-focused operations if this is truly the agency-preferred alternative.

In Section 4.7.1.1, the document notes that Arecibo can only see roughly 30% of the sky. However, this limitation does not mean a minority of asteroids is visible from Arecibo. On the contrary, because asteroids are moving targets, they move in and out of Arecibo’s field of view as they pass by Earth. In fact, an internal NASA study led by Dr. Jon D. Giorgini of the Jet Propulsion Laboratory submitted as a white paper to the Vision and Voyages planetary science decadal survey found that Arecibo could detect more than 80% of potentially hazardous asteroids before they impact Earth. The draft EIS document’s implication that Arecibo is inefficient at detecting asteroids is false. The natural motion of asteroids combined with the unmatched sensitivity of the planetary radar system allows Arecibo to characterize dozens of potentially hazardous asteroids per year and dozens more that could cause destructive airbursts if they were to collide with Earth, *e.g.*, the airburst over Chelyabinsk, Russia in 2013 that caused nearly 1500 injuries and damaged thousands of buildings. Removing the Arecibo planetary radar capability, leaving only the Goldstone Solar System Radar, would reduce the number of radar detected and characterized asteroids to roughly 30% of its current value. No facility can replace Arecibo in this respect.

Though mature impact mitigation technologies have not yet been demonstrated (the accuracy of the Arecibo planetary radar system will be vital for validating these technological demonstrations), this does not preclude

identifying potential impact hazards, determining when and where they will impact, and characterizing their physical properties prior to impact, for all of which radar is a uniquely powerful technique. On the national level, NASA and the Federal Emergency Management Agency regularly play out mock impact scenarios and work to optimize disaster response, most recently on October 25 of this year: <http://www.jpl.nasa.gov/news/news.php?feature=6669> . On the international level, the Space Missions Planning Advisory Group, Impact Disaster Planning Advisory Group, and the International Asteroid Warning Network, all sanctioned by the United Nations, consider such impact scenarios and are working to determine the appropriate response to an imminent threat. The risk to public safety from an asteroid impact is taken very seriously on a national and international level, while it is dismissed as “negligible” in this document. The fact that an impact cannot necessarily be prevented does not mean we should not do our best to determine as much as possible about the asteroid prior to an imminent impact to properly protect the safety of the public.

The document concentrates unnecessarily on an imminent, inevitable impact threat. Part of the Arecibo planetary radar system’s power is to extend predictions of an asteroid’s location decades or centuries into the future to determine potential long-term hazards to Earth such that there is ample time to plan necessary impact mitigation strategies (see the cases of asteroids 99942 Apophis and 101955 Benu). The comparison of predicted impact frequencies to the lifetime of the observatory is irrelevant and misleading and should be removed.

Patrick A. Taylor
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From: Raul Rios <raulrios@alum.mit.edu>
Sent: Monday, December 12, 2016 4:48 PM
To: Envcomp-AST@nsf.gov; achp@achp.gov
Subject: Save Arecibo Observatory!

Hello!

My name is Raul and I am writing to express my concern for the future of the Arecibo Observatory in the hopes that you will reconsider your funding distribution and help save this wonderful installation. I must admit that I have not seen the observatory in person or done any work there, but I had the privilege to learn about the Arecibo Observatory from a coworker who interned there in 2014. The enthusiasm she has regarding her experience at the observatory manifests itself in her eagerness to speak about her work and the sheer awe that descriptions of the site inspires. After several engaging discussions and even listening to a formal presentation about the important science being done at Arecibo, I must say I am dismayed to hear there is a chance it may be shut down.

The Arecibo Observatory provides an immeasurable opportunity for undergraduate students in furthering their research and career, allowing them to work with leading scientists at a location that hosts the largest single dish telescope, a unique environment that cannot be found elsewhere in the world. In addition to the educational opportunities, Arecibo Observatory also contributes greatly to three different areas of research: ionosphere research, radio astronomy research, and asteroid research. During my coworker's internship, the observatory detected pulsar stars for the very first time, an invaluable contribution to the scientific community. Furthermore, countless countries have used this single dish telescope; have come specifically to Arecibo Observatory to make use of its unique, one of a kind environment. Closing the observatory will be a terrible loss to the community at large. Please reconsider and help save Arecibo Observatory.

Thank you,
Raul Rios

Arecibo Science Advocacy Partnership



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NM Tech

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To: NSF Astronomical Sciences (AST) envcomp-AST@nsf.gov
Attn: Ms. Elizabeth Pentecost

From: Arecibo Science Advocacy Partnership (ASAP)

Re: Objections/Questions regarding the Draft Arecibo EIS

Date: 12th December 2016

We are writing to address concerns regarding the draft Arecibo Observatory (AO) Environmental Impact Statement (EIS), considering three categories: socioeconomic and educational impacts, physical Earth environmental impacts, and impact on larger US scientific infrastructure network. Below, we address these three categories, with parenthetical references to their relevant EIS sections.

In addition, we share an over-arching question, given these concerns: Why was the no-action alternative (ES 4.6) not considered? How can this not be preferred from the point of view of minimizing environmental impact since other alternatives all come with negatives and few, if any, positives?

Socioeconomic and Educational Impacts:

- Broader impacts on education and other socioeconomic factors are highly understated in draft EIS, and neglect under-served communities on and off Puerto Rico that use the facility and are educated there.
- Arecibo does excellent science and educational development in the United States, directly benefiting a large Hispanic population both in PR and in the continental US.
- Impacts on students, postdocs, and young scientists (as well as more established scientists) in the rest of the US were not adequately addressed. Local socioeconomic impacts were considered, but not the impacts on the global community of astronomers and physicists that use AO. Changes in operation will have major adverse effects on users spread across the United States, many of whom are students and early career scientists

who rely on AO for their scientific careers.

- Many AO users and students trained at the facility are members of URMs and/or study at MSIs, and the role of AO as a Hispanic-serving educational institution is completely neglected in the draft EIS.

Environmental Impact:

ES 4.6 (no-action alternative) seems to have the lowest environmental impact, yet seems not to be under serious consideration.

- The Arecibo planetary radar is the most sensitive and accurate instrument for assessing impact hazards: ignorance regarding the orbits of potentially hazardous asteroids represent a primary human environmental safety concern, as evidenced by a US congressional mandate, and this is grossly under-stated in the draft EIS.
- The environment under the AO dish is unique (as addressed in 3.1.1 regarding endangered, threatened, or vulnerable plant species) and deserves its own studies. It is different and distinct from that assessed in the Rio Abajo Commonwealth Forest ecosystem report. Though the draft states “The karst forest region harbors the richest biodiversity in Puerto Rico and includes more than 1,300 species of plants and animals,” most of the environmental impact (3.1.1) is assessed via the Rio Abajo Commonwealth Forest ecosystem report, which is ten years old.
- Revegetation is addressed in the draft, but not potential conflicts between existing native species that have adapted to the environment under the dish, and reintroduced species (ES 4.4)
- The draft EIS fails to address the secondary environmental effects of the deconstruction process itself, with heavy truck traffic on narrow local roads, and the associated effects on air quality and road maintenance. (1.6) ES 4.1 should address the impact on public safety of the deconstruction of 26 buildings and the associated removal of heavy materials via small roads. Road bed and road surface testing is needed to see whether the roads can still withstand such heavy loads between site and landfill and whether this meets federal requirements for public safety.
- Similarly, the impacts of the use of hazardous materials (explosives) in deconstruction are not adequately addressed with regard to water and vegetation.

Scientific Infrastructure Impact:

A major oversight in the draft EIS is not addressing the congressional mandate to NASA to characterize hazardous near-Earth objects (NEOs). It is not scientifically justified to use the term negligible in the statement: "Negligible, adverse, and long-term impacts to public safety could occur during operations, primarily resulting from the reduced capability to observe potentially hazardous near-Earth objects (PHOs)."

Section 2.3.1 states "All infrastructure related to the 12-meter and 305-meter telescopes would be maintained," yet this is inconsistent with the targeting of several critical buildings, facilities, and systems for deconstruction. The draft EIS deconstruction plan is a serious mismatch with established scientific priorities of fundamental physics and the NASA NEO mandate.

- NASA is still willing to support the near-Earth asteroid radar program as part of its mandate, but the deconstruction list includes the S-band high voltage power supply which means that the radar system would be inoperable. It also demolishes the Administration building which houses all the scientific staff and library. How can AO find partners for operation when this crucial capability is slated for removal? Where will staff work if the Administration building is removed?
- The draft places AO among "facilities which have a lower scientific impact," though NSF reviews provide a conflicting picture of the impact on/of AO without explicitly evaluating this claim. Specifically, the 2012 Astronomical Sciences Portfolio Review prioritized Arecibo (Recommendation 10.3): Our recommended portfolio includes ALMA, ATST, VLA, Gemini, Blanco, DST, Arecibo, NISP, and SOAR."
- Gravitational wave science and fundamental physics have been identified as areas of high priority by NSF and the astronomy and physics communities, and AO makes critical contributions in these areas.
- Potential impacts are not being evaluated in the larger context of the potential for NSF to alter operations at its other large single dish radio observatory — the Green Bank Telescope. Because AO and GBT are used in a complimentary fashion by a similar user community for high-impact science, changes in operation of one affect the other. These changes cannot be evaluated in isolation.

From: francisco.cordova@sri.com
Sent: Monday, December 12, 2016 7:24 PM
To: envcomp-AST@nsf.gov; Pentecost, Elizabeth A.
Cc: john.kelly@sri.com; anthony.vaneyken@sri.com; Pesce, Joseph E.; Gaume Jr., Ralph A.; cblanco@nsf.gov
Subject: Comments on the Draft Environmental Impact Statement for the Arecibo Observatory

Dear Ms. Pentecost,

The Arecibo Observatory has been a critical scientific site for over 53 years, performing cutting edge research in the areas of radio astronomy, space and atmospheric sciences and planetary sciences. It currently plays a vital role in the study of potentially hazardous asteroids, studying space weather (solar flares) and enabling discoveries that help humanity better understand the Universe. It is also a key facility for science, technology, engineering and mathematics education; hosting over 90,000 visitors every year, the majority of which are minority students local to Puerto Rico.

It has been clearly communicated by NSF that severe internal financial pressure is driving the agency to reduce funding for various large facilities, Arecibo being one of them. While we may disagree on the need to divest in Arecibo based on the uniqueness of the site and the remarkable scientific and educational accomplishments; we have been focused on helping NSF find suitable solutions that will provide long term financial stability for the Arecibo Site and today we reiterate our commitment in providing that support. In the published DEIS, NSF identified "Alternative 1 – Collaboration with Interested Parties for Continued Science-focused Operations" as the Agency-preferred Alternative. The AMT is optimistic about NSF wanting to continue science focused operations at the Arecibo Observatory, however, we are concerned by the details behind NSF's proposed alternative, in particular the deconstruction of over 26 buildings at the site and the implied elimination of the planetary radar and the space and atmospheric science capabilities at Arecibo.

The DEIS states and I quote that Alternative 1, "would meet the purpose and need of reducing the funding required from NSF". However, nowhere in the document has this financial analysis been presented nor has it been clearly communicated why or how the deconstruction of critical elements of the observatory is of financial benefit to NSF. It certainly did not come from the AMT. A rationale for how and why these specific buildings were selected for deconstruction should also be included. A thorough financial analysis outlining the exact maintenance and operational costs for each of the buildings also needs to be performed and included in the document as data.

