

NATIONAL SCIENCE FOUNDATION ' GREEN BANK OBSERVATORY ' RECORD OF DECISION '

I. INTRODUCTION

The Green Bank Observatory (GBO) is a scientific research and education facility located in Green Bank, West Virginia, and owned by the National Science Foundation (NSF). Since its inception in Green Bank in 1957, the National Radio Astronomy Observatory (NRAO) has operated telescopes there under a cooperative agreement between Associated Universities, Inc. (AUI) and NSF. GBO has been operated by AUI as a standalone facility since October 1, 2016, when it was separated from NRAO to encourage and enable development of operational partnerships.

GBO resides on approximately 2,600 acres of federal land. Its location within two radio quiet zones – the National Radio Quiet Zone and the West Virginia Radio Astronomy Zone – provides unique protection from many forms of anthropogenic radio frequency interference, making it an excellent site for experiments that require a low-noise radio environment. There are 48 buildings on site with a combined footprint of over 185,000 square feet.

The main scientific instrument at GBO is the 100-m Robert C. Byrd Green Bank Telescope (GBT), which became operational in 2001. The GBT is the world's largest fully steerable single-dish telescope, operating at frequencies from 0.2 GHz to 116 GHz; its large sky coverage, very high sensitivity, and extensive suite of instruments make it a powerful and versatile telescope which continues to enable important advances in virtually all areas of modern astrophysics, including: Solar System and planetary astronomy; star formation and evolution; interstellar physics and chemistry; pulsar studies of long-wavelength gravitational waves; physics of black holes and neutron stars; and galaxy formation and evolution. The GBT is complementary and synergistic with interferometric arrays, such as the Very Large Array (VLA), Very Long Baseline Array (VLBA), and the Atacama Large Millimeter/submillimeter Array (ALMA). It also plays a critical supporting role as a highly sensitive element of very long baseline interferometry, as well as a bistatic radar receiver for rapid and sensitive imaging of near-Earth objects and asteroids.

Other facilities at GBO include engineering laboratories and fabrication shops; a visitor and education center (known as the Green Bank Science Center); the 43-meter Telescope; the Green Bank Solar Radio Burst Spectrometer; the 20-meter Geodetic Telescope; the 40-foot Telescope; the Interferometer Range; on-site accommodation for visiting researchers, educators, and students; and previously operational telescopes.

GBO conducts a vibrant program of educational activities which include student training, teacher training workshops, involvement of underrepresented groups in radio astronomy research, and public outreach. In addition, the Observatory plays a role in the local economy: Green Bank Science Center attracts nearly 50,000 visitors annually (in a county of about 8,000 residents) and GBO employs approximately 140 individuals, including about 100 permanent staff and 40 seasonal employees.

NSF acknowledges the significant value of GBO to the scientific community, but confronted with limited resources to fulfill its mission to support forefront research for ground-based astronomy in the United States, NSF determined that it needed to reduce its support for the operations of GBO (Proposed Action). To meet the purpose and need of the Proposed Action, NSF analyzed a wide-range of Alternatives. After careful consideration of a variety of important factors, including scientific priorities, budgetary constraints, and the results of NSF's compliance with the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), and the National Historic Preservation Act (NHPA), NSF now issues this Record of Decision (ROD) selecting **Alternative A: Collaboration with interested parties for continued science- and education-focused operations with reduced NSF funding (Agency-Preferred Alternative)** for implementation. This Alternative was identified as the Agency-Preferred Alternative in the environmental review conducted for GBO, and it proposes funding changes for GBO that would continue operations in collaboration with viable external partners. This Alternative allows NSF to preserve critical capabilities offered by GBO, while simultaneously addressing the need to reduce its share of the operations cost of GBO within the context of scientific priorities and a constrained budgetary environment.

II. THE PROPOSED ACTION

A. Purpose and Need

NSF's Division of Astronomical Sciences (AST) is the federal steward for ground-based astronomy in the United States. Its mission is to support forefront research in ground-based astronomy, help ensure the scientific excellence of the United States astronomical community, provide access to world-class research facilities through merit review, support the development of new instrumentation and next-generation facilities, and encourage a broad understanding of the astronomical sciences by a diverse population of scientists, policy makers, educators, and the public at large. AST supports research in all areas of astronomy and astrophysics as well as related multidisciplinary studies. Because of the scale of modern astronomical research, AST engages in numerous interagency and international collaborations. Areas of emphasis and the priorities of specific programs are guided by recommendations of the scientific community, which have been developed and transmitted by National Research Council (NRC; now National Academies) decadal surveys, other National Academies committees, as well as federal advisory committees, such as the Astronomy and Astrophysics Advisory Committee (AAAC) and the Advisory Committee for the Directorate for Mathematical and Physical Sciences (MPSAC).

Numerous reviews and surveys conducted by the scientific community have assigned a lower scientific priority to GBO relative to several other facilities and programs in AST's portfolio. In 2006, the AST Senior Review (SR) Committee, a subcommittee of the MPSAC, delivered a report to NSF. This Committee, comprised of external scientists, was charged with examining the AST investment portfolio and finding significant savings, primarily from the facilities portion of the AST budget, while following the priorities and recommendations of community reports. One of the SR's primary recommendations was that "Reductions in the cost of Green Bank Telescope operations, administrative support and the scientific staff at the National Radio Astronomy Observatory should be sought."

In 2010, the NRC conducted its sixth decadal survey in astronomy and astrophysics. In their report, *New Worlds, New Horizons in Astronomy and Astrophysics*, the NRC recommended that

*NSF-Astronomy should complete its next senior review before the mid-decade independent review that is recommended in this report, so as to determine which, if any, facilities NSF-AST should cease to support in order to release funds for 1) the construction and ongoing operations of new telescopes and instruments and 2) the science analysis needed to capitalize on the results from existing and future facilities.*¹

In response to this recommendation, the NSF Directorate for Mathematical and Physical Sciences (MPS) commissioned a subcommittee of the MPS Advisory Committee to assess the AST portfolio of facilities. This subcommittee, composed solely of external members of the scientific community, was charged with recommending a balanced portfolio to prioritize the science recommended by the decadal surveys under constrained budget scenarios. The resulting Portfolio Review Committee (PRC) report, *Advancing Astronomy in the Coming Decade: Opportunities and Challenges*,² was released in August 2012 and included recommendations about all major AST telescope facilities.

Under a constrained budget, the 2012 AST PRC recommended divestment from the GBT. In response to this report, AST took steps to determine the viability of transitioning to an operations model involving significant funding by external collaborators in order to reallocate resources to higher-priority programs.

The continued importance of the NSF response to the PRC Report was highlighted in the annual report of the AAAC in March 2016, which recommended that “[s]trong efforts by NSF for facility divestment should continue as fast as is possible.” The divestment process was also affirmed in the August 2016 National Academies mid-decadal report, *New Worlds, New Horizons, A Midterm Assessment*.³ Recommendation 3-1 states:

The National Science Foundation (NSF) should proceed with divestment from ground-based facilities which have a lower scientific impact, implementing the recommendations of 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.

The same report acknowledged, however, that the “loss of access to the GBT would be very detrimental” to key science programs being carried out with significant NSF support, and to technical capabilities such as very long baseline interferometry and bistatic radar measurements of near-Earth objects and small solar system bodies.

While acknowledging these recommendations, the AAAC also suggested that NSF first consider collaborations with external entities for continued operations rather than complete closure of facilities, in order to preserve U.S. community access to unique scientific capabilities. The March 2016 annual report of the AAAC⁴ stated: “A balanced portfolio is crucial to better realize the scientific potential of the leading facilities and missions and to maintain the success of U.S.

¹ *New World New Horizons in Astronomy and Astrophysics*, 2010, The National Academies of Science, Engineering and Medicine, <http://nap.edu/12951>. !

