

NATIONAL SCIENCE FOUNDATION
4201 Wilson Boulevard
Arlington, Virginia 22230



December 2, 2016

Mr. Randall Reid-Smith
State Historic Preservation Officer
West Virginia Division of Culture and History
Historic Preservation Office
1900 Kanawha Boulevard East
Charleston, West Virginia 25305

RE: Section 106 Consultation for the Proposed Changes to Green Bank
Observatory Operations, Green Bank, West Virginia

Dear Mr. Reid-Smith:

The National Science Foundation (NSF) has identified the need to divest several facilities from its portfolio to retain the balance of capabilities needed to deliver the best performance on the key science of the present decade and beyond. Green Bank Observatory (GBO) in Green Bank, Pocahontas County, West Virginia, is one of the facilities identified for potential divestment. The decision regarding the potential changes to GBO operations is considered a federal undertaking. While engaging in Section 106 consultation under the National Historic Preservation Act (NHPA), NSF will be simultaneously conducting an Environmental Impact Statement (EIS) process under the National Environmental Policy Act (NEPA) to identify potential impacts associated with the proposed operational changes due to funding constraints. With this letter, NSF is formally initiating Section 106 consultation under the NHPA, transmitting the *Cultural Resources Evaluation, Green Bank Observatory, Green Bank, West Virginia* (Enclosure 1) for your review and comment, and requesting concurrence on determinations of eligibility for properties surveyed at GBO.

Project Location and Background

GBO is located on federal lands adjacent to the Monongahela National Forest. This land is owned by NSF and consists of numerous parcels that were acquired/condemned by the U.S. Army Corps of Engineers in the 1950s when GBO was formed as the first (and then, only) site of the National Radio Astronomy Observatory (NRAO). The GBO is the anchor and

administrative site of the 13,000-square-mile National Radio Quiet Zone (NRQZ) and is situated on approximately 2,200 acres in the NRQZ, where all radio transmissions are limited. The GBO facility has a long history of science, technology, engineering, and mathematics education, ranging from student training and mentorships through the outreach and training opportunities offered through the NRAO Center for Science Education, which is based at the GBO site. More than 40,000 visitors each year pass through the Green Bank Science Center, including students, educators, and the general public who generally stay on site for more than one night to take advantage of the educational facilities. The GBO facility is host to multiple educational workshops and programs each year for middle school through post-graduate student training, and an average of 10 to 15 undergraduate and graduate students are mentored at the facility each year.

GBO facilities include the Green Bank Telescope; 43-meter telescope (also referred to as the 140-foot telescope); Green Bank Solar Radio Burst Spectrometer (45-foot telescope); Interferometer Range (includes three 85-foot diameter telescopes); 20-meter Geodetic Telescope; 40-foot telescope; three non-operational historical telescopes (Jansky Replica Antenna, Reber Radio Telescope, and Ewen-Purcell Horn); and other support facilities and infrastructure.

Project Description

NSF's Division of Astronomical Sciences (AST) is the federal steward for ground-based astronomy in the United States, funding research with awards to individual investigators and small research groups, and via cooperative agreements for operation of large telescope facilities. These national and international telescope facilities provide world-leading, one-of-a-kind observational capabilities on a competitive basis to thousands of astronomers per year. These facilities also enable scientific advances by making archived data products available to researchers. Along with funding telescope facilities and research awards, AST supports the development of advanced technologies and instrumentation, and manages the allocation and assignment of specific frequencies in the radio spectrum for scientific use by the entire NSF community. The need for NSF to reduce funding for the GBO has been established through a number of reviews and surveys conducted by the science community.

In 2014, CH2M conducted a Cultural Resources Evaluation for the architectural resources at the GBO. The results of the survey are included below under "Determinations of Eligibility." The associated technical report, entitled *Cultural*

Resources Evaluation, Green Bank Observatory, Green Bank, West Virginia, is attached for reference (Enclosure 1).

A range of preliminary proposed Alternatives is being considered for evaluation. These preliminary proposed Alternatives, which will be refined through public input, include the following:

- Continued NSF investment for science-focused operations (No-Action Alternative).
- Collaboration with interested parties for science- and education-focused operations with reduced NSF-funded scope (Agency-Preferred Alternative).
- Collaboration with interested parties for operation as a technology and education park.
- Mothballing of facilities (suspension of operations in a manner such that operations could resume efficiently at some future date).
- Deconstruction and site restoration.

These alternatives may be further refined during the early phases of the compliance review and will be informed by the public process.