It is also puzzling, that while NSF wants interested parties to collaborate and financially support the Arecibo Observatory, NSF proposes the elimination of the very elements that differentiate Arecibo from other sites around the World – the Radar and space weather capabilities.

To provide an example: more than 10 million NSF dollars have been spent over the past 10 years in the development and commissioning of a heating facility in support of space and atmospheric sciences. Yet, under the DEIS, NSF recommends its deconstruction. The heating facility was explicitly requested by the scientific community, has potential to become revenue-generating and just commissioned less than 3 weeks ago.

Similarly, approximately 1/3 of the current operating budget for Arecibo is provided by NASA, solely for the use of the planetary radar capabilities and the studies of Near Earth Objects. This is another unique equipment which is being deconstructed under alternative 1. The following quote talks about the role of studying NEO'S as a public health resource.

"This improved characterization and tracking has an impact on public safety only if there is a means of deflecting or disrupting objects on a collision course with Earth, which would be completely independent of Arecibo Observatory. The U.S. Government does not currently have such a capability."

This logic is similar to saying that the human race should stop studying the disease of cancer, because we have no way to cure it, that we should stop looking for other galaxies, because we have no way to reach them. It is the very essence or research to dive into the unknown, to accomplish what had never been accomplished before, in order to make our World a better one.

We reiterate our support for all three scientific areas: planetary sciences, radio astronomy and space and atmospheric sciences to continue operations at the site. We believe these capabilities make Arecibo more marketable and better prepared for a future with reduced NSF funding. We will continue to collaborate with NSF as much as possible in an effort to ensure the future of the Arecibo Observatory and to maintain the prestige and recognition this institution has held for over 50 years.

We also request the following:

- A complete archeological site survey be performed as part of the official EIS process. This will ensure no critical historic archaeological artifacts are on the site (or in the general vicinity). No facts or data were provided to specify why this was omitted from the DEIS. Understand this is also a requirement of Section 106 of the National Historic Preservation Act.
- We request a revision to the socioeconomic impact associated with alternatives 2-5 of the DEIS. We believe the number of jobs that would be lost are different than what is presented on the report.
- We request a revision to the socioeconomic impact associated with alternative 1 of the DEIS. As it is currently written, alternative 1 would result in significant reduction in scientific and maintenance staff as the number of staff required only to support radio astronomy observations ONLY, would be dramatically different from the current staff that also support radar and space weather activities.
- A set of site upgrades should also be considered as part of the DEIS process, and not only deconstruction activities. The following are feasible upgrades that have been informally discussed with clients in the past:
 - Expanding the size of the dish to add 30 ft in diameter to increase the effective area of the dish
 - Expansion of at least 75 ft of the north east quadrant of the dish to enable geo belt surveys as well as to observe at the galactic center.
- We request a delay of the EIS process, until the National Academies of Sciences have completed their evaluation of the Portfolio Review. Until then, confirmation of the validity of the portfolio review is still in question, and the recommendations provided in that review should not be implemented or followed.
- We request a revision to the cost estimates associated with the deconstruction of the site to be performed by a different contractor than the one who provided the current set of estimates included in the DEIS. The deconstruction costs are radically different from those that have been presented in the past. We recommend multiple local construction companies familiar with the structure and the terrain to provide input for this.

Comments associated with Section 106 – National Historic Preservation Act

- Pursuant to Section 106 of the historic preservation act, we request that Arecibo be treated as a National Landmark, not just as a district within the national registry, since a submission for the Arecibo site has already been performed in 1989 for its consideration as a national landmark by Harry A. Butminsky of the National Park Services. A separate note to the Advisory Council on Historic Preservation Office of Federal Agency Programs will be sent making this request as well.
- The current mothballing process as it has been detailed in the DEIS does not comply with the State Historic Preservation Office Mothballing guidelines. We request that this section be revised to ensure compliance. After reviewing the guidelines, we believe it to be highly unlikely for the Arecibo Observatory to comply with such guidelines, for which this option should be completely eliminated from the process, and a new DEIS issued taking into consideration only the appropriate viable alternatives.
- In accordance with Section 106, ample notification to the public shall be given to ensure participation in these public meetings/events. As it was noted at the meeting held on Thursday November 17th, 2016, very little

participation from the general public was present, mainly due to the lack of notification provided to the public by NSF. We request that new public meetings be performed with at least 8 weeks' notice to be clearly advertised in both Spanish and English in 3 local newspapers to Puerto Rico (both printed and electronic) as well as 3 national newspapers (both printed and electronic) in the United States. We believe this is critical not only to alert the local residents of Puerto Rico but the broader community in the United States, as the Arecibo Observatory is an international entity. This process should include a clear communication plan that also includes social media and printed media (flyers to be handed out in shopping malls across Puerto Rico). We also request that one of these events should be held on a Saturday or Sunday, to allow working residents of the Island to attend without impacting their current job responsibilities. Note that this also applies to the notifications for the Environmental Impact Statement and NEPA processes.

- Public notification when simultaneously performing the NEPA and Section 106 processes needs to be performed in accordance with Section 106 of the National Historic Preservation Act. We are not aware that public notification stating the combination of these 2 processes has been performed, thus violating Section 106 of the National Historic Preservation Act.
- Impact Boundaries of the Arecibo Observatory have not been clearly defined within the Section 106 process. We believe, that as an international research facility, these impact boundaries need to be extended at least to include the entire the Continental U.S.
- In accordance with Section 110 of the National Historic Preservation Act we request NSF to provide the preservation program for the Arecibo Observatory before continuing with either the EIS process under NEPA or any process associated with Section 106 or 110 of the National Historic Preservation Act. This program should be approved by SHPO and reviewed by the consulting parties before continuing with the Section 106 or Section 110 processes.
 - Section 110(a)(2) requires that agency preservation programs be established "in consultation with the Secretary." Federal agencies seeking such consultation should contact the Associate Director, Cultural Resource Stewardship and Partnerships, National Park Service, Department of the Interior, 1201 Eye St., NW, Washington, D.C. 20005.

We request that based on the volume and impact of these discrepancies/ inconsistencies, the currently published DEIS needs to be rendered inadequate. We request a new DEIS to be completed and published appropriately. We also request a new meeting in accordance with Section 106 of the National Historic Preservation Act.

We also request these procedural tasks to be completed before a new solicitation process is initiated for continued operations of the Arecibo Observatory (this solicitation process was announced in the Dear Colleague Letter issued on September 30, 2016).

Thanks,

Francisco Córdova, MSCE, PE

Director – Arecibo Observatory

National Astronomy and Ionosphere Center

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December 12, 2016

Via Email and U.S. Mail

Envcomp-AST@NSF.gov
National Science Foundation
4201 Wilson Boulevard
Suite 1045
Arlington, VA 22230
ATTN: Ms. Elizabeth Pentecost

Re: Arecibo Observatory

Dear Ms. Pentecost:

On behalf of firm clients with a significant interest in this matter, Baker, Donelson, Bearman, Caldwell & Berkowitz, PC submits the following comments on the Draft Environmental Impact Statement ("DEIS") for the Arecibo Observatory in Arecibo, Puerto Rico (the "Observatory"). The DEIS was prepared by and for the National Science Foundation ("NSF") and published on October 28, 2016. We are pleased to have this opportunity to provide input and discuss certain issues regarding the DEIS by the deadline of December 12, 2016, although a response to our earlier request for an extension of the public comment period would have been preferred for the reasons stated therein.

For purposes of this letter, we will not review all of the identifying information about the Observatory, possible NSF courses of actions considered, many environmental impact areas analyzed, or the extensive governing regulations and policies of NSF and other agencies under the National Environmental Policy Act ("NEPA," 42 U.S.C. § 4321, *et seq.*) as set forth in the DEIS and accompanying materials. Neither will we review many of the dozens of topics and comment areas raised by others, including by multiple Federal and Commonwealth agencies, during the scoping process undertaken by NSF earlier in 2016 and as part of the current DEIS process. Instead this letter will be limited to our clients' most significant concerns about the proposed alternative projects of NSF at the Observatory. We also state our analyses about potential shortcomings in the DEIS that, in the interest of full compliance and fairness to all parties, should be reconsidered by NSF before it finalizes the DEIS. In order to remain concise,

it is assumed that any reader of this letter is already closely familiar with the DEIS, the NEPA process, and the Observatory.

Our areas of comment presented below may be generally organized as follows:

1. Recognized Environmental Conditions
2. Asbestos and Lead-Based Paint
3. Site Demolition and Removal Cost
4. Endangered Species
5. Climate Change
6. Environmental Justice

We would be glad to engage in further discussion with NSF counsel and staff going forward when such opportunity arises. The ultimate conclusions reached by our clients are that:

- A. **The DEIS needs to be reworked, revised, supplemented, and reissued at this time, for the reasons stated herein, before it is finalized.**
- B. **Under any analysis, NSF should only pursue either the No-Action Alternative 6, while securing additional funding for itself, or the chosen Alternative 1 with continued science operation and new partners and funding.**

1. Recognized Environmental Conditions ("REC's")

A key component of NSF's analyses and conclusions in the DEIS is an Environmental Baseline Study ("EBS") prepared by CH2M and dated December 2015. The EBS was performed following the model and requirements of a Phase I Environmental Site Assessment using the definitive ASTM Standard E 1527-13. The EBS presents valuable information about the Observatory property and its many structures, functions, history, campus, surrounding area, and environmental risks. Included are references to a number of prior environmental studies done at this site over the years and several cleanup activities undertaken there, such as removal of a solid waste debris pile (2007, with soil testing), dry wells closure (2005 and 2007, with soil testing), and removal of three petroleum underground storage tanks (2011, with testing). The EBS concludes that there are no REC's found at the Observatory as of 2015 despite historical and current factors noted including de minimis oil staining on the warehouse floor and parking areas.

While there is an element of judgment exercised by Environmental Professionals ("EP's") when undertaking such site assessments, we believe that the "no-REC's" conclusion is incorrect in this situation. This is because CH2M also describes two areas of concern and suspect conditions on the property as follows (from the EBS Executive Summary/Conclusions):

"A 55-gallon capacity oil-water separator is associated with the tank farm [above-ground petroleum storage] containment area. Stormwater that collects within the containment area is pumped to the oil-water separator and then discharges to the ground surface. Inspection/maintenance records of the oil-water separator were not available. With the oil-water separator being 50 years old, a possibility exists that it may have failed and impacted surrounding soils."

"The septic and leach field system serving the maintenance area has the potential for concern. No maintenance records were available and the system has served facilities where hazardous and petroleum products have been stored and used for over 50 years. No visual evidence of contamination was observed during the site reconnaissance."

The referenced oil-water separator's location, function, age, and lack of associated environmental data should lead a careful EP to conclude that this feature is a REC meriting further investigation. Also, even if groundwater at the Observatory is very deep, the prevalence of karst geologic formations, sinkholes, and steep slopes there leads to risk that any resulting contamination may impact groundwater resources and not just present a case of simple impacted soil removal.

Some of the 13 septic tanks located around the Observatory campus were previously found to be unpermitted and subsequently permitted with the appropriate local governmental agency. Like the separator, however, the existence of septic tanks and a leach field system serving buildings and areas used for maintenance and for storage and handling of petroleum products, wastes, and hazardous chemicals for 50 years should be an automatic REC "red flag." This is more than a case of only domestic sewage waste finding its way underground. Instead this situation would lead most, if not all, EP's to conclude that a REC exists and that further investigation is warranted and necessary.