² *Advancing Astronomy in the Coming Decade: Opportunities and Challenges*, Report of the National Science Foundation ! Division of Astronomical Sciences Portfolio Review Committee, August 14, 2012, ! https://www.nsf.gov/mps/ast/portfolioreview/reports/ast_portfolio_review_report.pdf

³ *New World New Horizons, A Midterm Assessment*, 2016, The National Academies of Science, Engineering and Medicine, ! <http://nap.edu/23560>. !

⁴ Report of the Astronomy and Astrophysics Advisory Committee, March 15, 2016, ! https://www.nsf.gov/mps/ast/aaac/reports/annual/AAAC_2015-16_Report.pdf. !

astronomy and astrophysics in the future.” The report further noted that “the NSF/AST division continues to make progress in responding to the PRC recommendations...[by] partnering of some facilities while limiting the negative impact on the scientific community.” Subsequently, the March 2017 report of the AAAC⁵ noted: “It is recognized by the Portfolio Review Committee, NSF/AST, and the AAAC that complete removal of funding from a facility/telescope might remove productive and sometimes unique assets from being available for astronomical research. For this reason, the preferred divestment alternative being pursued by the NSF has involved forming partnerships that enable valuable observing capabilities (the combination of telescope and instrumentation) to be used for astronomical research. This approach could and should reduce costs to NSF/AST without as severe an impact (on research) as closure.”

The scientific value of GBO remains high, as demonstrated by the capabilities of and demand for its premier instrument, the GBT. The GBT's large collecting area and high sensitivity provide excellent response to point sources such as pulsars, extremely faint sources, extended emission from comets, molecular clouds, and distortions of the cosmic microwave background. The GBT is an extremely efficient and sensitive survey telescope, and it works synergistically with interferometric arrays for observations requiring the highest sensitivity and angular resolution. Its flexibility and ease of use allow rapid response to innovative ideas from the scientific community, including the development of cutting-edge instrumentation in collaboration with university groups and partners. Hundreds of scientists use the GBT each year for research that spans virtually every field of modern astrophysics. Currently, about 4,500 hours of NSF-sponsored "Open Skies" time is available to the general scientific community, and the oversubscription rate (i.e., the ratio of the requested time to available time) has been in the range 2-3 in recent years.

The priorities set forth in the 2012 Portfolio Review have continued to guide the use of limited AST resources. As recognized by the subsequent reports and recent demand, however, the GBT retains significant value and supports a healthy user community, motivating consideration for continuing NSF support of GBO, albeit at a reduced level, while increasing external contributions. Thus, “*Collaboration with interested parties for continued science- and education-focused operations with reduced NSF funding*” was identified as NSF’s Preferred Alternative during its environmental review. This Alternative represents a balanced consideration of community advice and it preserves critical community access to GBO while addressing NSF's need to maintain the most compelling scientific program within a constrained budget. NSF recognized, though, that the ultimate selection of it would be contingent on the presence of a viable collaborator.

B. Identification of Potential Alternatives

NSF sought input regarding concepts of operations that would reduce NSF funding of GBO from the public and scientific community through several meetings and discussions. Currently, NSF owns GBO and provides funding through a Cooperative Agreement with Associated Universities, Inc. (AUI) for management of the facility. The Breakthrough Prize Foundation provides additional funding to AUI to support research at GBO in the search for extraterrestrial

⁵ Report of the Astronomy and Astrophysics Advisory Committee, March 15, 2017, https://www.nsf.gov/mps/ast/aaac/reports/annual/aaac_2016-2017_report_corrected_letter.pdf.

intelligence. Other current GBO funding partners include the North American Nanohertz Observatory for Gravitational Waves (NANOGrav) Project (through a separate NSF funding line) and West Virginia University (WVU). On October 1, 2016, GBO was separated from the NSF-funded NRAO. NSF communicated the plan for separation to the research community on March 22, 2013, in a Dear Colleague Letter DCL NSF 13-074.⁶ That DCL requested expressions of interest in exploring ideas for future operation and management of GBO. Around that same time, NSF directed its environmental contractor to conduct an engineering/feasibility study, which included a baseline environmental survey, to help AST identify potential approaches to divestment. Preliminary proposed alternatives were developed based on the response to the 2013 Dear Colleague Letter, the final engineering/feasibility study, as well as further conversations with AUI, and were included in the Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) pursuant to NEPA, which was published in the *Federal Register* on October 19, 2016.

NSF also sought expressions of interest in the management and operations of GBO through two separate DCLs. The first DCL, NSF 13-074, announced plans for conducting a competition for management and operations of NRAO, excluding the GBT and VLBA to facilitate exploration of cost-efficient operational models and sustainable partnerships for the latter facilities. The DCL invited requests for individual consultations from interested parties in exploring ideas for the operations and management of the GBT and VLBA. The second, more recent DCL, NSF 18-050⁷, “Consultation Regarding Future Continued Operations and Management of Green Bank Observatory,” dated March 5, 2018, sought expressions of interest in providing funding support and in management and operations of GBO. The DCL informed the community that expressions of interest may be very broad in scope “including, for example, science-focused operation of existing facilities, science- and education-focused operations of a reduced set of facilities, or operation as a technology and education park.” Neither DCL elicited expressions of interest from organizations other than AUI.

III. ENVIRONMENTAL COMPLIANCE

A. Compliance with NEPA

GBO is federally owned and funded by NSF. Because NSF proposed a significant change to the operating model of the facility, which could include the demolition of historically significant properties within the site, NSF decided to conduct the most comprehensive environmental analysis under NEPA. NEPA regulations require federal agencies to conduct environmental analyses with various degrees of complexity, depending on the issues associated with a particular analysis. For this Proposed Action, the environmental impacts associated with the proposed Alternatives for GBO were anticipated to be significant; therefore, NSF determined that preparation of an EIS was warranted.

⁶ NSF 13-074, Dear Colleague Letter- National Radio Astronomy Observatory (NRAO) the Robert C. Byrd Green Bank Telescope (GBT) and the Very Long Baseline Array (VLBA), March 22, 2013, <https://nsf.gov/pubs/2013/nsf13074/nsf13074.jsp>.

⁷ NSF 18-050, Dear Colleague Letter: Consultation Regarding Future Continued Operations and Management of Green Bank Observatory, March 5, 2018, <https://www.nsf.gov/pubs/2018/nsf18050/nsf18050.jsp?org=DIAS>.

The scoping process for NSF's environmental review was initiated upon publication of the NOI on October 19, 2016. NSF notified, contacted, and/or consulted with agencies, organizations, and individuals during the scoping process and throughout the development of the EIS. Public disclosure and involvement included pre-assessment notification letters to agencies, social media announcements, website updates, scientific digests and blogs, newspaper public notices, fliers mailed to local schools, post offices, and businesses, and two public scoping meetings (conducted on November 9, 2016, in Green Bank, West Virginia). The public comment period concluded on November 25, 2016, ending the scoping phase of the NSF's NEPA process. (Details of the significant efforts NSF took to notify and involve the public during its environmental review are provided in Section 5 of the Final Environmental Impact Statement (FEIS), which was issued on February 22, 2019.) Input received during the scoping phase was used to vet the preliminary proposed alternatives presented in the NOI and to provide focus on the issues to be evaluated in the Draft Environmental Impact Statement (DEIS).

1. Alternatives Considered

As detailed in the EIS, following the scoping process and consideration of the oral comments provided during the scoping meetings and the 817 written letters and emails received during the public comment period, NSF refined the Alternatives and identified an Agency-Preferred Alternative. The four Action Alternatives, in addition to the No Action Alternative, were considered for the proposed change in operations of GBO:

- Alternative A: Collaboration with Interested Parties for Continued Science- and Education-focused Operations with Reduced NSF funding (Agency-Preferred Alternative)
- Alternative B: Collaboration with Interested Parties for Operation as a Technology and Education Park
- Alternative C: Mothballing of Facilities
- Alternative D: Demolition and Site Restoration
- No-Action Alternative: Continued NSF Investment for Science-focused Operations

Under each Action Alternative, it was noted that some level of demolition of buildings and structures could occur, depending on the needs of the collaborator(s) involved. Buildings and structures that could be demolished were identified only for the purpose of analysis and would not necessarily be demolished. Alternatives A and B were defined by the reduction of NSF funding and the continuance of science- and education-focused operations (under Alternative A) or operation as a technology and education park (under Alternative B) and not by the disposition of any one facility or structure. AST acknowledged that Alternatives A and B could only be implemented if potential collaborators and/or operators provided viable proposals for continued operations, including plans for obtaining funding to supplement that provided by NSF. Use or demolition of any particular building, structure, or instrument could not be determined unless or until a viable collaboration option were under consideration. Because reduction of NSF funding could require the mothballing or demolition of facilities, the EIS analyzed the Action Alternatives under the most conservative (highest environmental impact) scenario in terms of NSF's analysis of potential changes to facilities, so that the full range of potential environmental impacts could be assessed. The analysis approach taken was consistent with NEPA requirements

and was sufficiently broad to allow NSF to complete its analysis without regard to the specifics of a future collaboration.