Proposed Area of Potential Effects

The Area of Potential Effects (APE) being proposed for the project is defined as the property boundary of GBO. The total geographic area of the Observatory was chosen as the APE to encompass all buildings and structures on the property. This inclusive APE enables a determination of whether GBO constitutes a potential historic district that could be affected by the activities associated with the proposed changes to operations at the Observatory. Figure 2-1 included in Enclosure 1 shows the boundaries of the APE. We invite your comments on this proposed APE.

Public Involvement

A Notice of Intent (NOI) was published in the Federal Register on October 19, 2016 to initiate the public scoping process for the EIS. A revised NOI was published on November 1, 2016. Two public scoping meetings were conducted on November 9, 2016, at GBO. Section 106 public outreach was addressed as part of the public meeting,

and participants were invited to identify whether they would like to participate in Section 106 as a consulting party. Concurrent to the mailing of this letter, NSF will email these potential consulting parties a description of the role of a consulting party and requesting that they confirm their interest. A separate Section 106 consulting party meeting will be scheduled following the release of the Draft EIS this spring. Follow-up discussions with consulting parties will occur as needed.

Tribal Involvement

Your office provided a list of tribes with historic ties to West Virginia (email correspondence from Ms. Lora Lamarre, November 7, 2016, see Enclosure 2). These tribes were provided email notice of the proposal during NEPA scoping, and we will be providing them with letters inviting them to participate in Section 106 consultation.

Previously Identified Historic Properties

A literature review was conducted through the West Virginia State Historic Preservation Office (SHPO) Interactive Map on November 7, 2016. The literature review focused on the APE and included a 0.5-mile study area.

The Reber Radio Telescope is the only structure or building located within GBO that is listed in the NRHP. It was listed in the NRHP in 1972 and designated a National Historic Landmark in 1986. The telescope was listed under Criteria A and B for its nationally significant association with the origins of radio astronomy and for its association with Grote Reber.

One residence within the APE, the Riley House (House #15), was previously recorded in 2011. The associated survey form states that the early twentieth-century wood-frame farm house does not appear to be significant under NRHP Criterion C. The literature review did not identify any prior cultural resources surveys that have occurred within the APE. Two archaeological sites and nine architectural resources have been recorded outside of the APE, along State Routes 28 and 92, directly adjacent to the eastern boundary of the Observatory. The two previously recorded archaeological resources were not evaluated for the NRHP. One of the architectural resources, the Liberty Presbyterian Church on State Route 92 that was constructed in 1851, is described as significant as an excellent example of Greek Revival architecture, although no formal NRHP evaluation is included with the survey form. The church was recorded on two West Virginia Historic Property Inventory Forms (PH-0002 and PH-0037-0018). Four architectural resources were evaluated as not eligible for the NRHP and three buildings

were recorded, but not evaluated for the NRHP. The cultural resources that have been previously recorded within or directly adjacent to the APE are listed below in Table 1. In addition, two surveys (a bridge survey and a cultural resources survey) have occurred and 34 additional cultural resources have been identified within the 0.5-mile study area.

TABLE 1. Previously Recorded Cultural Resources Within and Directly Adjacent to the APE*

Resource Name	Description	Status	Recorded by
Reber Radio Telescope	1937 telescope located at the entrance to GBO within APE	NRHP listed 1972; National Historic Landmark 1986	National Register of Historic Places Registration Form
Riley House (House #15) PH-0331	Circa 1915 farm house within APE	Not eligible for the NRHP	Justin Greenawalt and Mary Stack (Skelly and Loy, Inc.); 2011
Liberty Presbyterian Church PH-0002 PH-0037-0018	1851 Greek Revival Church adjacent to APE	Not formally evaluated for the NRHP, but described as "significant as an excellent example of Greek Revival architecture in the area"	Michael Gioulis (Historic Preservation Consultant); 1993
George Porter Kerr House – Historic Orlan Shears House PH-0037-0040	Circa 1901 residence adjacent to APE	Not evaluated for the NRHP	Sherron Waybright; 1986
Dr. J.P. Mooumau House PH-0037-0044	1873 residence adjacent to APE	Not evaluated for the NRHP	Jessie B. Powell; 1986