The DEIS states that as a mitigation measure for potential hazards, full site characterization and remediation of contamination will be completed prior to deconstruction activities. (Section ES.6). Regardless of which NSF project alternative is favored in the DEIS, however, even continued full operation of the Observatory requires that such basic delineation of site environmental conditions be completed now. This is necessary for the sake of Observatory workers and visitors as well as for potential new operating partners and the surrounding natural environment. Checking the potential impact of these REC's should not just be pushed ahead and left for future action by NSF or possible new investors or other parties. Instead it should be addressed now in the DEIS in accordance with best approaches under NEPA and principles of "All Applicable Inquiry."

As stated in the EBS, a REC under ASTM Standard E 1527-13 is defined and can be described as "the presence or likely presence of a hazardous substance or petroleum product on the property under conditions that indicate an existing release, a past release, or material threat of a release of hazardous substances or petroleum products into the structures of the property or into the ground, groundwater, or surface water of the property. The term includes hazardous substances or petroleum products even under conditions in compliance with applicable laws. The term is not intended to include de minimis conditions that generally do not present a material risk of harm to public health or the environment and that generally would not be subject to enforcement action if brought to the attention of the appropriate government agencies." Another ASTM standard for assessing federal property, D6008-96(14), notes that for an EBS in "certain cases, additional data, including sampling and analysis, may be needed in the EBS to support the classification of the property...."

NEPA regulations state that an EIS should focus on significant issues for a project and site and not on every possible environmental topic. See 40 CFR § 1500.1. Clearly the aged waste-receiving septic tanks and system at the Observatory maintenance area and the ancient fuel tank farm oil-water separator are REC's requiring further action now and not later. They are "significant" for purposes of the DEIS. Disposal practices at a facility such as this in the years before modern environmental rules, sensibilities, and training make contaminant releases into the septic system likely to have taken place over time. A Phase II investigation may also implicate notification requirements, and this should be determined at this time. Thus, we recommend that, prior to finalizing the DEIS:

- A. NSF cause CH2M to update and revise the EBS not only to make it more current, but also to reach a more accurate "REC's-found" conclusion; this work should appear in a new DEIS.**
- B. NSF cause CH2M to carry out a Phase II Environmental Site Assessment, with that investigation to include soil and groundwater sampling and possibly soil gas/vapor intrusion testing, at both of these REC locations.**
- C. Depending upon the results of the Phase II work, regardless of the differences among future alternatives considered, NSF should carry out necessary environmental response actions now; these steps could include removal and/or replacement of failed equipment, treatment or removal of impacted soil as needed from these locations, and other appropriate measures.**
- D. NSF use these actions and additional environmental information to strengthen and complete the EIS and resulting**

Record of Decision ("ROD") on which later NSF decision-making will be based.

2. Asbestos and Lead-Based Paint

Many of the buildings and structures that make up the Observatory are of an age and construction that make them rife with asbestos-containing materials ("ACM") and other hazardous components. The EBS refers to a 2005 site study by a contractor that found ACM in buildings 1, 2, 3, 4, 6, and 17, and another 2007 study that found lead-based paint ("LBP") in many of the same and additional buildings and structures. Further details about ACM and LBP locations and descriptions appear in the EBS and DEIS. No records indicate any ACM or LBP abatement done in the past at the Observatory other than some area re-paintings. Also there appears to be no discussion in the DEIS of any ACM Operation and Maintenance ("O&M") plans existing there now to manage asbestos in place and protect human health from exposure to friable asbestos fibers. An O&M plan is required even when the law does not mandate removal of ACM from occupied structures.

Every project alternative for the Observatory studied by NSF in the DEIS involves significant destruction and demolition of buildings, except for the No-Action option and to some degree the Alternative 3 Mothballing. In each case the DEIS notes that updated and specific ACM surveys must be done before deconstruction occurs at any building under any option selected. For ACM found and to be disturbed, abatement must be accomplished first in order to protect health and the environment and to comply with applicable laws and rules of the Environmental Protection Agency ("EPA"), the Occupational Safety and Health Administration ("OSHA"), and their Puerto Rican counterparts. See, e.g., 29 CFR § 1926.62. However, even for buildings that would remain on-site under mothballed conditions or in continued use under the 1, 2, and No-Action Alternatives, information is still needed as to current ACM and LBP conditions and ongoing potential exposures or releases. Thus, determination of friable material locations/deterioration/repairs/management should receive more attention in the impact assessment process now. Finally, disposal of ACM and LBP wastes is discussed in the DEIS by simply noting that Ponce Landfill - operated by Republic Services and located some 39 miles by road route from the Observatory - has the capacity to take all of the potential ACM/LBP waste generated by any alternative of this project. That permitted landfill is authorized to accept such special waste in addition to ordinary debris and solid waste, but the DEIS does not mention what waste analysis is required for disposal.

Section 4.6 of the DEIS then presents estimates, based on those prior studies, of quantities of ACM and LBP waste to be generated by deconstruction under each of the analyzed alternatives. For example, metric tons of ACM abatement waste are thought to range from 0 under the Mothballing and No-Actions plans up to 260 for Alternatives 4 and 5 involving partial or complete destruction. Similarly, LBP waste produced could vary from 0 to 80 metric tons under these alternatives.

We believe, however, that the prior surveys were insufficient and incomplete and that true costs, amounts, and potential impacts from ACM and LBP at this facility should be adequately addressed in the DEIS now and not saved for later determination. As with certain other points, for the moment NSF postpones or "kicks down the road" the full investigation and delineation of ACM conditions until after the EIS process is completed and choices are made. Could the ACM work needed here be vastly more burdensome and costly than seems to be estimated now? Potential associated risks are also ignored or given short shrift in the DEIS when it comes to NSF's likely creation of huge quantities of construction and demolition waste, to include ACM and LBP, which are slated for off-site disposal. Such additional questions, beyond just managing expected short-term heavy truck traffic, include: are there ACM exposure risks to residents and others along the expected route of waste truck traffic from the Observatory to Ponce Landfill? Does Ponce Landfill require waste characterization first, and how may that change any work time estimates stated in the DEIS? What are the true expected costs attributable to ACM assessment and abatement to be incurred under all of the Alternatives for this project? What ACM exposure conditions do current and future workers at the Observatory face under the alternatives that allow for continued facility operation, including any friable ACM conditions seen now at specific locations and the existence and implementation (or not) of required O&M plans on-site? Asbestos being a defined "hazardous substance" under the federal Superfund law, 42 U.S.C. § 9601 et seq., what risks are posed to NSF (or a future partner) from becoming the "arranger for disposal" of large quantities of ACM to Ponce Landfill should that facility suffer releases and become a Superfund site - with NSF as one of the no-fault "potentially responsible parties" perhaps jointly and severally liable for the entire site? What potential on-site releases of ACM and LBP may still occur in the future into the water and soil of the Observatory itself from the Mothballing/minimum maintenance alternative? One need only look to military base closings to realize the need for additional consideration now, up front in the DEIS, for many of these potential ACM-related risks, costs, and impacts. Thus, we recommend that, prior to finalizing the DEIS:

- A. NSF cause CH2M or another qualified contractor to perform an updated thorough asbestos assessment and survey now of all buildings at the Observatory, whether they may remain or may be removed later, with no gaps for inaccessible units; this would include a discussion of current potential human exposure conditions and protective measures that are regularly taken, if any; this work should appear in a new draft DEIS.
- B. NSF prepare revised estimates of quantities and costs attributable to ACM presence and abatement under the Alternatives considered, create and implement any missing current O&M plans, and address the environmental risk from leaving ACM and LBP in place throughout much of the facility under minimal maintenance in the Mothballing scenario.

- C. **NSF prepare an analysis of Superfund liability risk to itself and others resulting from all of the scenarios that involve any deconstruction and off-site ACM waste disposal, including the status, history, and financial assurance situation at Ponce Landfill.**

3. Site Demolition and Removal Cost

Closing the Observatory would be a devastating blow to the people of Arecibo and of Puerto Rico as a whole, as well as to scientific communities and interests in many places around the world. These points are detailed in numerous comments submitted before and during this DEIS process. The various project alternatives will also have other environmental impacts such as those analyzed in the DEIS and beyond. But the full deconstruction and site restoration alternative could also have a major effect on the NSF budget as we believe that the total cost thereof stated in the DEIS at Section 49 and elsewhere has been badly underestimated. Certain associated time estimates, such as for revegetation of the entire site after deconstruction, also appear to be inaccurate as now stated in the DEIS. While neither partial nor complete deconstruction is a favored or chosen alternative of NSF under the DEIS, it is still important for the DEIS to be accurate when looking toward both its finalization and the important decisions to be made thereafter by NSF based on this document.

We will not recount all of the steps and components for planning and field work and their aftermath under the deconstruction alternatives considered. However, the total cost that the DEIS presents for the Complete Destruction and Site Restoration Alternative appears to be \$18.7 million. A footnote records how this number assumes the use of explosives for demolition of the towers and rim wall during the removal of all improvements, and other methods would be substantially greater in cost. However, even with explosives use, the deconstruction cost is likely to be much greater than estimated in the DEIS. This view and our concern are based upon the existence of a prior Decommissioning Study undertaken for NSF by ECCI, dated January 2008 (not just the EBS done by ECCI in 2008). In that report the near-complete or complete demolition options detailed were estimated to cost \$79 million to \$89 million projected ahead to 2012. Those totals would now be even greater for 2017 and beyond. The alternative at that time, when use of explosives was included, produced a reduced cost estimate of approximately \$21 million looking ahead to 2012. That option also excluded the rim wall and supports, which are included now in the DEIS as perhaps the only structures on which explosives will be used. While the new DEIS cost estimates may seek to update the earlier study, it seems clear that the current 2017 removal project option should cost far greater than \$18.7 million.

We believe that NSF did not sufficiently consider the existence, content, and conclusions of this prior work when analyzing the cost of full Observatory demolition and removal in the DEIS. More accurate discussion and quantification need to be added to the DEIS on this topic at this time to further support the conclusions reached, choices considered, and actions to be taken. Thus, we recommend that, prior to finalizing the DEIS:

- A. **NSF revisit the demolition/removal/restoration cost estimation process and result, including reference to and consideration of the prior Decommissioning Study and any other essential or relevant current information and past data; this work should appear in a new DEIS.**
- B. **NSF should revise and update all such cost references to better support the alternatives that do not call for major or complete deconstruction, and to further disfavor those that do.**

4. Endangered Species

The DEIS contains information about federally listed endangered and threatened species that are possibly found in the area of the Observatory. Several confirmed species of interest present - including the local boa snake, the nests of several hawk species, and possibly certain ferns living in the shade of the radio dish - are discussed, and limited practices and mitigation plans are set out for addressing possible impacts to them from the alternatives studied. At points throughout the DEIS, NSF states that it is consulting with, continues to consult with, or plans in the future to consult with the United States Fish & Wildlife Service ("FWS") on species and impact issues raised by the Observatory alternatives.

Despite the consultations and analysis to date, we believe the approach on species by NSF in the DEIS is flawed. The DEIS relies initially and heavily in Section 3.1.5 (Threatened and Endangered Species) and Section 3.16 (Migratory Birds) on the IPaC Trust Resources Report for identifying potential species and wildlife of concern in this region. This screening-level report, however, is described by FWS as being for information purposes only and not to be used for analyzing project-level impacts. For projects that require FWS review or concurrence, a party is supposed to request an official species list from FWS either through the Regulatory Documents page of its website or directly otherwise.