The Alternatives analyzed in the EIS are described below:

Alternative A – Collaboration with Interested Parties for Continued Science- and Education-focused Operations with Reduced NSF funding (Agency-Preferred Alternative)

Action Alternative A would involve collaborations with new stakeholder(s) who would use and maintain GBO for continued science- and education-focused operations. NSF would reduce its funding of GBO and the new stakeholder(s) would be responsible for future maintenance and upgrades. Under this Alternative, NSF could transfer or retain the property. Potential transfers could be made to other federal agencies, commercial interests, or non-profit entities. Action Alternative A would involve the least change to the current facility and would retain the GBT, other appropriate telescopes, and supporting facilities for education and research as determined by NSF and the new and/or existing stakeholder(s). Any structures not needed to meet the anticipated operational goals would be safe-abandoned⁸, mothballed⁹, or demolished, as appropriate.

Operations after implementation would be similar to current operations, and operation staffing levels would be expected to stay the same. Operations would be expected to continue at non-affected facilities during any scheduled demolition activities. Demolition activities that could interfere with the use of the GBT and other telescopes and data collection would be coordinated with GBO staff to minimize the potential for disrupting scientific work.

Alternative A was also identified as the Agency-Preferred Alternative. This Action Alternative would meet the purpose of reducing the funding required from NSF and allow continued benefits to the scientific and educational communities. This Alternative, however, could only be implemented if new and/or existing collaborators came forward to participate as collaborating parties with viable proposed plans to provide additional non-NSF funding in support of their science- and education-focused operations. Collaborators being sought could include agencies, educational institutions, non-profit entities, industrial or commercial ventures, or private individuals.

Alternative B – Collaboration with Interested Parties for Operation as a Technology and Education Park

Action Alternative B would involve collaborating with outside entities to operate and maintain GBO as a technology and education park. In this scenario, the site would focus on tourism and serve as a local attraction. The Science Center, residential hall, cafeteria, and 40-foot telescope would remain active. Under this Alternative, NSF could transfer or retain the property. Potential transfers could be to other federal agencies, commercial interests, or non-profit entities.

⁸ Safe-abandonment: To remove a building or facility from service without demolishing it. This includes removing furnishings, disconnecting utilities, and isolating the structure from public access by fencing or other means to reduce fall and tripping hazards and preclude vandalism. The structure would also be made secure from environmental damage due to wind, rain, humidity, and temperature extremes. Pest and insect damage would also be taken into account and biodegradable items would be removed to the maximum extent practicable. Under safe-abandonment, there is no intention that structures would be brought back to operational status.

⁹ Mothball: To remove a facility or structure from daily use while maintaining the general condition for a defined period. Equipment and structures would be kept in working order but not used.

Operations would be expected to continue during implementation. Demolition activities that could interfere with the use of the 40-foot telescope and data collection would be coordinated with GBO staff to minimize the potential for disrupting observational work.

Operations after demolition would be comparable to current operations. However, it would be anticipated that there would be a reduction in operations staff under Action Alternative B.

Alternative C – Mothballing of Facilities

Action Alternative C would involve mothballing (temporarily preserving) essential buildings, telescopes, and other equipment, with periodic maintenance to keep them in working order. This method would allow the facility to suspend operations in a manner that would permit operations to resume efficiently at some time in the future. It is not known what types of operations would be implemented at the end of the mothball phase. Operations at the time of resumption could be similar to current operations, other science-based operations, education-based operations, or some other type of operations. Because of this uncertainty, the resumption of operations is not considered part of this Alternative.

Supporting structures would be evaluated to determine whether they are critical to the operation of the telescopes. Under this Alternative, up to nine structures and facilities could be determined to be obsolete and possibly removed.

A maintenance program would be required to protect the facilities (e.g., buildings and structures) from deterioration, vandalism, and other damage. Regular security patrols would be performed to monitor the site. Common mothballing measures, such as providing proper ventilation, keeping roofs and gutters cleaned of debris, and performing ground maintenance and pest control, would be implemented. Lubrication and other deterioration-preventing measures would be required on the remaining telescopes.

Visitor housing and recreational areas would be closed indefinitely, with water lines drained and electricity turned off. All supplies, books, photographs, furnishings, and other items not needed for periodic maintenance would be removed from the site. Equipment, tools, machinery, furniture, and ancillary items not needed for the resumption of operations would be disposed of in accordance with federal law.

Gates and fencing would be evaluated to determine whether upgrades would be needed to provide appropriate security.

Landscaped areas would be maintained during the mothball period. All infrastructure related to the telescopes would be conditioned for safe storage to prevent the degradation of equipment and allow operations to be restarted. Regular vegetation maintenance would be implemented to keep vegetation from overgrowing the reflector dishes.

For purposes of the analyses in the EIS, it was assumed that operations would be suspended for an indefinite time and then resumed at some point in the future. It was anticipated that technical staff responsible for operating the telescopes, scientific support staff, and cafeteria workers would not be retained. However, it was expected that current staffing levels for facilities maintenance would mostly remain the same under Action Alternative C because of the level of maintenance required to keep the infrastructure operable.

Alternative D – Demolition and Site Restoration

Action Alternative D involves the removal of all structures. Demolition would be accomplished using conventional demolition equipment (cranes, hydraulic excavator equipped with hydraulic-operated shears, grapplers, and hoe rams), other conventional heavy- and light-duty construction equipment, trades personnel, and trained demolition crews. For safe demolition of the GBT, 43-meter telescope, and water tower, initial demolition would likely be accomplished using explosives in the form of shaped charges and conventional demolition and/or construction equipment.

Equipment, tools, machinery, furniture, and ancillary items that have a salvage value could be transported to another NSF facility, sold, or donated by GBO prior to demolition activities. All remaining facilities and structures, except for the existing perimeter fencing, would be demolished. Exposed below-grade structures would be removed to a maximum of 4 feet below grade to enable the restoration of the ground surface topography.

Areas revegetated following demolition activities would be maintained for a period of up to 18 months, or less if target revegetation were achieved sooner. Vegetation maintenance staff would be retained through this period.

Operations at GBO would cease. It is anticipated that under this Alternative, staffing levels would not be maintained.

No Action Alternative: Continued NSF Investment for Science-focused Operations

Under the No Action Alternative, NSF would continue to fund GBO at current levels. None of the Action Alternatives (Alternatives A through D) would be implemented.

2. The DEIS, and the FEIS

Following the scoping phase of its NEPA process and consideration of all comments received during the public comment period, NSF prepared its Draft Environmental Impact Statement (DEIS). A Notice of Availability of the DEIS was announced in the *Federal Register* on November 8, 2017, and NSF distributed it to federal, state, local, and private agencies, organizations, and individuals for review and comment during a 60-day public comment period, which commenced on November 9, 2017, and concluded on January 8, 2018. (The public comment period was extended beyond the 45-day comment period required by NEPA regulations in consideration of the winter holidays.) The DEIS was also filed with the U.S. Environmental Protection Agency (EPA).