Hamed House PH-0037-0048	1910 residence adjacent to APE	Not evaluated for the NRHP	Jessie B. Powell; 1986
Jack Nelson House PH-0209	Circa 1900 residence adjacent to the APE	Not eligible for the NRHP	Jeff Drobney (Skelly and Loy, Inc.); 1996
Jerry Thortnon House PH-0210	Circa 1880-1890 vernacular residence adjacent to APE	Not eligible for the NRHP	Jeff Drobney (Skelly and Loy, Inc.); 1996
PH-0326	Circa 1920 bungalow residence adjacent to APE	Not eligible for the NRHP	Justin Greenawalt and Mary Stack (Skelly and Loy, Inc.); 2011
PH-0327	Circa 1920 bungalow residence adjacent to APE	Not eligible for the NRHP	Justin Greenawalt and Mary Stack (Skelly and Loy, Inc.); 2011
PH-0332	1949 bungalow residence adjacent to APE	Not eligible for the NRHP	Justin Greenawalt and Mary Stack (Skelly and Loy, Inc.); 2011
Shinaberry's Fifth Grade Site 46-PH-64	Prehistoric open archaeological site adjacent to APE	Not evaluated for the NRHP	Dick Reigel; 1987
Sheets Site 46-PH-27	Prehistoric campsite adjacent to APE	Not evaluated for the NRHP	Stephen Davis; 1977

* Shaded rows indicate previously recorded resources within the APE.

Determination of Eligibility

A Secretary of the Interior-qualified architectural historian with CH2M conducted an intensive architectural survey at the GBO from October 6-9, 2014. The site visit to GBO was also used to engage GBO staff in informal interviews and to conduct archival research, including the review of historic photographs and narratives, newspaper articles, construction records, and architectural drawings.

The field survey encompassed standing structures built in or before 1969, which is 47 years from the present year. The standard NRHP age threshold is 50 years; however, using 47 years as the cutoff allowed a buffer for the execution of the proposed Alternatives. All built environment resources from 1969 or earlier within the GBO boundary were surveyed and assessed, including a determination of eligibility for listing in the NRHP, except for the Reber Radio Telescope. Buildings and structures were evaluated individually as well as part of a potential historic district.

Using aerial photographs of GBO and information provided by GBO staff, 47 built environment resources that had been constructed in or before 1969 were identified as extant within the APE. These include: 5 telescope structures (one of which contains three large telescopes), 2 horn instruments, 1 antenna, 1 airstrip, 1 water tower, 1 recreation area, 24 residential buildings, and 12 operational and administrative buildings. As noted above, one of these telescopes, the Reber Radio Telescope, was previously evaluated. The remaining 46 built environment resources in the APE built in or before 1969 were photographed and evaluated for NRHP eligibility. Data collected through the background research and field investigations were analyzed to determine NRHP eligibility of the 46 surveyed built environment resources individually. In addition, the Green Bank Telescope, which was constructed after 1969, was evaluated individually due to its exceptional importance to radio astronomy over the last 50 years. All 47 historic-era properties (constructed in or before 1969, including the Reber Radio Telescope) and the GBT were also evaluated as a potential historic district. Properties surveyed in 2014 are listed in Attachment A of Enclosure 1. Figure 5-1, included in Enclosure 1, shows the location of each evaluated built environment resource.

NSF has determined that within the historical context of NRAO/GBO, there are four telescope instruments that are individually eligible for listing in the NRHP: the Interferometer Range, the 40-foot Telescope, the 43-meter Telescope, and the Green Bank Telescope. In addition, NSF has determined that GBO is eligible as a historic district for representing an important time in science history and for its significant contribution to the advancement of radio astronomy. There are 44 resources within the APE that are recommended as contributing to the proposed GBO historic district, the boundaries of which coincide with the site's property boundaries (and the APE). Contributing elements include 8 administrative/operational buildings, 1 airstrip, 1 water tower, 1 recreational area, 24 residential buildings, 2 horns, 1 antenna, and 6 telescopes (the Interferometer includes 3 large telescopes) (Table 2).

The scientific instruments within the APE are a collection of telescopes, horns, and antenna that are significant for their role in the development of radio astronomy and, in several instances, as remarkable feats of engineering. As a whole, the majority of the components that make up the potential district's historic character possess integrity, even though many of the buildings are individually undistinguished. The administrative and operations buildings and structures within the GBO are primarily utilitarian buildings or structures with simple designs executed using practical and standard materials. These elements create a cohesive, visual unit that emphasizes their historically linked function as support for the observatory. As a group, the 44 contributing built environment resources are a distinct and well-preserved representation of the early years of the NRAO, complete with scientific instruments, administration/operational facilities, recreation area, and residential buildings. Additionally, the scientific instruments present on site illustrate a linear, historical narrative of the history of radio astronomy from the Jansky Replica Antenna and Reber Radio Telescope to the monumental Green Bank Telescope. Four buildings within the APE were identified as non-contributing resources. These include three barns and one cellar building, all of which pre-date the establishment of the NRAO and have been primarily left vacant or used as miscellaneous storage facilities.