In this case, it appears that NSF has not requested an official species list from FWS. Thus NSF may be over-relying on a general starting point screening tool, after which normally a study, official list, and/or biological opinion would follow. The IPaC Trust Resources Report itself states that it is not to be used alone for planning for or analyzing specific project effects on species. Aside from the other referenced consultations described generally in the DEIS (along with information on several known/confirmed/observed forms of protected flora and fauna, for which certain mitigation techniques and measures are outlined), what else has NSF specifically done now to assure that no other such endangered species are actually to be encountered and impacted at Arecibo? What additional plans need to be made up front, instead of putting them off "down the road" into the future, in order to have fully analyzed this important area of environmental impact before selecting a chosen EIS alternative and then a ROD based thereon?

A full biological assessment and biological opinion should take place now rather than later just before field work is undertaken in one way or another, to better understand site conditions and issues today and strengthen the NEPA process and NSF result. See 50 CFR Part 401.

"A biological assessment shall evaluate the potential effects of the action on listed and proposed species and designated and proposed critical habitat and determine whether any such species or habitat is likely to be adversely affected by the action, and is used in determining whether formal consultation or a conference is necessary.... The procedures of this section are required for Federal actions that are "major construction activities".... The biological assessment shall be completed before any contract for construction is entered into and before construction is begun." Id. at § 402.12.

Almost all of the alternatives proposed and considered by NSF in the DEIS involve site actions with potential, or yet-unknown, species impacts. (The current plan also does not seem to call for a full-time biologist to be present on-site later during work, much less fill such gaps now.) Therefore, more needs to be done up front to assess these potential impacts and plan for their avoidance and/or mitigation in agency decision-making to come, and not to put off those next steps. Thus, we recommend that, prior to finalizing the DEIS:

- A. **NSF request an official species list from FWS, if not done already, for more knowledge and assurance as to potentially impacted species in Arecibo (and possibly other parts of Puerto Rico as may be affected by off-site activities under these project alternatives); this work should appear in a new DEIS.**
- B. **NSF prepare or have prepared additional species assessments or biological opinions, under the consultation procedures of Section 7 of the Federal Endangered Species Act of 1973, 16 U.S.C. § 1536, or otherwise, including study in the unique environment beneath the 50+ year old radio dish; NSF should meet all other requirements and best practices in this area now in order to better inform the overall process and results. See 40 CFR § 1508.27(9).**

5. Climate Change

One of the most important environmental issues facing the world today is climate change. Much has been written on this topic in general and will not be repeated in this comment letter. However, in addition to excluding air quality, the DEIS excludes consideration of climate change because it is an area that does not have the potential for noticeable or measureable impacts under any of the considered alternatives (Sections ES.5 and 1.6). This threshold conclusion is based on

the fact that the facility as currently operated produces few greenhouse gas emissions. Various alternatives will involve either short-term or long-term increases or decreases of diesel generator and vehicle uses and are considered to be relatively insignificant from an overall climate change perspective. Also as stated in the DEIS, despite the presence of manufacturing and utility operations in Puerto Rico, the location of the Observatory is relatively remote from an air pollution perspective. Moreover, its inland elevated setting "is such that impacts from climate change would not affect operations," as with a coastal facility having to adapt to rising sea levels, or changing atmospheric or temperature conditions interfering with the functioning of the Observatory.

By contrast, we submit that a mere site-specific judgment by NSF in the DEIS as to the "insignificance" of the climate change issue is inadequate. Instead climate change must also be analyzed for the proposed NSF actions "in several contexts such as society as a whole (human, national)" as well as the "degree to which the effects on the quality of the human environment are likely to be highly controversial." See 40 § CFR 1508.27. Numerous challenges to projects, agencies, and EIS work are underway around the country demanding that a broader view be taken of potential indirect impacts of proposed actions on climate change (even if sometimes an agency may not have jurisdiction in a particular program when preparing an EIS for a private project receiving a federal permit). See "Enviros Fight DOE Approval of LNG Exports at DC Circ.," Law 360, December 1, 2016 (export terminal analyses arguably should have included climate change impact of new natural gas production enabled by new terminals if built); "Fish Hatchery Enviro Review Missing Climate Change Impact," Law 360, November 22, 2016 (environmental review by National Marine Fisheries Service held arbitrary and capricious for not considering effects of climate change on water use given best available regional science).

The Arecibo DEIS falls short in this regard because NSF fails to investigate and analyze the role of the Observatory in ongoing climate research and study. How would the loss of this facility impact that work, and potentially human health and the environment, moving into the future? Certain comments on this topic received by NSF during the scoping process are not even minimally addressed in the DEIS.

Even though the DEIS favors the option of some level of partnering and continued science operation of the Observatory, NSF still fails to take the long view of potential climate change impact. Instead, based solely on the local view, the DEIS excludes climate change as an insignificant issue in this case. The DEIS notes that many scientists will lose important work capabilities if the Observatory goes away; but in this respect, the loss of important climate change study capabilities could contribute to climate impacts on human health, safety, and the environment going forward. Future climate change preventative actions could be based upon work done at the Observatory along with, and even considering the existence of, numerous other methods, facilities, and scientists working to assess and document climate change. Finally, while the newly elected President of the United States is expected to cut back on certain climate actions and national commitments undertaken recently, most across the political spectrum should agree that more climate research and data are necessary to resolve remaining scientific uncertainties, refine models, and inform choices on the "hot button" topic of climate change. As stated before

by another party, Arecibo is an irreplaceable national jewel with unique capabilities for studying the atmosphere and ionosphere.

Even if this omission from the DEIS primarily relates to the multiple science-ending project alternatives not chosen by the DEIS, those options remain possible for selection in the ROD and in NSF actions thereafter which will be based upon many factors. If "a draft statement is so inadequate as to preclude meaningful analysis, the agency shall prepare and circulate a revised draft of the appropriate portion." 40 CFR § 1502.9(a). Thus, we recommend that, prior to finalizing the DEIS:

- A. **NSF review, revise, and supplement the DEIS to address the issue of climate change and the potential impact from loss of this science facility and its atmospheric research capabilities on human health and the environment, beyond the limited view of only boilers, bulldozers, and trucks; this work should appear in a new DEIS.**

6. Environmental Justice

Another important issue, both substantively and as a "hot button" topic of the day, is "Environmental Justice." Executive Order 19898 and various authorities and policies giving rise to the need to consider Environmental Justice in federal actions are well-documented and discussed in the DEIS and elsewhere. Included in the DEIS is use of the EJ Screen tool appearing at Appendix 4.12-A. (Once again, this is a screening tool leading to additional consideration, analysis, and outreach rather than forming a basis for decision-making.) Considerable further information appears at Sections 4.9 and 4.12 of the DEIS among other segments. However, the conclusion reached by NSF in the DEIS is that there are no Environmental Justice concerns associated with any of the proposed actions and alternatives. This position essentially is based on the fact that since nearly all of the population of Arecibo (100%) and of Puerto Rico (99%) is minority (Hispanic), as well as low-income people forming a strong majority of the population both in Arecibo and in Puerto Rico, then there is no Environmental Justice issue because the proposed actions do not produce disproportionately high and adverse impacts to any minority and low-income populations. See DEIS sections ES.5 and 4.12.

Once again we believe that NSF is taking too narrow a view of this issue because of its setting in Puerto Rico as an island Commonwealth of the United States. We believe that NSF should and must take a broader view and recognize the critical importance of Environmental Justice in this case. Otherwise almost no activity anywhere in Puerto Rico could ever be seen as arousing these concerns. (This advice is especially true given past disregard for the interests of Puerto Ricans by certain major federal actions taken and their cumulative impacts, such as abrupt accelerated closure of Roosevelt Roads Naval Station and Department of Defense activities with

respect to Ramey Air Force Base and Vieques Island.) The Observatory is a cultural icon of Puerto Rico, a source of great local, ethnic, and territorial pride as well as a significant driver of employment, spending, tourism, income, and education there. Yet NSF states in the DEIS that there is no Environmental Justice impact, even upon facility closure, on cultural resources or socioeconomic resources because the impact will be borne equally among demographic groups and not disproportionately or solely by minority or low-income populations - even if those most negatively impacted are minorities in the larger sense and are already economically depressed.

While localized environmental impacts may only reach a local population, the DEIS process includes many factors of a broader nature. There is substantial comment, testimony, and analysis already on the impact that loss of the Observatory would have on education including encouragement of Hispanics and children, not just confined to Puerto Rico. Hispanic students and teachers from elsewhere have taken part in the internship programs offered by this facility, producing more Hispanic physics graduates and inspiring Hispanic women in the field. As stated by one of many prior commenters: "The community of science in the U.S. needs programs like this reaching out to minorities, reaching out to women" (Appendix 5B, p. 29). In addition, scientists and others all over the nation and the world, including non-minorities and non-low income persons and communities, are knowledgeable about and use this facility and will be impacted by NSF decisions on Arecibo even if not within physical range of local environmental factors except upon their visitation to the Observatory. This is especially true for all project options other than a preferred "keep-operating" alternative. But the disproportionate negatives of any action there will fall more greatly on minority and low-income persons than on everyone because the health and human impact area to be assessed overall should extend beyond just Arecibo and Puerto Rico.

If the Observatory were instead located within downtown Detroit, or in the middle of the Navajo Nation, in both cases surrounded for many miles by minority and low-income populations being impacted by a proposed major federal facility deconstruction or closure, would this same Environmental Justice conclusion be reached by an agency in a DEIS? Would not the existence of non-minorities and higher income persons utilizing the facility from farther away be influential? Are the impacts to be considered solely environmental in nature if the DEIS process by rule extends beyond just environmental factors? Does the broader (including climate-related) human health risk created by the loss of this facility's research functions expand the affected populations beyond those only within a limited mileage radius of the Observatory, the local community, the trucking zones, and the waste disposal locations? Thus would not the extreme local impacts, even if primarily cultural and socioeconomic, be looked upon as further overburdening existing minority and low-income communities compared to all others impacted? Should NSF not favor or even err on the side of inclusion in this case? See, e.g., "FERC Ignored Pipeline's Impact on Minorities, DC Circ. Told," Law 360, December 9, 2016.

In performing Environmental Justice analyses under NEPA, Federal agencies including NSF "should recognize the interrelated cultural, social, occupational, historical, or economic factors that may amplify the natural and physical environmental effects of the proposed agency action." Environmental Justice: Guidance Under the National Environmental Policy Act,

Council on Environmental Quality, December 10, 1997 (p. 9). Assessors should not be locked into rigid formulas for determining affected communities and may exercise appropriate and reasonable judgment in considering appropriate comparison groups. See references to "disproportionately high and adverse human health effects" and other key determinations, id. at Appendix A; see also Technical Guidance for Assessing Environmental Justice in Regulatory Analysis, EPA, June 2016. While current guidance may recognize that regular uniform distribution of impacts may not indicate potential for disproportionate adverse impact, defining the affected environment under NEPA is also flexible and reasonably subjective and may vary for each resource topic analyzed in a DEIS. As stated by EPA also in 2016: "After considering unique conditions (e.g., ecological, aesthetic, historic, cultural, economic, social, or health) of the potentially affected minority populations and low-income populations, Agencies may wish to consider that the extent of the affected environment may also not be contiguous" (emphasis added). Promising Practices for EJ Methodologies in NEPA Reviews, EPA, March 2016 (p. 15).