A public meeting on the DEIS was conducted on November 30, 2017, in Green Bank, West Virginia during which 125 participants registered and 39 speakers provided public comments. The total number of oral and written comments received during the public comment period was 237. (A summary of the comments received is presented in Section 5 of the FEIS.) NSF also received comments during its Section 106 consultation process pursuant to the NHPA. NSF considered all public comments received on the DEIS and during its Section 106 consultations and addressed them in its FEIS, which was issued on February 22, 2019. (The FEIS is available on NSF's website, www.nsf.gov/ast, as can also be found in EPA's Environmental Impact Statement Database.)

Issuance of this Record of Decision is the last step in NSF's NEPA. It also reflects NSF's other considerations in reaching its decision on a path forward for GBO, including the results of its

ESA and Section 106 consultations, NSF's recognition of the scientific research capabilities of GBO within the AST portfolio, AST budgetary requirements and constraints, the viability of potential collaborators, and the astronomy community's recommendations.

3. Environmental Impacts

The FEIS contains a detailed analysis of the environmental impacts associated with each Action Alternative and the No Action Alternative. The FEIS includes the methodology used to determine impact thresholds and the factors considered to assess the impact threshold for the resource areas analyzed under each Action Alternative and the No Action Alternative. Impacts were generally classified as negligible, minor, moderate, or major, assuming that best management practices (BMPs) and identified mitigation measures are implemented. Impact thresholds were specific to each resource. A description of impact intensity for each resource is provided in the "Impact Thresholds" table at the beginning of the subsection for each resource evaluated in Section 4, Environmental Consequences, of the FEIS. Section 4 also contains descriptions of BMPs and mitigation measures associated with each Alternative. The BMPs and mitigation measures applicable to the selected Alternative are also summarily discussed in Section IV. DECISION, of this document.

The potential environmental impacts are summarized below only for the general categories where moderate or major impacts are envisioned under each Alternative. A comprehensive discussion and analysis of all impacts (including those anticipated to be negligible or minor) and mitigation measures, however, is provided in the FEIS. (Note that the FEIS and the entire administrative record supporting NSF's environmental reviews under NEPA, the ESA, and Section 106 are hereby incorporated by reference.)

Alternative A: Collaboration with Interested Parties for Continued Science- and Education-focused Operations with Reduced NSF Funding (Agency-Preferred Alternative)

Cultural Resources: Although Alternative A primarily involves continued operations of GBO, this Alternative does, as discussed earlier, include some demolition, safe-abandonment and mothballing. Because of the significance of some of the historic resources at the site, demolition would result in a major, adverse, long-term impact to known historic properties. Likewise, safe-abandonment would result in moderate, adverse, and long-term impact. There would be negligible impacts on known historic properties from mothballing during operations. Post-implementation, the safe-abandonment of the 43-meter telescope (140-foot telescope) would result in a major, adverse, long-term impact. If the property remains under federal ownership, the impacts on the GBO historic district as a whole would be moderate, adverse, and long-term. If the property is transferred out of federal ownership, the impacts on the GBO historic district as a whole would be major, adverse, and long-term. No impacts to archaeological resources would be expected during either demolition, safe-abandonment, mothballing, or operation activities.

Noise: The limited demolition associated with this Alternative would result in moderate, adverse, and short-term noise impacts on onsite workers and site neighbors. Noise impacts from increased traffic volumes would be negligible. There would be no noise impacts post-implementation.

Socioeconomic: Impacts on temporary housing in Pocahontas County during implementation would be moderate, beneficial, and short-term. There would be no impact on permanent housing in Pocahontas County or Green Bank, and Arbovale census-designated places (CDPs) post-

implementation. Impacts on the economy of Pocahontas County during implementation would be moderate, beneficial, and short term. Post-implementation there would be negligible impacts on the economy. During demolition, there would be no impacts on school enrollment. Post-implementation, there would be no impacts on school enrollment in Pocahontas County or Green Bank and Arbovale CDPs. There would be minor, adverse, and short-term impacts on regional educational opportunities and there would be no impact on regional tourism. Post-implementation, the impacts on community cohesion on Pocahontas County would be minor, adverse, and long-term and on Green Bank and Arbovale CDPs the impacts would be moderate, adverse, and long-term.

Alternative B: Collaboration with Interested Parties for Operation as a Technology and Education Park

Cultural Resources: Although Alternative B primarily involves continued operations of GBO, this Alternative does include some demolition, safe-abandonment and mothballing. The limited demolition associated with this Alternative would result in a major, adverse, long-term impact to known historic properties. Due to anticipated deterioration of known historic properties, safe-abandonment would result in moderate, adverse, and long-term impact. There would be negligible impacts on known historic properties from mothballing during operations. Post-implementation, the safe-abandonment of the 43-meter telescope (140-foot telescope) would result in a major, adverse, long-term impact. If the property were to remain under federal ownership, the impacts on the GBO historic district as a whole would be moderate, adverse, and long-term. If the property is transferred out of federal ownership, the impacts on the GBO historic district as a whole would be major, adverse, and long-term. No impacts to archaeological resources would be expected during either demolition, safe-abandonment, mothballing, or operation activities.

Noise: Demolition noise would result in a moderate, adverse, and short-term impact on onsite workers and site neighbors. Noise impacts from increased traffic volumes would be negligible. There would be no impacts from noise post-implementation.

Socioeconomic: Impacts on temporary housing in Pocahontas County during implementation would be moderate, beneficial, and short term. Post-implementation, there would be minor, adverse, and long-term impact on permanent housing in Pocahontas County as well as in Green Bank and Arbovale CDPs. Impacts on the economy of Pocahontas County during implementation would be moderate, beneficial, and short term. Post-implementation there would be moderate, adverse, and long-term impacts on the economy. During demolition there would be no impacts on school enrollment. Post-implementation, there would be minor, adverse, and long-term impacts on school enrollment in Pocahontas County and moderate, adverse, and long-term impacts on Green Bank and Arbovale CDPs. There would be moderate, adverse, and short-term impacts on regional educational opportunities and there would be moderate, adverse, and long-term impact on regional tourism. Post-implementation, the impacts on community cohesion on Pocahontas County would be minor, adverse, and long-term and on Green Bank and Arbovale CDPs, the impacts would be moderate, adverse, and long-term.

Alternative C: Mothballing of Facilities

Cultural Resources: Although Alternative C primarily involves mothballing, this Alternative does include some demolition activities, which would result in a major, adverse, long-term impact to known historic properties. There would be negligible impacts on known historic

properties from mothballing during operations. Post-implementation, the mothballing activities would result in a moderate, adverse, long-term impact. If the property were to remain under federal ownership, the impacts on the GBO historic district as a whole would be moderate, adverse, and long-term. No impacts to archaeological resources would be expected during either demolition or mothballing activities.

Noise: Demolition noise would result in a moderate, adverse, and short-term impact on onsite workers and site neighbors. Noise impacts from increased traffic volumes would be negligible. There would be no impacts from noise post-implementation.

Socioeconomic: Impacts on temporary housing in Pocahontas County during implementation would be moderate, beneficial, and short term. Post-implementation, there would be moderate, adverse, and long-term impact on permanent housing in Pocahontas County and major, adverse, and long-term impact on Green Bank and Arbovale CDPs. Impacts on the economy of Pocahontas County during implementation would be minor, beneficial, and short term. Post-implementation there would be major, adverse, and long-term impacts on the economy. During demolition there would be no impacts on school enrollment. Post-implementation, there would be moderate, adverse, and long-term impacts on school enrollment in Pocahontas County and major, adverse, and long-term impacts on Green Bank and Arbovale CDPs. There would be major, adverse, and short-term impacts on regional educational opportunities and there would be major, adverse, and long-term impact on regional tourism. Post-implementation, the impacts on community cohesion on Pocahontas County would be moderate, adverse, and long-term and on Green Bank and Arbovale CDPs the impacts would be major, adverse, and long-term.

Alternative D: Demolition and Site Restoration

Biological Resources: During demolition, impacts to biological resources would include minor, adverse, short-term impacts to vegetation, negligible impacts to wildlife, no impact to threatened and endangered species, and negligible impact to migratory birds. After site restoration, there would be a moderate, long-term benefit to vegetation and wildlife, and a minor, long-term benefit to threatened and endangered species and migratory birds.