Table 2 lists the properties at the GBO that were identified as individually eligible for the NRHP. Attachment A, included in Enclosure 1, lists the buildings that contribute to the NRHP-eligible historic district.

TABLE 2. NRHP-Eligible Built Environment Resources within the APE

Resource Name	Year Constructed	Description/Significance	NRHP Eligibility Recommendation
GBO Historic District	1958-2000	Collection of administrative/operational structures, residential buildings, and radio astronomy equipment associated with the NRAO/GBO.	Eligible (Historic District); 44 contributing resources (Attachment A in Enclosure 1)
Interferometer Range:	85'-1: 1958-1959	The Tatel Telescope (85'-1) was the first telescope	Individually eligible and contributing to

TABLE 2. NRHP-Eligible Built Environment Resources within the APE

Resource Name	Year Constructed	Description/Significance	NRHP Eligibility Recommendation
Howard E. Tatel Telescope (85'-1) and 85'-1 control building; 85'-2 Telescope; 85'-3 Telescope; and the Interferometer control building	85'-2: 1963-1964 85'-3: 1965-1968 Interferometer control building: 1967-1968	constructed by the NRAO and performed the world's first Search For Extra Terrestrial Intelligence (SETI) observations. The Interferometer Range connected two nearly identical telescopes to the Tatel Telescope in a linear formation. The three telescopes operated in unison and proved that dishes could be combined to form very large telescopes. This information spurred the construction of the Very Large Array telescope in New Mexico in the 1970s.	GBO Historic District
40-foot Telescope and control building	1962	First fully automated radio telescope in the world. Currently operates as an educational telescope for visiting students.	Individually eligible and contributing to GBO Historic District
43-meter Telescope	1958-1965	Largest telescope in the world to use an equatorial (for polar aligned) mount. Currently used as part of the Russian Radioastron project.	Individually eligible and contributing to GBO Historic District

TABLE 2. NRHP-Eligible Built Environment Resources within the APE

Resource Name	Year Constructed	Description/Significance	NRHP Eligibility Recommendation
Robert C. Byrd Green Bank Telescope (Green Bank Telescope)	1991-2000	Largest moving structure on land in the world; tilt and point design that can rotate a full 360 degrees; performs highly sensitive data collection.	Individually eligible and contributing to GBO Historic District

Request for Concurrence

NSF requests your input on the proposed APE and concurrence with the determination that there are four telescopes at the GBO that are individually eligible for listing in the NRHP (one of which is the Interferometer which encompasses three large telescopes) and that the GBO is eligible for the NRHP as a historic district, containing 44 contributing resources.

Initiation of Section 106 Consultation

The GBO is a federally-owned property that contains historic properties. Therefore the Proposed Action has the potential to affect historic properties. In compliance with 36 Code of Federal Regulations (CFR) 800.3(c), NSF is initiating consultation with the West Virginia State Historic Preservation Officer (SHPO) on the proposed changes to GBO operations. Please respond within 30 days from receipt of this letter to:

Ms. Elizabeth Pentecost
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Division of Astronomical Sciences
4201 Wilson Blvd, Suite 1045
Arlington, Virginia 22230
epenteco@nsf.gov

NSF is also transmitting the *Cultural Resources Evaluation, Green Bank Observatory, Green Bank, West Virginia* (attached as Enclosure 1). If you have any questions, please do not hesitate to contact me by phone at 703-292-4592 or by email at

cblanco@nsf.gov. Information about this proposal will be posted, throughout the NEPA and Section 106 processes, at www.nsf.gov/AST (click on "AST Facilities-Environmental Reviews," the "Green Bank Observatory.") We look forward to further consultation on this proposed undertaking.

Regards,

A handwritten signature in blue ink that reads "Caroline M. Blanco". The signature is written in a cursive style with a large initial 'C'.

Caroline M. Blanco
Federal Preservation Officer
Assistant General Counsel
Office of the General Counsel

Enclosures:

1. *Cultural Resources Evaluation, Green Bank Observatory, Green Bank, West Virginia*
2. Email from SHPO's office with list of tribes with potential interest in West Virginia projects