Furthermore, for Environmental Justice analyses, "agencies can benefit by being sensitive to situations where a large percentage of the residents is comprised of minority individuals.... A larger scale reference community (e.g., municipal, state, or regional) may be required under this circumstance to obtain results that accurately reflect the existence of a minority population in the geographic unit of analysis...." Id. at p. 21. We believe that social impacts, and indirect effects over time and farther removed in distance, may enter into the picture in cases such as this. Extraordinary circumstances and unique situations may also be considered. (Climate change, for example, may constitute a project issue that also disproportionately affects poor people's lives when looked at on a larger geographic scale.) Finally, EPA notes again that agencies "may wish to recognize that in instances where an impact from the proposed action initially appears to be identical to both the affected general population and the affected low-income populations, there may be inter-related ecological, aesthetic, historic, cultural, economic, social, or health factors that amplify the impact.... After consideration of factors that can amplify an impact to minority populations and low-income populations in the affected environment, an agency may determine the impact to be disproportionately high and adverse." Id. at p. 39.

Additionally, aside from age and functional differences of NSF astronomic facilities, what are the demographics of people living near and impacted by the other similar NSF facilities that are competing with the Observatory for shrinking budget dollars and future priority status? How can this facility located in an "all-minority" and "nearly all poor" area of the United States be the one facing possible closure without Environmental Justice concerns found?

A finding of Environmental Justice impacts in an EIS does not preclude a proposed Federal action from going forward. Nor does it necessarily compel a conclusion that a proposed action is environmentally unsatisfactory. However, it is critical for the DEIS to have fairly weighed all applicable considerations, and to propose measures to address them in light of the alternatives analyzed, since the ROD and final NSF decision-making will be based on the final EIS in large part. All alternatives other than the No-Action option and the favored Alternative 1 may well have greater detrimental permanent impacts, including health effects, on the local population and community, the larger Hispanic Commonwealth, Puerto Ricans living elsewhere

in the United States, and Hispanics in general as compared to the populations living near other NSF facilities and the overall impacted American population and international scientific communities. Others are affected by this matter, including non-Hispanics and non-poor, but to a lesser degree in comparison to the disproportionate minority and low-income human impacts. (Native Hawaiian group reactions to Mauna Kea facility plans may provide further tangential lessons in this regard.) Thus, we recommend that, prior to finalizing the DEIS:

- A. **NSF revisit and revise/supplement its Environmental Justice analysis in this DEIS and exercise available flexibility to recognize unique circumstances that show that cessation or closure Alternatives here present significant Environmental Justice concerns; this should be addressed and this work should appear now in a new DEIS, and later it should be fully taken into account in final agency decision-making on the future of the Observatory.**

As stated, we appreciate this opportunity to provide to NSF our comments, changes, and concerns with the DEIS and the issues presented for the Observatory going forward. Please feel free to contact the undersigned regarding any of these matters.

Sincerely,



Robert M. Steele

RMS:skg

From: Robert Minchin <robert.minchin@gmail.com>
Sent: Monday, December 12, 2016 3:06 PM
To: Envcomp-AST@nsf.gov
Subject: Comment on draft EIS for Arecibo

It is clear that many of the mitigation measures mentioned in ES6 have the potential to substantially increase the cost and timescale of deconstruction. In order to properly inform decision making, the geophysical survey work would need to be undertaken before a final decision is made on deconstruction, not after deconstruction has been decided upon, and would need to be capable of identifying hidden karst features. The full EIS should include such a survey.

Robert Minchin

From: Robert Minchin <robert.minchin@gmail.com>
Sent: Monday, December 12, 2016 3:12 PM
To: Envcomp-AST@nsf.gov
Subject: Comment on Arecibo draft EIS

Section ES 4.2, discussing Alternative 2, states that “Operations after deconstruction would be comparable to current operations.” As this alternative includes safe-abandoning the 305-m telescope, this is clearly untrue. The section goes on to state that “Deconstruction activities that could interfere with the experimental use of the 12-meter telescope and data collection would be coordinated with Observatory staff to minimize the potential for disrupting scientific work.” As the scientific work for which the 12-m was funded is as a phase-reference antenna when doing VLBI observations with the 305-m telescope, this statement is completely incompatible with the idea of safe-abandoning the 305-m. This alternative also includes demolishing the Operations Building, which is needed for the operation and maintenance of the 12-m telescope.

The analysis of Alternative 2 also includes the concept that 16 scientific researchers will continue to be employed at the Observatory, despite the demolition of their offices and the removal of the ability to do science with the 305-m telescope. This seems somewhat farfetched. The analysis of Alternative 2 should be re-visited, taking into account the above points.

Robert Minchin

From: Robert Minchin <robert.minchin@gmail.com>
Sent: Monday, December 12, 2016 3:04 PM
To: Envcomp-AST@nsf.gov
Subject: Arecibo draft EIS comment

If demolition is carried out on-site of buildings, such as Building 2, that have been identified in the Environmental Baseline Study as containing hazardous substances such as lead and asbestos, it will be necessary not only to engage in runoff control to prevent erosion but to trap water that may be contaminated with hazardous substances until it can be treated.

Robert Minchin

From: Barbara Cohen <barbylon@gmail.com>
Sent: Monday, December 12, 2016 3:07 PM
To: envcomp-AST@nsf.gov
Subject: Arecibo Observatory

I am writing to comment on the NSF EIS for Arecibo. I work as a Planetary Scientist but I am writing as a private citizen.

I urge the NSF to choose to keep the Arecibo facility open and running. Arecibo is an important asset in its unique ability to image and determine trajectories of potentially threatening asteroids. This makes Arecibo the best tool for investigating Near Earth Objects and warning the world about possible asteroid threats. In addition, ionospheric radio wave propagation studies conducted at Arecibo form an important component of space technologies, from communications satellites to the Global Positioning System (GPS).

I hope NSF will consider keeping Arecibo open. Thank you.

Barbara Cohen
107 Morning Vista Drive
Madison AL 35758
barbylon@gmail.com

From: Robert Minchin <robert.minchin@gmail.com>
Sent: Monday, December 12, 2016 3:19 PM
To: Envcomp-AST@nsf.gov
Subject: Comment on draft EIS for Arecibo Observatory

The Executive Summary states, with respect to Alternative 1, that "Operations after deconstruction activities would be comparable to current operations". This is not compatible with the demolition proposed as a possibility in this Alternative. The buildings to be demolished include the S-band High Voltage Power Supply (necessary for S-band operations) and the HF Transmitter Building (necessary for HF operations), and other buildings essential for current operations as well as the Warehouse, which is essential for maintenance of the telescope. In this scenario (which I understand is the worst-case environmental impact within Alternative 1), operations after deconstruction activities would not be comparable to current operations. It should also be noted that the buildings used for the REU program and the scientific offices used by REU mentors are removed, so in this scenario there is a loss of this educational program. This is also not included in the 'worst case' analysis.

Overall, the analysis of Alternative 1 fails to properly take into account the knock-on effects of the possible demolition of the buildings, and thus does not present the actual worst-case environmental impact for this Alternative. This analysis needs to be re-visited, taking into account the use of the various buildings proposed for demolition, what effect their removal would have on operations at the telescope, and the socio-economic impacts that therefore follow from the removal of these buildings.

Robert Minchin

From: Michael Nolan <michaelcnolan.1@gmail.com>
Sent: Monday, December 12, 2016 3:21 PM
To: Envcomp-AST@nsf.gov
Subject: Arecibo Observatory

The Draft Environmental Impact Statement seems to choose the structures to remain and to be deconstructed arbitrarily, possibly considering structure age but not use. It assumes removal of the "S-Band high Voltage Power Supply Building", which is needed for any work by NASA (which currently provides about 1/3 of the Observatory's funding), yet it retains the "750-kilowatt Emergency Generator Building" that contains only a decommissioned Diesel generator. It removes the "Administration building", which provides all of the office space, without which "collaboration with interested parties" would be nearly impossible.

The Draft Environmental Impact Statement states that explosives could cause damage to the karst terrain in a way such that "Impacts to underlying geology would be moderate, adverse, and long-term". As the karst system is protected under Puerto Rican law, such damage would be unacceptable. The large concrete structures on site are, by design and construction, well-coupled to the underlying terrain, so that it would be impossible to restrict explosive shocks to the structures without affecting the underlying karst terrain.

The concept of converting the facility to an educational based facility is unrealistic. There might be some residual tourism for historical interest, but the facility is in a remote location, and access would only become more difficult. Educational activities are tied to the use of the 305-m telescope as a functioning scientific and engineering enterprise, in order to inspire young future scientists and engineers. There is no future and no inspiration in a non-operating facility.

Regards,

-Michael C. Nolan

University of Arizona

Tucson, Arizona

From: Robert Minchin <robert.minchin@gmail.com>
Sent: Monday, December 12, 2016 3:22 PM
To: Envcomp-AST@nsf.gov
Subject: Comment on the draft EIS for Arecibo Observatory

The draft EIS states that “Minor, adverse, short-term impacts to traffic and transportation would be expected during deconstruction.” However, the proposed route makes use of roads that are already falling away due to subsidence and which the local council does not have the money to repair. Unless the cost of making good the local roads during and after deconstruction is covered by the NSF, there are likely to be major, adverse, long-term impacts to transportation in the local area. This should be included in the cost analysis.

Robert Minchin

From: Eric Briggs <ebriggs733@gmail.com>
Sent: Monday, December 12, 2016 3:40 PM
To: Envcomp-AST@nsf.gov
Subject: Maintenance of Arecibo Operations

Good afternoon,

For the second time in 30 days I am writing to ask NSF to help maintain continued operations at one of the United States' major radio observatories. I previously asked, "How often should we have to rebuild the previous generation's largest telescopes?" The obvious response is, "not often." Although I have not visited NAIC, I have visited Green Bank, and I am pretty clear on the challenges that had to be overcome to build both facilities.

The new Chinese radio observatory seems larger than Arecibo, but I understand its spheroidal construction restricts its field of view at any one time to the same size as Arecibo. Arecibo is also closer to the equator and can scan a wider swath of sky.

Most importantly, Arecibo is located inside the United States, in a part of the country that really needs the investment to be maintained. The radio observatory is the most interesting part of Puerto Rico for me. Please don't take that away. Please continue to fund Arecibo, or if you must, similar to the GBT, generate a new PPP that provides a sound independent funding rationale. It is imperative that all participants be comfortable in working as a coalition. The alternative is for American researchers studying potentially hazardous asteroids, pulsars, etc. to participate in the Chinese FAST telescope.

Just this morning there was a glitch in the Vela Pulsar observed from a radio observatory in Australia, that probably indicates an enormous mass shift that would make a 10th magnitude earthquake look miniscule. That kind of study should be possible at an American observatory that is already built and paid for, and should not require future generations to reinvent the wheel.

(<http://www.astronomerstelegam.org/?read=9847>)

CUA



THE CATHOLIC UNIVERSITY OF AMERICA

Department of Physics

200 Hannan Hall

Washington, DC 20064

202-319-5315

Fax 202-319-4448

12 December 2016

Dear Ms. Pentecost,

In January 2016, I led a team of partner institutions that prepared a response to the NSF Dear Colleague Letter (NSF 16-005) inviting concepts for future operation of the Arecibo Observatory. An important element of our approach is to pursue opportunities to generate revenue for the Observatory in a broad-brush way that takes advantage of all existing resources and infrastructure.