Cultural Resources: Demolition would result in a major, adverse, long-term impact to known historic properties. If the property were to remain under federal ownership, the impacts on the GBO historic district as a whole would be major, adverse, and long-term. No impacts to archaeological resources would be expected during demolition activities.

No Action Alternative: Continued NSF Investment for Science-focused Operations

Under the No Action Alternative, current operations of GBO would continue. No demolition, safe-abandonment, or mothballing would occur, and no change from current conditions would result. There would be no impacts to resources under the No Action Alternative.

4. Environmentally Preferable Alternative

The determination of the Environmentally Preferable Alternative, as required by the regulations implementing NEPA, is based on the analysis of environmental impacts presented in Section 4 of the FEIS (which is hereby incorporated by reference) and summarized under Section III. A.3. Environmental Impacts, herein. Also considered were the net differences in impacts among the Alternatives after applying all mitigation and monitoring measures. Based on this analysis and a comparison between the net differences in impacts among all of the Alternatives, the No Action Alternative would have the least potential for adverse impacts and, therefore, is the

Environmentally Preferable Alternative. However, because the No Action Alternative does not meet the purpose and need of the Proposed Action, NSF has completed a comparison of the net impacts anticipated from the four Action Alternatives. When compared to the other Action Alternatives, Alternative A would result in the least amount of adverse impacts. The net impacts associated with Alternative A would include only the following moderate adverse impacts:

- moderate, adverse, short-term impact on known historic properties from safe-abandonment
- moderate, adverse, long-term impact on the NRHP-eligible historic district if the property remains under federal ownership
- moderate, adverse, short-term noise impacts resulting from implementation
- moderate, adverse, long-term impact on community cohesion

The net impacts associated with Alternative A would result in only the following major adverse impacts:

- major, adverse, long-term impacts on NRHP-eligible historic properties from any demolition activities
- major, adverse, long-term impacts on the NRHP-eligible historic district if the property is transferred out of federal ownership

When compared to the other Action Alternatives, Alternative A would result in the least net moderate and major adverse impacts. Accordingly, NSF has determined that Alternative A is the Environmentally Preferable Action Alternative.

5. Post-FEIS Comments Received

Following issuance of the FEIS, NSF received four comments, two from individuals, one from the U.S. Environmental Protection Agency (EPA), and one from the SHPO. One of the individual commenters submitted an email in which he inquired about the status of the Proposed Action. NSF responded by indicating that a final decision is being determined and would be released soon. The second individual commenter submitted an email noting that GBO “should be maintained for continued research and searching for signals from exoplanets and intelligent beings in our galaxy and other galaxies in deep space.” He also suggested that NSF thoroughly check with “NASA, SETI, and major universities doing this type of astronomical research.” NSF now responds to this comment by noting that the selection of Alternative A does allow for such research to continue to be carried out, and that NSF has reached out to NASA and others through the DCL and other processes described at the outset of this ROD to solicit interest in GBO.

In the letter from the EPA, it was noted that the “EPA appreciates the efforts [of NSF] to make changes and adopt recommendations from previous comments, state and federal agencies, tribes, and public input. As a result of these changes and our previous review of the document, EPA has reviewed the FEIS and has no further comments.” NSF appreciates the feedback from EPA and notes that no further response is warranted.

In its letter to NSF, the SHPO indicates its continued concurrence with NSF’s determination that all of the Action Alternatives would have adverse effects on historic properties. The SHPO also notes that the Area of Potential Effects (APE) (i.e., the portions of GBO that would likely be affected by the Proposed Action) has not been surveyed for the presence of archaeological sites,

and that such sites could be present within the APE. The SHPO then states that, as long as no tree removal or disturbances to undeveloped areas would be necessary during any demolition activities, as is indicated in the FEIS, it concurs that the Proposed Action would have no effect on archaeological resources. The SHPO cautions, however, that any undertaking outside of that scope would need to be submitted separately for its review. NSF acknowledges the information provided in the SHPO's letter and notes that no further response is warranted.

B. Compliance with Other Legal Authorities

Concurrently with the NEPA process, NSF carried out its compliance with Section 7 of the ESA (16 United States Code [U.S.C.] §§ 1531–1544), and the Department of the Interior and Department of Commerce regulations implementing Section 7 on interagency cooperation, which are found at 50 C.F.R. Part 402. NSF also carried out its compliance with Section 106 of the NHPA (54 U.S.C. § 306108, formerly 16 U.S.C. § 470f) (Section 106) and its implementing regulations promulgated by the Advisory Council on Historic Preservation (ACHP) found at 36 C.F.R. Part 800.

1. Endangered Species Act (Section 7) Compliance

The ESA and subsequent amendments thereto provide for the protection and conservation of threatened and endangered species (listed species) of animals and plants, and the ecosystems on which listed species depend. The ESA prohibits federal agencies from funding, authorizing, or carrying out actions likely to jeopardize the existence of listed species through direct taking or through the destruction or adverse modification of critical habitat designated for these species under the ESA. Section 7 of the ESA requires consultation with the U.S. Fish and Wildlife Service (USFWS) when any listed species under its jurisdiction may be affected by a proposed action.

A letter was sent to USFWS on October 20, 2016, to formally initiate Section 7 consultation, and a follow-up “findings of effect” letter was sent on March 16, 2017. A “no effect” determination letter from USFWS was received on March 29, 2017. On April 13, 2017, USFWS followed up with an additional letter that concurred with NSF's determination that any Alternative selected by NSF would have no effect on the federally-listed bat species, and that no biological assessment or further Section 7 consultation under ESA was required.

2. National Historic Preservation Act (Section 106) Compliance

The implementing regulations for the NHPA are found at 36 C.F.R. Part 800 (Protection of Historic Properties), which define historic properties as any prehistoric or historic district, site, building, structure, or object that is included in, or eligible for inclusion in, the National Register of Historic Places (NRHP) (54 U.S.C. § 302101). Here, the proposed changes to operations at GBO with reduced NSF funding constitutes an “undertaking” under the Act and, therefore, established the need for Section 106 compliance. The purpose of the Section 106 consultation process is to: 1) evaluate the Proposed Action's potential for adverse effects on existing NRHP-eligible or listed historic properties, if any, and 2) consult with interested parties, including government agencies and local community associations, and the State Historic Preservation Officer (SHPO) on ways to resolve any adverse effects through avoidance, minimization, and/or mitigation. The resolution of any adverse effects is memorialized in either a Memorandum of Agreement or a Programmatic Agreement (PA).

NSF determined that GBO is eligible for listing on the NRHP as a historic district and that all four Action Alternatives would have the potential to result in adverse effects on historic properties due to the potential demolition, safe-abandonment, and/or mothballing of some or all components of GBO. Given the range of potential outcomes associated with this undertaking, as well as a lack of information regarding whether any potential collaborator(s) would be identified and the specific needs of any new collaborator(s), NSF developed a PA in compliance with 36 C.F.R. § 800.14(b)(1)(ii) to determine appropriate measures to address adverse effects associated with the range of potential outcomes (*see* FEIS Appendix 4.2A). In addition to the more general provisions, the PA specifically requires NSF to do the following:

- To the extent that GBO operations continue under NSF or new federal ownership, NSF would make every effort to avoid adverse effects on historic properties by encouraging any collaborator(s) with operational responsibilities or new federal owner(s) to use as many historic properties as practicable, provided that such use facilitates continued operations.
- To the extent that GBO operations continue under NSF ownership, NSF would ensure that any new collaborator(s) with operational responsibilities continue a program of cyclical maintenance to preserve the structural integrity and historic fabric of the NHL Reber Radio Telescope, as well as the Jansky Replica Antenna, Ewen-Purcell Horn, and the Calibration Horn, and would provide for long-term preservation of these properties.
- To the extent that GBO operations continue under NSF or new federal ownership, as soon as practicable following selection of a new collaborator, NSF would consult with the SHPO and any new collaborator(s) with operational responsibilities to discuss the development and implementation of preservation principles and management strategies that permit continued science- and education-focused operations at GBO while preserving its historic integrity. In addition, NSF would ensure that the key facility staff of any new collaborator with operational responsibilities receive an initial, one-time historic preservation awareness training to encourage awareness of the historic significance of GBO and to minimize the potential for adverse effects on historic properties.
- To the extent that GBO operations continue under NSF ownership, any mothballing of historic properties would be implemented in accordance with the National Park Service's (NPS's) Preservation Brief 31, "Mothballing Historic Buildings" (Park, 1993) and The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Buildings (Grimmer, 2017).
- If a change in disposition of the Reber Radio Telescope (e.g., a transfer of ownership to a non-federal entity) would occur, NSF would consult with the NPS, the SHPO, and any new collaborator with operational responsibilities on preservation principles and management strategies regarding the long-term preservation of the NHL Reber Radio Telescope. Should long-term preservation in place not be feasible or desirable, NSF would consult with the NPS and the SHPO on possible relocation of the Reber Radio Telescope, either onsite or offsite. If relocation to a suitable location is not feasible, then NSF would consider appropriate documentation for the Reber Radio Telescope, in

consultation with the NPS and the SHPO, prior to any demolition or dismantling of the telescope.

- If a change in disposition (whether it be demolition, safe abandonment, or transfer to a non-federal entity) of any historic property would occur, NSF would complete appropriate and reasonable documentation.
- If demolition, transfer to a non-federal entity, safe abandonment, or mothballing of historic properties would occur, NSF would identify any historically significant equipment and artifacts associated with historic properties that would not be repurposed for further scientific or educational use, and if feasible, NSF would contact relevant scientific/educational institutions for possible reuse of the equipment and artifacts, or contact an appropriate museum to determine if any of the equipment and/or artifacts can be donated to the museum's collection.
- If a transfer to a non-federal entity would occur, NSF would consult with the SHPO and the new owner to discuss the development and implementation of preservation principles and management strategies that permit continued science- and education-focused operations at GBO while preserving its historic integrity. In addition, NSF would ensure that the key facility staff of any new owner receive an initial, one-time historic preservation awareness training to encourage awareness of the historic significance of GBO and to minimize the potential for adverse effects on historic properties.
- In the case that unanticipated archaeological resources are discovered during implementation of the undertaking, NSF would address potential adverse effects on historic properties.

The PA was developed following several consultation meetings including, but not limited to, a conference call with the SHPO and ACHP on March 8, 2018 to discuss measures to avoid, minimize, and/or mitigate adverse effects, a June 28, 2018 consultation meeting with all consulting parties at GBO to discuss a draft PA that was distributed on June 14, 2018, and a final consultation meeting on July 25, 2018 to discuss a revised draft PA that was prepared following a 30-day comment period on the draft PA. NSF's Section 106 compliance process was completed on August 3, 2018, with the signing of the PA by the NSF, the ACHP, the SHPO, the NPS, and Concurring Parties (FEIS Appendix 4.2A).

IV. DECISION

NSF has determined that it must change operations at GBO in light of funding constraints. The scientific community's recommendations to reduce NSF's contributions to operations at GBO and ensure a balanced portfolio led to NSF's determination that an increase in contributions from external partnerships to reduce NSF support was necessary and desirable.

Any decision by NSF to reduce funding and change operations at GBO must be made with a full understanding of the environmental consequences resulting from these changes. NSF's decision was made after reviewing and considering all of the analyses completed during the environmental review process, including the analyses presented in the FEIS and the outcomes of the ESA and NHPA consultations. Based on the analyses contained in the FEIS, including the implementation of mitigation measures, as well as in the ESA and NHPA consultations, none of the Action Alternatives would result in impacts that would be a barrier to their selection. The

selection of a suitable alternative was also predicated on three other important considerations: 1) contributions to NSF's mission of advancing science and education, 2) the viability of potential collaborators to support science and education activities at the facility, and 3) the impact on AST's budget. A discussion of NSF's decision follows.

A. Alternative Selected

Alternative A: Collaboration with Interested Parties for Continued Science- and Education-focused Operations with Reduced NSF funding (Agency-Preferred Alternative)

As an important step toward enabling Alternative A, NSF has identified an additional viable external collaborator who seeks to use the GBT for basic and applied research. Contingent on this ROD selecting Alternative A, the new collaborator would contribute significantly to the annual operations cost of GBO, allowing NSF to reduce its funding of the facility. Given the viability of the potential new collaborator, it is now reasonable to consider implementation of Alternative A as being feasible.

The implementation of Alternative A would:

- Enable a balance between reducing NSF funding and supporting critical capabilities of GBO for the scientific community;
- Preserve significant open access to GBO by the U.S. community for science and education activities; and
- Minimize adverse impacts on the environment, historic properties, local economy, and personnel relative to Alternatives B, C, and D.

Alternative A, as explained previously and more thoroughly in the FEIS, could, however, result in adverse impacts on various resources. To reduce those impacts, which largely would result from demolition activities deemed necessary by a collaborator(s), NSF has committed to implementing mitigation measures. All practicable means to avoid or minimize environmental harm from Alternative A have been adopted. In addition to the avoidance, minimization, and mitigation measures set forth in the PA to address adverse effects on historic resources, the following list of mitigation measures would be implemented as part of Alternative A:

Biological Resources

- Demolition activities would occur only in currently disturbed and maintained areas. Forested areas and streams would be fully avoided.
- Stormwater BMPs would be implemented prior to starting demolition 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 demolition.
- While it is unknown whether GBO would be transferred out of federal control in the future, if it were, NSF would consult with USFWS, as appropriate, to meet Section 7 consultation requirements and to determine any necessary mitigation measures (e.g., land use controls).

- If demolition activities were to extend beyond one year, NSF would confirm with the USFWS that there are no new threatened or endangered species expected in the area. If new species are present NSF will reengage in ESA Section 7 consultation.

Visual Resources

- Mothballed and safe-abandoned buildings would be regularly maintained to preserve the visual character of the site.

Geology and Soils

- Standard construction stormwater controls would be implemented and maintained to prevent scour and soil loss from runoff. 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, including 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 any demolition.
- Disturbed areas would be stabilized and revegetated and/or re-landscaped to minimize the potential for erosion after any demolition is completed.
- Any earth-disturbing activities would be conducted in a manner that minimizes alteration of existing grade and hydrology.
- Because of the potential for heavy rain events to result in unsafe work conditions and increased landslide conditions, including, but not limited to, debris flow, the decision to conduct any demolition-related work during heavy rain events would be evaluated on a case-by-case basis to lower the risk for debris flow. Explosives would not be used during a period of high landslide potential.

Water Resources

- Stormwater BMPs would be implemented prior to the start of demolition 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 demolition. Site-specific stormwater BMPs would be detailed in a construction SWPPP, which would be prepared before breaking ground.
- A Groundwater Protection Plan (GPP) would be developed for any demolition work to address risks to groundwater from potential spills. The GPP would address 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.

Hazardous Materials

- A site characterization and the removal or remediation of contamination would be completed prior to any demolition and land transfer activities.
- Hazardous materials and waste would be used, stored, disposed of, and transported during demolition in compliance with all applicable laws and regulations.
- Contractors would create and implement a spill response plan.
- NSF would require all contractors to create and implement a construction management plan, including hazardous materials discovery protocols. The construction management plan would include, at a minimum, a list of contact persons in case of a possible encounter with undocumented contamination; provisions for immediate notification of the observation to construction management; and provisions for notifying the regulatory agency with jurisdiction. If previously unknown contamination is found, demolition would halt near the find and the next steps would be decided in consultation with the regulatory agency.

Solid Waste

- Whenever possible, demolition debris such as soil would be used onsite.
- Demolition debris would be diverted from landfills through reuse and recycling to the extent practicable.

Health and Safety

- The contractor carrying out demolition work would develop and implement a demolition phase Health and Safety Plan.
- GBO personnel would comply with OSHA safety protocols.
- Fencing and signage would be installed around demolition sites.