Our team has reviewed the recent Draft Environmental Impact Statement (DEIS), which, alarmingly, makes specific recommendations about the disposition of buildings and other infrastructure at the observatory. It is our firm belief that those who are selected to manage and operate the site be allowed to make decisions on which buildings (if any) are to be removed.

Our team is fully committed to helping the Observatory and NSF find viable solutions to the deficit in funding for facility management and operations. However, we need to know that our proposed approach will be carefully and objectively considered by NSF should a solicitation be issued based on the DEIS.

As of this date, we've received no feedback from NSF regarding our response to the DCL. Thus, we are wondering whether the approach described in our plan was considered in the development of the alternatives presented in the DEIS. I hope that you can provide guidance on this as our team continues to develop strategies to mitigate the impending reductions to Arecibo's budget.

Best Regards,

Steve Kraemer
kraemer@cua.edu
202-319-4335

Subject: Arecibo Public Comments - part 2
Date: Monday, December 12, 2016 at 1:45:17 PM Eastern Standard Time
From: Ricardo Correa
To: NSF/AST Environmental Compliance Mailbox
CC: 'Andrew Ortiz'
Attachments: image001.jpg, NSF-public-comments-2.pdf

Greetings,

Attached you'll find 72 comments from locals showing support to the Arecibo observatory.



Ricardo Rey Correa | Public Relations and Communications Officer
Arecibo Observatory
SRI - USRA - UMET
Tel. (787) 878-2612 | Ext.615
www.naic.edu

[website](#) | [facebook](#) | [twitter](#)

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

El Observatorio de Arecibo es de los pocos lugares en Puerto Rico donde se aplica todo lo que se aprende en la escuela de manera interactiva, interesante y divertida. Permite que nuestros niños se adapten mejor a la vida que de otra forma no podrían conocer. Es importante cualquier apoyo económico a de cualquier tipo que ayude a este observatorio. A mis hijos les encanto el lugar.

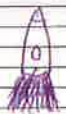
Enrique Rodríguez
Lajas, Puerto Rico

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Espero ayudar a que el observatorio de Arecibo permanezca porque es muy importante y con el obtenemos información que no podemos tener sin él.

AS.FI  
CLUB



STELLA
MÁRQUEZ



Con tu ayuda lo lograremos

#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Espero que les haya gustado mucho este primer paso
para hacer el primer observatorio de Arecibo. Espero que
les haya gustado mucho y que les haya servido de
ayuda para poder hacer el primer observatorio de Arecibo.
Espero que les haya gustado mucho y que les haya servido de
ayuda para poder hacer el primer observatorio de Arecibo.

11
U

ASFI

Club

Isabela:

Steffe

Mejinez

Santitas

D. D.

Con tu ayuda lo lograremos

#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Espero ayudar con la permanencia del observatorio de Arecibo con mi comentario. Es un excelente lugar y muy interesante ya que ayuda a estudiantes y a otros investigadores con todas sus investigaciones con sus conferencias abiertas a diversos foros que le ayudan a colaborar al mayor nivel posible.

ASFI

CLUB NUEVO FUTURO

Escuela Stella Marquez SALINAS

Espero y cuento mi COMENTARIO

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Me nombre en Calle, Virginia. Desde pequeño
y venía de casa escuchando al radio con el aparato,
con la familia y ahora con un aparato de bolsillo,
y lo más importante es el nuevo modelo con los
cambios a través de un programa que ahora
dejan de ser de un programa a través de
el que se ve el contenido del programa. Luego
se venían y se perdían en cuanto más que
en casa que se venían desde que se venían.
La atención que se presta ahora de
que quien tenía el Radio Interactivo con un
que se venía de la computadora. Luego se
pueden ver la computadora de manera que se
pueden y ahora también en la computadora.
El contenido que se ve en la computadora
no se venía con los programas, por lo tanto
a un nivel.

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

10/dic/2016.

¡Desearía que el Observatorio continuara
con sus labores de excelencia!

Es importante para el estudio y observación
de los meteoros y otros cuerpos celestes,
que puedan ser observados e impactar
a nuestra planeta.

Para que Occidente tenga
como ojo del Universo este
radio telescopio.

Please give us your
support \$ \$.

César Ramos Caro
Kathy McLeskeyMartinez

Con tu ayuda lo lograremos

#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Manejar el observatorio en función
es importante para la enseñanza de nuestros
niños y para aprender de nuestra experiencia

Xit Pichay Coarant

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Dicen Espao que a través de este papel les haga saber cuan importante es este observatorio. Tengo solo 16 años y me ha ayudo de mucho el haber visitado el lugar ya se a que me dedicare y para eso este lugar debería y estar abierto y en libro ya que personas de mi edad y mayores han disfrutado del recorrido. También veo que muchos niños llegan y salen muy entusiasmados del observatorio y tengo 7 hermanitos y sin duda los traeré en cuanto tenga la oportunidad de ir y con deseo que a través de estas firmas y comentarios lo dejen en funcionamiento.



Con tu ayuda lo lograremos

#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Hoy visitamos a este hermoso lugar y nos pareció que es buen lugar para ir con familia y buscar información.

Angelita Neri Peña
Norma Venegas
Yaradiel Guisasa
Luz
Ketzia
Román Luis Rivera

Apoyemos el
Observatorio

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

I think the observatory should continue to function, because we need to develop more research in order to discover new things.

Balkina Peje

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

mi opinion es que deben dejar el observatorio abierto por que son muchas oportunidades para muchos la visitan por su cosas. Muchos hasta viene. Es una cosa muy bella y espectacular.

D. C. L.
Santitas, P.R.

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

El observatorio promueve las ciencias en PR
además de proveer una herramienta
viable efectiva y económica a las
investigaciones hechas en el campo.

Kevin Rodríguez

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

I think the observatory should continue to be funded
for research purposes. Very important astrophysical and extragalactic
research is performed and should be maintained.

Jon Velaz

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

El observatorio es importante para fomentar la continua educación a los puertorriqueños sobre la importancia de la astronomía y las actividades del OA.

Aunque claro trae una gran cantidad de turistas pero tiene un gran problema 1 km solo recibe turistas. Tenemos que continuar cuidando el sitio para seguir mejorando el sistema de observación y áreas adyacentes.

El OA es patrimonio y un lugar educativo y turístico de gran importancia para el PR y la comunidad americana.

Eliminamos a quienes los desprecian
EPPOR.

Con tu ayuda lo lograremos

#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

El Observatorio es fascinante, No solo
hace investigaciones importantes sino inspira
a todas las visitantes a interesarse por
aprender más del universo. Necesitamos que
su operación continúe para que siga brindando
frente en conocimiento y inspiración para la humanidad

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Debemos dejar el observatorio abierto ya que esto es muy importante para las observaciones.

[Handwritten signature]

Suárez, D. R.

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

La NASA recluta muchos científicos en PR.
Estoy segura de que gran parte de ellos
han sido inspirados en sus visitas
al radiotelescopio, disponible ~~en~~ aquí,
sin tener que salir de la isla. El radio
telescopio de Arecibo siembra el
interés por las ciencias en sus visitantes
locales, incluyendo los niños.
El Radiotelescopio produce científicos
y ^{futuros} astrónomos puertorriqueños !!!
..

Con tu ayuda lo lograremos

#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Bueno creo que el observatorio de Arecibo es un gran lugar debido a que esta lleno de aparatos interesantes. He aprendido cosas invaluable. También uno de las cosas que aprendí fue que hay que en China pero como pide por China no puede hacer transacciones solo recibirlos. Y creo que eso es un punto a favor para este único y especial observatorio. Creo que gracias a este Observatorio, es una gran oportunidad de aprender a esta comunidad y fortalecerla. También es una oportunidad para conocer grandes personas las cuales nos han enseñado cosas innumerables con un carácter positivo, amigable lo que hace que me sienta a sus puntas más cómodas. Es un ambiente en el cual podemos pasarla en familia y con grandes amigos. Creo que esta experiencia sea invaluable, y creo que vendré más seguido. A este lugar llega muchas personas que buscan tenerse de sobrecarga y salen satisfechos ya que se les nota en la cara. Este observatorio tiene muchas cosas a favor, cosas que el de China no a podido hacer y me entrego que en un largo tiempo no podría. Es único y diferente lleno de grandes personas que nos ayudan a quien sea, y llegan muchas familias con los cuales podemos discutir nuestros dudas y de alguna manera conocerlos a través de la información que nos brinda el Observatorio De Arecibo por eso y muchas cosas más lo apoyo la permanencia del Observatorio de Arecibo.

N. Villalón
Natalia N. Villalón

N. Villalón
Natalia N. Villalón
Salinas.

Con tu ayuda lo lograremos

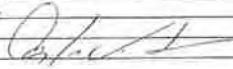
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Por ser este como siempre el Sector del lenguaje
de los que se encuentran a la cabeza del desarrollo
de las actividades por medio de la tecnología por el bien de la
comunidad.

Carlos Velez
Jorge Lora
Luis Velez
Javier Velez



10 Dic 2016

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Es un orgullo tener un telescopio de tan importante sistema.
Nuestros hijos pueden visitar y aprender
mas sobre el mundo astronomico.
y con preguntas para estos en este lugar
podemos aclarar dudas preguntas y dudas
facilmente en el cambio tan rapido
de este sistema.

Fernando Caspe Luna
Humberto Lopez
Diciembre 10, 2016

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Por mucho tiempo el Observatorio de Arecibo fue el más grande. Supe siempre muy especial, a pesar de que no soy el más grande. Era el orgullo de los arecibenses y deseo que muchos otros tengan la misma oportunidad.

Diciembre 10, 2016
-Verónica Giralt

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

*El observatorio de Arecibo es importante. Tiene un valor
invaluable. Tiene que seguir con vida para poder tener todo
lo que necesitamos.*

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

de gusto ver las actividades que tienen.
Es importante mantenerlo para seguir
con sus estudios. Especialmente para
estudiar los hoyos negros. Por Ernesto

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

I will follow the Observatory to continue their job - the process between it is a junction to the other future. To move knowledge of our planets, planets behavior. What will it change it. What can we learn, what we would do.

I think and hope this will continue do all our future. We can't stop doing what we're doing by we don't know anything.

Even though that we are not alone in the world. Too big to ignore it.

Mike

Arge M...

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

El turismo es una importante
en el mundo, no solo en este
país y recibe tanto turistas
internacionalmente de la
ciencia y tecnología y provee
servicios para ayudar a
mejorar y ayudar a crecer
de la red social por lo que
será una bienvenida para
los servicios privados por
una institución tan importante
y reconocida mundialmente por
la que tienen reconocimientos
por sus servicios. Importante ya
que es uno de los lugares
más importantes en Cuba
y en el mundo que más
representación tiene por ser
más alternativas y opciones
para seguir con los servicios
privados. Esperamos que continúen
y reconozcan sus creaciones

Martha Evangelina

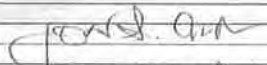
10/12/10

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

El Observatorio de Arecibo es muy importante por
diversas razones Socio, Educativas y Económicas. No podemos
olvidar que todo se vive por que esto es parte
de nuestro pueblo y nuestros V. de


Jose Luis Chaves

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

El Observatorio de Arecibo es un
sitio importante por su investigación
científica de mucha importancia en el
mundo entero. Desearíamos que permaneciera
abierto ofreciendo servicios de Investigación.

Carmen Ríos Pineda
P.O. Box 1263
Utterley, PR.
Rama campo Clases

Con tu ayuda lo lograremos

#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

I am 10 years old and when I grow up I want
to be a scientist so I really like this place as
an opportunity to learn new things.

John D. Hernandez
10/20

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Mi experiencia en el Observatorio fue
divina estuvimos en la noche Nocturna también
con toda la familia y a todos nos encanto.
Es muy educativo y el personal es muy
abierto. Soy madre y mis hijos son homeschooling
y los traen las veces necesarias para que
adquieran más conocimiento.

Muy buena experiencia
muy encanto y debe
permanecer abierto, es
una de nuestras reliquias
más importantes.

[Handwritten signature]

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

A quien pueda interesar:

En presente es para apoyar a el continuo
fundamento del observatorio de Arecibo esto es
un patrimonio y un legado invaluable. El cual
muchos de nosotros podemos ser sus señores, privilegiados
y orgullosos de ellos a su aportación a la comunidad
científica. Las aportaciones y contribuciones de esta
invaluable estructura se enfocan en todas las edades.
Agradecemos infinitamente que nunca cierre este observatorio.

A-H

Liznamyr Vega

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

A quién Puede Interesar

Quiero por este medio expresar mi pasión acerca del Observatorio Sky madre de 2 años los cuales están muy interesados en la ciencia nuestra vida hizo que mis hijos disfrutaran y a la vez aprendieran acerca de la astronomía a lo que ellos les gusta mucho que es de su importancia que los niños tengan acceso a esta información tan valiosa que los educa e impulsa a aprender más. Espero que tengan en cuenta cómo importante es para nuestros niños y el impacto positivo que tiene en ellos.

Olivia Juarez

Con tu ayuda lo lograremos

#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Yo no quiero que lo cierren porque este
lugar es muy interesante.

Fabian edad 6 años @6

Con tu ayuda lo lograremos

#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

To whom it may concern

It is my firm belief that the Arecibo Observatory must keep its funding. In Puerto Rico, we don't have many scientific resources and, as a student of the University of Puerto Rico majoring in physics, I believe we must keep what little we have. Also, this observatory is the main reason I chose this line of study, so it holds a special place in my heart.

Abraham P. Torres

abptorres

Con tu ayuda lo lograremos

#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

El Observatorio de Arecibo debe permanecer abierto ya que gracias a esta gigantesca herramienta hemos podido aprender el maravilloso mundo sobre quienes somos y hacia donde vamos como humanidad. Además, este lugar a pequeños costos será una experiencia y me sería un ser parte de este gran proyecto.

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

El observatorio de Arecibo es una maravilla de las ciencias. Este ha hecho muchas descubrimientos importantes alrededor de su historia. Como este no sería lo mismo ya que el radiotelescopio de Arecibo ~~es~~ es el más grande del mundo.

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

El Observatorio de Arecibo es un proyecto de investigación que tiene como objetivo estudiar la actividad solar y su impacto en la Tierra. Necesitamos tu ayuda para mantenerlo funcionando y mejorar sus servicios. Si tienes alguna sugerencia o comentario, por favor escríbenos en este espacio.

Ayuda la economía y la actividad.

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Visto como el Observatorio con nuestra
fija y es esencial. Es bien importante
la permanencia de este lugar donde
se aprende tanto. Nos encanta los
medios de observación. Se aprende mucho
de un buen observador a la capacidad de
nos mantener a día en cuanto a nuestra
planta.

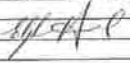
Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

A quien pueda interesar:

Por este medio informo la existencia de este laboratorio especial por encachones de nuestros techos. Hay toda la oportunidad de hacerlos en mi familia y hemos quedado encantados con las facilidades. Espero poder seguir colaborando con el laboratorio para otros niños y jóvenes de nuestro país. Este laboratorio sirve de motivación para personas de todas las edades. Si desean comunicarse conmigo para más detalles lo pueden hacer al tel. 77-951-6512 con el Sr. Eli Iván de Mayaguez, PR.



Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Aquí puedes escribir:

El observatorio de Arecibo es un espacio de aprendizaje, crecimiento y desarrollo tanto para profesionales científicos, técnicos profesionales, niños, jóvenes y adultos en general.

This space is important to Puerto Rico and the entire world. We need spaces like this.

Angela Cruz

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

U guara pundo cabras

*Desio expresar que el observatorio es una
guaridosa institucion que se aprende y se estira
conocimiento. Desde niños y adultos, pueden conocer
sobre nuestra historia y de los lugares a nuestro
alrededor. Es un beneficio para todos y debe
ser valorado.*

*Gracias por su atención
Dorothy*

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

El observatorio es un excelente lugar para las familias y estudiantes. Es un lugar de gran educative y atractivo que nos invita al aprendizaje y al descubrimiento de nuevos conocimientos.

Agradecemos y muchas gracias por brindarnos este lugar de aprendizaje y desarrollo.

Prof. Lidia Marín y familia

Con tu ayuda lo lograremos

#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

During this experience, I can say that it was
amazing to learn more than I usually did, especially
about the sun, stars, and all the nebulas. For the sky
should be like this, nice because people can learn more
than they usually do, like I did.

I really really like the
experience, and I hope
to come and visit this
place again so I can learn
more about space...

Winaika y Apertika Otago

Con tu ayuda lo lograremos

#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Querida NSA por favor No cierren el observatorio
de Arecibo. Este ha servido a muchos descubrimientos científicos
tambien es el radiotelescopio más sensible del mundo.
Por favor no lo cierren

gracias

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Soy madre homeschool y me encantó el parque.
Es una excelente oportunidad para motivar a los
niños a interesarse en la ciencia. Además una
manera divertida para aprender. Gracias muchas!

Yoselyn Heredia J.

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Por Favor jamás cierren este observatorio NUESTROS NIÑOS y jóvenes NECESITAN CONOCER y preocuparse POR NUESTRO planeta y CONOCER NUESTRO UNIVERSO y como CONOCER a Tu Familia y de donde vienen También es Fuente de conocimiento y de empleo para NUESTRO pueblo

GRASIAS mil
Janelly Ritz

Con tu ayuda lo lograremos

#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Creo que es muy importante que el Observatorio de Arecibo permanezca abierto porque es importante los estudios que se hacen que aquí se realizan, y para el bien común de la humanidad.

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

no lo cierren porque es buena.

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

A quien pueda interesar

Por parte de las familias participamos ~~para~~ ~~queremos~~ pedir el que este maravilloso y ~~interesante~~ ~~logro~~ sea una que continúe en ~~funcionamiento~~ por muchos años venideros. Agradecemos jamás ~~ciertas~~ ~~horas~~ de aprovechamiento ~~para~~ educativo para familias y personas de todas las edades.

A.H

Familia Vega

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Estados, este lugar es muy importante para el desarrollo científico. Resiste a niños, adultos jóvenes y donaciones ideas y recursos del mundo exterior.
Espero que se reconsidere la idea de quitarle los fondos, pero sería un atentado contra el desarrollo científico, no solo a Puerto Rico sino del mundo.

Atentamente

Luella Gutierrez

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Debemos conservar nuestra
tecnología con todo el apoyo del mundo.
Es muy importante para poder
seguir estudiando toda la astronomía
visible a la espera de encontrar
todo lo que tenemos aquí en Puerto Rico y
será una pena perderlo.

III

Geovani G. González Cruz
(Barrington, PR)

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

El Observatorio de Arecibo es de importancia
para la ciencia astronómica y la vida de
Puerto Rico a su enorme capacidad que ha hecho
al campo de la astronomía que se haya
renombrado el nombre de PIA en 2016 con dicho
determinación, lo pesamos!

April Reyes J.

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Con la permanencia del Observatorio de Arecibo se
abren mas oportunidades para la comunidad que vive local.
Tambien el observatorio es un legado para Puerto Rico
el cual es muy importante para las proximas generaciones.

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Nuestra experiencia en el Observatorio de Arecibo fue espectacular. Aprendimos muchas cosas nuevas sobre la astronomía y reconocimos la importancia de este observatorio, ya que es el más grande por capacidad de transmitir y puede estudiar nuevos cuerpos celestes que se descubran.

Marta M. Franco

Con tu ayuda lo lograremos

#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Pienso que seguir ocupando fondos al observatorio de
Arecibo podría ser de gran ayuda para el seguir
describiendo nuevas constelaciones como lo están
planos eclipse solares etc.
Enaque lo que

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Deveria seguir abierto ya que es interesante
saber su historia planeta otros mas tambien por cultura
asaber y aprender Astronomia Yo escribi esto por que he estado
leer en este lugar es muy interesante aprendi muchas cosas
que no sabia gracias.

Elias Jri Pizarra Colon

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

No quieren el observatorio en Puerto Rico es un tema serio, tiene muchos beneficios y te ayuda mucho a la ciencia de Puerto Rico y a la educación y me da la importancia que tiene el país porque así y todo el mundo tiene conciencia sobre el clima y espere que se recuperen y piensen lo contrario gracias

Angel Enrique Rivera Heredia

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

This Observatory (Arecibo's Observatory) is important to the world. Especially for children and young people because all the knowledge about astronomy is being updated for the world and the things that we can learn about other galaxies or planets.

Guillermo Rios

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Es el único observatorio que recibe información,
lo que lo hace ser de gran importancia.

Además no se debe dejar perder una facilidad
en la que se ha invertido tanto tiempo y dinero,
sino que se debe continuar mejorando y
sacándole provecho. En adición su
ubicación es otro factor importante.

¡Conservémoslo!

Juliana Hernández López
Luisa Hernández López

Con tu ayuda lo lograremos

#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

El observatorio de Arecibo ha sido
una gran maravilla por sus descubrimientos, que hacen
de él el lugar más avanzado en la tecnología con sus
descubrimientos gracias a su tamaño y a su posición.
Años del trabajo que este lugar ha hecho a favor
de la humanidad en el área de investigación astronómica.
Con la construcción de este lugar, se trabajó para el
bien y la felicidad que dejó este observatorio, y la
cantidad de personas que se salvaron.

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

El observatorio es muy importante para este país ya que es uno de las cosas más espectacular que tiene esta isla. Es un lugar muy bonito donde se aprende mucho sobre la astronomía. A pelo un 100% este lugar.

Juan Carlos Hernández

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

PUERTO RICO SE A DESTACADO POR SU PASADO Y
EXCELENCIA A LA DON DE INGENIERIA, PROYECTOS
CONSERVACIONES Y VANGUARDISTAS. POR LO TANTO ES
SUFICIENTE IMPORTANTE Y DE POCO VALOR A LA
CONCIENCIA CIENTIFICA QUE EL RADIO TELESCOPIO
PERMANESCA EN PUERTO RICO, ESA GARANTIZANDO
MAYORES Y MAS BONS LOGROS PARA TODOS.

Rafael Hernandez Colon
P.R. 00981

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Mi primera vez aquí, fue una gran experiencia para mí (2016). Aprendí cosas como el eclipse solar y lunar con sus distancias, y que somos el único observatorio que transmite y recibe siempre (una vez por semana solamente). Vale la pena salir al observatorio para poder aprender más cosas al crear. Quiero que sea permanente.

Christina Hernández
3 years
2016

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

El observatorio de Arecibo se ha desatendido por un uso de las
casas en Puerto Rico, haciendo crecer y crecimiento desde
PB. Para usar backup y perdido ver la clase. Crecimiento
PA posee uno de los lugares más estratégicos del mundo.