Noise

- Notify neighbors of demolition noise in advance and its expected duration so they may plan appropriately.
- Ensure exhaust systems on equipment are in good working order. Equipment would be maintained on a regular basis and would be subject to inspection by the construction project manager to ensure maintenance.
- Use properly designed engine enclosures and intake silencers where appropriate.
- Use temporary noise barriers where appropriate and possible.
- Ensure new equipment is subject to new product noise emission standards.
- Locate stationary equipment as far from sensitive receptors as possible.
- Perform demolition activities in noise sensitive areas during hours that are the least disturbing for adjacent and nearby residents.

Traffic and Transportation

- Transport of materials and large vehicles would occur during off-peak hours when practicable.
- Delivery truck personnel and construction workers would be notified of all potential height restrictions and overhead obstructions.
- Vehicles used for material transport would 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 from the proper authority.
- Further detailed waste haul routes and concerns would be addressed during the demolition planning phase of the Action, including verification that all bridge crossings on the delivery route have adequate strength and capacity.
- The contractor would coordinate with local public schools to ensure haul routes do not adversely affect school bus traffic.

The most significant major, adverse impact from the change in operations under Alternative A at GBO is the impact on historic properties associated with the historic use of GBO. Although mitigation measures would be implemented to avoid impacts, the potential for major, adverse impacts remains if demolition is requested by a future collaborator(s) for continued operations. As discussed above, the PA was developed to address those impacts (FEIS Appendix 4.2A).

It is important to note that Alternatives A and B are the only Action Alternatives that would continue science- and education-focused operations (under Alternative A) or operation as a technology and education park (under Alternative B) at GBO in keeping with NSF's mission. Below we describe why Alternatives B through D were not selected for implementation.

B. Alternatives Not Selected

Alternative B: Collaboration with Interested Parties for Operation as a Technology and Education Park would require potential collaborators to be interested in funding the operation of GBO as a technology and education park. The response to the NSF 18-050 March 5, 2018 Dear Colleague Letter indicated that potential collaborators are not interested in funding a technology and education park. No expressions of interest in operating GBO as a technology and education park were received in response to NSF 18-050 Dear Colleague letter dated March 5, 2018. Hence, Alternative B is not considered to be a viable Alternative and, therefore, was not selected.

Alternative C: Mothballing of Facilities would negate the scientific and educational opportunities discussed previously. The cost of mothballing GBO, as identified in a preliminary study contracted by NSF, would be approximately \$4.9 million at the outset, and approximately \$2.1 million annually; this estimate is based on fiscal year 2015 dollars and does not include additional costs associated with mothballing historic properties at the site in accordance with historic preservation standards. Given the cost associated with preparation and continued maintenance, AST does not view mothballing this facility as part of a viable solution for the final disposition of GBO. Mothballing would only be justified as a temporary measure if no viable new collaborators were identified and the pursuit of external collaborators interested in funding GBO at levels required to maintain operations was anticipated to yield results. Since NSF has

identified a viable collaborator who would provide funding at significant levels, AST does not view mothballing as a reasonable course of action.

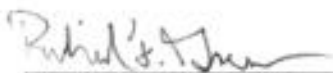
Alternative D: Demolition and Site Restoration permanently negates all science and educational opportunities at GBO, which were valued by the scientific community and the public. As a result, an investment in demolition and site restoration is not justified, and, accordingly, Alternative D was not selected.

The No Action Alternative is not viable because it does not meet the purpose and need of the Proposed Action outlined in the FEIS (i.e., the requirement to reduce NSF funding).

C. Conclusion

NSF has completed a multi-year and comprehensive assessment of GBO to determine a path forward for the facility. This assessment included a community-based determination of priorities relative to other AST programs, the identification of GBO's continuing benefits to the scientific community and the general public, a thorough EIS process that carefully analyzed the anticipated environmental impacts associated with a range of Alternatives and mitigation measures available to address significant adverse impacts. A viable new collaborator has also been identified that would allow NSF to reduce its funding of GBO while preserving critical community access to the facility, making successful implementation of Action Alternative A feasible.

At its May 15, 2019 meeting, after reviewing the scientific merit and the considerations outlined above, the National Science Board authorized the Director (or her designee) to approve the selection of **Alternative A: Collaboration with Interested Parties for Continued Science- and Education-focused Operations with Reduced NSF funding (Agency-Preferred Alternative)** as the path forward for GBO. As the Director's designee, I have, likewise, considered the scientific merit of GBO, the budgetary constraints faced by NSF, the anticipated environmental consequences and mitigation measures associated with a wide range of Alternatives, the public comments received throughout the environmental review process, and the viability of a new collaborator that would allow NSF to reduce its funding of GBO. After thorough consideration of the entire administrative record, I conclude that **Alternative A: Collaboration with Interested Parties for Continued Science- and Education-focused Operations with Reduced NSF funding (Agency-Preferred Alternative)** represents an opportunity to enable NSF to continue critical operations at an important and historically significant astronomical facility that conducts useful and innovative science and educational activities. Accordingly, I hereby issue this ROD selecting Alternative A as the path forward for GBO.



Dr. Richard F. Green
Division of Astronomical Sciences
National Science Foundation

26 July, 2019
Date

PROGRAMMATIC AGREEMENT
AMONG
THE NATIONAL SCIENCE FOUNDATION,
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION, AND
THE WEST VIRGINIA STATE HISTORIC PRESERVATION OFFICER
REGARDING
POTENTIAL CHANGES TO
GREEN BANK OBSERVATORY OPERATIONS
IN GREEN BANK, WEST VIRGINIA

WHEREAS, Green Bank Observatory is a federal facility owned and funded by the National Science Foundation (NSF), a federal agency, and as of the date of this Programmatic Agreement (PA), Associated Universities, Inc. (AUI) receives funding from NSF via a Cooperative Agreement to operate and maintain Green Bank Observatory for the benefit of research communities;

WHEREAS, NSF relies on formal processes within the scientific community (e.g., decadal surveys, senior-level reviews, and other advisory committees subject to the Federal Advisory Committee Act), to provide input on science priorities. The Portfolio Review Committee, a subcommittee of the NSF Mathematical and Physical Sciences Advisory Committee composed solely of external members of the scientific community, was charged with recommending a balanced portfolio to maximize the science recommended by National Academy of Sciences surveys of the field, which are carried out every decade (NASEM, 2016). To enable NSF to better address decadal survey science, the resulting Portfolio Review Committee Report (NSF AST, 2012), released in August 2012, recommended divestment of the 100-meter Robert C. Byrd Green Bank Telescope (GBT), which is a key component of the Observatory, and subsequent reports by the Astronomy and Astrophysics Advisory Committee and the National Academies' mid-decadal survey recommended that the divestment recommendations of the Portfolio Review Report be carried out expeditiously in order to maintain scientific program balance;

WHEREAS, such divestment would be achieved through significant reduction in NSF's contribution to the funding of Green Bank Observatory, and, based on the input NSF received from the scientific community and during National Environmental Policy Act (42 U.S.C. § 4321, *et seq.*) (NEPA) public scoping, NSF developed preliminary alternatives to address changes to operations from reduced NSF funding for Green Bank Observatory and is analyzing these alternatives via a Draft Environmental Impact Statement (EIS) and Final EIS;

WHEREAS, alternatives evaluated include Collaboration with Interested Parties for Continued Science- and Education-focused Operations with Reduced NSF Funding (Alternative A in the Draft EIS, and NSF's Preferred Alternative), Collaboration with Interested Parties for Operation as a Technology and Education Park (Alternative B in the Draft EIS), Mothballing of Facilities, defined as suspending operations in a manner that would permit operations to resume efficiently at some time in the future (Alternative C in the Draft EIS), and Demolition and Site Restoration (Alternative D in the Draft EIS);

WHEREAS, NSF has identified its Preferred Alternative as "Collaboration with Interested Parties for Continued Science- and Education-focused Operations with Reduced NSF Funding" (Alternative A in the Draft EIS), because this would reduce the funding required from NSF and allow for continued benefits to the scientific and educational communities by having new operations partners contribute funding that compensates for the reduction from NSF;