Noemi Lopez
Lopez
10 Cuidado

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

It is important to continue to explore the universe and benefit all other scientific fields from the knowledge obtained. The radio telescope provides a unique opportunity to the students & general public to learn and view science on a first hand basis. It serves as a tool to invite the children into learning and consider careers in science fields.

RS+1

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

I've been coming to this for many years
during the week & family & friends
you see and that's why this beautiful island
is what I would be glad to take
something so important to special love
people.

I'm sure that you guys can come up
with a way to keep this place open for
the public.

Don't take away the best pieces of history
to one side.
Thank you for your support to the

Yves
Ramon E. Lopez

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

No es que debas recitar fórmulas, por supuesto que
"ciberos" debes, porque cada una de esas actividades dan
algo a la empresa, que todos los conceptos, desde que en casa
con los aparatos, que se relacionan, pero que se hacen
educativos, porque en estos seguimos sabiendo que cada actividad es
específica. El que sea o no, lo que es estudiar ciencias, pero
esto es un apoyo a ellos que he visto en mi vida, desde
de todo lo que voy, está en lo más importante del mundo, pero
que de una manera sencilla, que sea una idea importante,
algo educativo, en algo que te ayude, pero siempre. Porque hay
a menudo, que cuando hablamos, ya que me voy a poner
encontrar como un caso, incluso, de hecho, de hecho, es un
to ha a científico. Es en todo.

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Porque me gusta estar el observatorio por la
segunda razón que es que nos proporcionan una infor-
mación que solo ellos nos pueden dar con detalle
y nos ayuda a saber más del planeta y otros que en
el universo.

José M. Ortiz Hernández
Alfredo L. Vázquez Martínez

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

El lugar es de gran ayuda para quienes que
tienen interés en el estudio astronómico.
Es también, un atractivo turístico, de ayuda
para el país. Despierta el interés en los
estudiantes a encaminarse en esta rama de
la ciencia.

Delia M. Ruiz

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

#Yo no me rendiré que se mantenga el observatorio
de función ya que es un centro de
investigación en Puerto Rico

George A. Salgado

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Me gusta que exista el observatorio por que es el lugar que puede
trabajar social y tecnico. También por que es el lugar en que está.

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

Dado que el Observatorio de Arecibo es un
centro educativo con una gran historia y
relevancia, y que es un patrimonio cultural
de nuestro país, es importante que se
mantenga y se complete.



~~12/11~~

Con tu ayuda lo lograremos
#YOapoyoelOA

EL OBSERVATORIO DE ARECIBO

CON TU COMENTARIO APOYAS LA PERMANENCIA DEL OBSERVATORIO DE ARECIBO:

En mi opinion el Radio telescopio debe
permanecer operando ya que es el unico
en el mundo que tiene la capacidad de
recibir y transmitir mensajes que puede
conducir a nuevas descubrimientos celestiales

J. Lopez M.

Con tu ayuda lo lograremos
#YOapoyoelOA

Subject: RE: Arecibo Observatory

Date: Sunday, December 11, 2016 at 8:29:59 PM Eastern Standard Time

From: A.Rozek

To: NSF/AST Environmental Compliance Mailbox

CC: achp@achp.gov

Dear Ms. Elizabeth Pentecost ,

As a user of the Arecibo Observatory I would like to express my concern about the possible decommissioning of the Planetary Radar at the Arecibo Observatory. The only alternative included in the Draft Environmental Impact Statement (DEIS) that allows continued operation of the facility is the No-Action Alternative. Closure of the Arecibo Planetary Radar would be a great loss for the scientific community worldwide and in long-term it might impair the planetary defence.

I have used the Arecibo Observatory observations performed in January 2015 and January 2016 to construct a physical model of the asteroid 1999 JV6 (proposals R2959 and R3036). I have visited the observatory for six weeks in January 2015 to cooperate on the detailed modelling of my object. The visit was an unique opportunity for me as a young researcher and helped me greatly to develop my PhD. I was impressed by the facilities, that included housing and office space in the proximity of the instrument, and felt incredibly lucky to be able to incorporate radar data into my project. The results of my work were presented at the Binaries in the Solar System workshop in Prague in June 2016

A. Rozek, S. C. Lowry, M. C. Nolan, E. S. Howell, P. A. Taylor, L. A. M. Benner, A. Fitzsimmons, S. R. Duddy, T. Zegmott, P. R. Weissman, W. D. Smythe, M. D. Hicks, S. F. Green, B. Rozitis, C. Snodgrass, S. D. Wolters, J. E. Richardson, E. Rivera-Valentin, L. A. Rodriguez-Ford, L. F. Zambrano-Marin, M. Brozovic, S. P. Naidu, J. D. Giorgini, L. G. Snedeker, J. S. Jao, F. D. Ghigo
[Shape and spin-state modelling of the NEA \(85990\) 1999 JV6 from radar and optical observations](https://www.asu.cas.cz/~binaries/contents/abstracts/pdf/abstracts_0024.pdf)
(https://www.asu.cas.cz/~binaries/contents/abstracts/pdf/abstracts_0024.pdf)

The physical modelling of 1999 JV6 also constitutes an important chapter of my PhD thesis and is intended for publication in a refereed journal. The asteroid investigated is one of the Potentially Hazardous Asteroids (PHA).

I strongly disagree with the statement put forward in the DEIS that the decommissioning of Planetary Radar would have a negligible long-term impact on public safety as there are no deflection mechanisms currently available. Detailed physical characterisation of PHAs, such as the subject of my study, is motivated partly by the purely scientific drive to understand the workings of the Solar System. However, it is also helpful in planning future spacecraft missions, for both research (understanding the space environment of Earth) and commercial (asteroid mining) purposes. Lastly, it is crucial in development of asteroid deflection mechanisms. It is impossible to plan and test out strategies to prevent asteroid impact with Earth without an in-depth knowledge about their properties that can be deduced by from astronomical observations. The extent of such characterization is seriously limited without radar data.

The precise radar astrometry (measurement of orbital parameters) of 1999 JV6 was used by J. Giorgini et al to calculate that there is a force, other than gravity, acting on this body. A measurement that would not be possible without the radar data, even though this object had been

regularly monitored with optical astrometry for over 16 years. (
<http://www.cbat.eps.harvard.edu/iau/cbet/004200/CBET004279.txt>)

Without radar astrometry it is essentially impossible to constrain the orbits of PHA to detect subtle forces (that have to be taken into account in planning asteroid deflection) or guarantee no impact risk for newly discovered objects. The Arecibo Observatory is one of only two facilities currently providing radar astrometry of PHA on regular basis (the second observatory, NASA JPL Goldstone Solar System Radar is a complementary facility rather than an alternative).

I hope a solution can be found where the Arecibo Observatory observations would continue and include the important work done with the Planetary Radar. Appreciating the unique capabilities of the Radar, I have planned to include the observations it performs in my future research.

Kind regards,
Agata Rozek

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Subject: Letter on Arecibo DEIS evaluation
Date: Sunday, December 11, 2016 at 8:58:42 PM Eastern Standard Time
From: Leonid Gurvits
To: NSF/AST Environmental Compliance Mailbox
Attachments: Acrobat.pdf

Dear colleagues,

Please, find a letter in response to the DEIS document on the Arecibo Observatory attached.

Best regards,
Leonid Gurvits

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Prof. Leonid Gurvits
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Ms. Elizabeth Pentecost
National Science Foundation
4201 Wilson Blvd., Suite 1045
Arlington, VA 22230
USA

Re: Arecibo Observatory

11 December 2016

Dear Ms. Pentecost, dear colleagues,

It is hard to offer any original arguments in support to the Arecibo Observatory, different from those already expressed in known to me corporate and individual letters of support. Nevertheless, I would like to stress that in my opinion the fate of the Arecibo Observatory as reflected in the publicly available DEIS document of October 2016 does not represent the true value of the unique and fully operational scientific facility in Puerto Rico. Leaving aside the science legacy of the 305-m radio telescope of the past decades, I would like to refer to just two very recent (2012–2016) top level achievements in Very Long Baseline Interferometry (VLBI) that have become feasible only due to the unbeatable sensitivity of the Arecibo radio telescope. One is the discovery of extremely high brightness temperature in the core of the quasar 3C 273 made on the Earth-Space interferometric baseline Arecibo–RadioAstron that poses serious questions to the conventional models of radio emission of active galactic nuclei (Kovalev et al. 2016, ApJ 820 L9, Johnson et al. 2016, ApJ 820 L10). The other one, dealing with the first astrometric VLBI identification of a Fast Radio Burst event will be published in the most prestigious science journal in January 2017. These outstanding results have been achieved not least due to the dedication of the Arecibo-based staff. And it is this staff who will be denied very modest working conditions if the leading option of the DEIS document involving destruction of the observatory buildings is implemented. I note that the advent in 2016 of the Chinese Arecibo-like but larger radio telescope FAST only amplifies the future potential role of Arecibo in studies of transient and fast radio burst phenomena: the two largest antennas in the world perfectly well complement each other helping to provide a larger sky coverage.

As a staff member of the Arecibo Observatory in 1992–94, I am familiar with the site. Its infrastructure is simple and functional. It is hard to see how an external funding

source would be attracted by the prospect of demolition of crucial site buildings, including, for example, the scientific and administrative staff offices.

I do understand that the US national science budget is not limitless. Nevertheless, its optimization by means of drastic measures toward a highly efficient and fully functional world-class science facility will send a very wrong message to the young people locally in Puerto Rico as well as elsewhere in the US and beyond. I do not believe the scientific community and public at large are prepared to endorse this highly detrimental effect with generation-long consequences.

Yours sincerely,



Professor Leonid Gurvits

Teresa Symons
1014 Pine St
Hamburg, PA 19526
484-663-4559
t.symons@ku.edu
December 12, 2016

Ms. Elizabeth Pentecost
4201 Wilson Blvd, Ste 1045S
Arlington, VA 22230

Dear Ms. Elizabeth Pentecost:

I am a physics graduate student at the University of Kansas, and I am writing on behalf of Arecibo Observatory, to urge the National Science Foundation not to restrict funding or shut down any part of the site. Arecibo has played a large role in my education as a young scientist, and I would hate to see others denied the wonderful opportunity that I had.

I grew up seeing Arecibo Observatory in the movie *Contact* and idolizing the scientists who worked there. While pursuing my B.S. in Space Physics, I was selected to participate in Arecibo's Research Experience for Undergraduates program. It was like a dream come true to get to do research at Arecibo. I even had the pleasure of visiting the platform and learning to operate the receiver. However, it was my research training at Arecibo that has been the greatest gift.

My work at Arecibo was the first real chance I had to engage in an independent research project. Under the guidance of my mentors there, I learned how to analyze data and create a model. I even got to attend the CEDAR workshop while at my REU, and later presented my research at a major conference. It would be doing Arecibo Observatory a disservice to describe my experience as anything less than transformative. I realized that I could have a future as a research scientist, and have since become a graduate student about to defend my master's thesis.

I am dismayed and alarmed that future generations of students may not have the opportunity that I did to learn to become a researcher in a truly unique environment. I felt honored to be able to learn in a place where so much important and groundbreaking work had been done. Now I fear that the department that I worked for may be shut down, my mentors may lose careers they have spent their lives on, or the entire site and all its significance as a historical and cultural icon may be closed to visitors and scientists alike.

I urge the NSF to please consider all that stands to be lost by defunding or dismantling any portion of Arecibo Observatory, and all the future scientists that would lose the opportunity to be inspired, educated, and transformed by Arecibo as I was.

Sincerely,



Teresa Symons