WHEREAS, the proposed decision regarding the potential changes to operations at Green Bank Observatory with reduced NSF funding is considered a federal undertaking and triggers compliance with

Sections 106 and 110(f) (54 United States Code [U.S.C.] Sections [§] 306108 and 306107) of the National Historic Preservation Act of 1966, as amended (54 U.S.C. § 300101, *et seq.*) (NHPA), and the NHPA's implementing regulations, "Protection of Historic Properties" (Title 36 *Code of Federal Regulations* [C.F.R.] Part 800);

WHEREAS, Green Bank Observatory contains the Reber Radio Telescope, which was listed in the National Register of Historic Places (NRHP) in 1972 under Criteria A and B for its nationally significant association with the origins of radio astronomy and for its association with Grote Reber; the Reber Radio Telescope, which was constructed in 1937, was moved to Green Bank Observatory in 1959–1960 to be displayed at the entrance to the Observatory, at which time some elements of the structure, including deteriorated wood pieces, were replaced; the Reber Radio Telescope was designated a National Historic Landmark (NHL) in 1986;

WHEREAS, NSF has determined that Green Bank Observatory is eligible for listing in the NRHP as a historic district with 44 contributing resources, including four telescopes that are individually eligible for listing in the NRHP: the Interferometer Range (which includes the Howard E. Tatel Telescope, two other nearly identical telescopes, and two control buildings), the 40-foot telescope (which includes an associated control building), the 43-meter (also referred to as the "140-foot") telescope (which includes a maintenance structure), and the GBT (see Attachment A for a table of evaluated resources with identification of those that are contributing); NSF's determination of eligibility was based on an evaluation of all resources built prior to 1969 within the Green Bank Observatory boundary, as well as the GBT due to its exceptional contribution to radio astronomy;

WHEREAS, NSF has conducted its Section 106 consultation process concurrently with, but separate from, its NEPA review process;

WHEREAS, under Alternatives A, B, and C as identified in the Draft EIS, some historic properties (contributing resources to the NRHP-eligible historic district and individually eligible historic properties) would be retained and some contributing resources could be demolished and/or safe abandoned (removal of a building or facility from service without demolishing it, with no intention that the building or facility would be brought back to operational status), depending on the needs of any collaborator(s) and/or in order to reduce costs of maintaining and operating the facilities; under Alternative D as identified in the Draft EIS, all contributing resources, with the exception of the Reber Radio Telescope, would be demolished; in addition, under Alternatives A, B, and C, NSF may retain or transfer ownership of Green Bank Observatory, depending, in part, on the needs of any new collaborator(s), which could be a federal or a non-federal entity or entities;

WHEREAS, on December 2, 2016, NSF formally initiated Section 106 consultation with the West Virginia State Historic Preservation Officer (SHPO) and established the area of potential effects (APE) as defined at 36 C.F.R. 800.16(d), included as Attachment B, and the SHPO agreed with the APE in a letter dated December 22, 2016;

WHEREAS, on December 12, 2016, NSF initiated Section 106 consultation with the following Native American tribes: Absentee Shawnee Tribe, Cayuga Nation, Cherokee Nation, Delaware Tribe of Indians, Eastern Band of Cherokee Indians, Eastern Shawnee Tribe of Oklahoma, Oneida Indian Nation, Oneida Nation, Onondaga Nation, Seneca Nation of Indians, Seneca-Cayuga Nation, St. Regis Mohawk Tribe, Shawnee Tribe, Tonawanda Band of Seneca, Tuscarora Nation, and United Keetoowah Band of Cherokee Indians in Oklahoma; NSF provided follow-up telephone calls and emails on December 29, 2016; Delaware Nation received an invitation letter on August 7, 2017 and responded on August 24, 2017 that it would be a consulting party; the Eastern Band of Cherokee Indians responded via email that the

proposed action would occur outside the traditional aboriginal territory of the Cherokee and referred the proposed action to the Shawnee; no other responses were received;

WHEREAS, the SHPO concurred with the determinations of individual NRHP-eligibility for four telescopes at Green Bank Observatory on December 22, 2016; further, based on 48 Historic Property Inventory forms completed and submitted by NSF on May 18, 2017, the SHPO concurred with the determination of Green Bank Observatory as eligible for listing on the NRHP as a historic district with 44 contributing resources on June 12, 2017;

WHEREAS, additional Consulting Parties identified for this undertaking and invited to participate include: Karen O'Neil, Daryl and Deana White, Grayg Ralphsnyder, Pocahontas County Landmarks Commission, Preservation Alliance of West Virginia, and Pocahontas County Historical Society;

WHEREAS, the public has had the opportunity to participate in the Section 106 process through the *Notice of Intent to Prepare an Environmental Impact Statement and Initiate Section 106 Consultation for Proposed Changes to Green Bank Observatory Operations, Green Bank, West Virginia and Notice of Public Scoping Meetings and Comment Period*, published on October 19, 2016, as well as during the public scoping meeting on November 9, 2016, and the public meeting on the Draft EIS on November 30, 2017, which included a presentation on the Section 106 process and an explanation that any public comments on historic properties would be considered during both the NEPA and the Section 106 reviews;

WHEREAS, the *Proposed Changes to Green Bank Observatory Operations: Historic Properties Assessment of Effects* (CH2M HILL, 2017) was prepared on behalf of NSF and provided to the SHPO and the other Consulting Parties on October 31, 2017; adverse effects identified include those that would occur if eligible historic properties were demolished or safe abandoned, as well as in the case NSF transfers ownership to a non-federal entity, since the federal consultation process under Section 106 would no longer be applicable to future actions by such a new owner; in the case that NSF transfers ownership to a federal entity for continued operations, the transfer would not have an adverse effect, since the Section 106 consultation process would be applicable to future actions by such a new owner;

WHEREAS, on December 4, 2017, the SHPO concurred that the undertaking would have an adverse effect on historic properties within Green Bank Observatory and requested continued consultation on measures to avoid, minimize, and/or mitigate the adverse effect;

WHEREAS, in accordance with 36 C.F.R. 800.6(a)(1)(i)(C), NSF has provided the Advisory Council on Historic Preservation (ACHP) the required documentation and invited it to participate in the Section 106 consultation process; the ACHP notified NSF that it would participate in the consultation via a letter dated December 22, 2017;

WHEREAS, in accordance with 36 C.F.R. 800.10, *Special requirements for protecting National Historic Landmarks*, NSF has provided the National Park Service (NPS) with information about the undertaking and how it relates to the NHL Reber Radio Telescope and invited participation in the Section 106 consultation process; the NPS notified NSF that it would participate in the consultation during a teleconference on March 16, 2018;

WHEREAS, NSF recognizes that continued operation of Green Bank Observatory can occur only if a collaborator(s) comes forward with viable plans to provide additional non-NSF funding in support of continued operations; therefore, in order to cover a range of possible outcomes, this PA addresses the potential effects of all alternatives currently being evaluated under the NEPA review;

WHEREAS, given that implementation of the alternatives described above could result in a range of potential outcomes depending on the needs of the collaborator(s), this PA has been prepared in

compliance with 36 C.F.R. 800.14(b)(1)(ii) to determine appropriate measures to cover the range of potential outcomes, including demolition or safe abandonment of some contributing resources and transfer of ownership;

WHEREAS, technical terms related to the NHPA are included in Attachment C, "References and Definitions," along with references for citations in the PA and links to those references;

WHEREAS, NSF has consulted with the SHPO, the ACHP, the NPS, and the other Consulting Parties on ways to avoid, minimize, and/or mitigate the adverse effects that the proposed undertaking could have on historic properties, including the NHL, pursuant to the regulations implementing Section 106 of the NHPA, 36 C.F.R. Part 800;

WHEREAS, the SHPO, the ACHP, the NPS, and the other Consulting Parties participated in the development of this PA; NSF, the SHPO and ACHP are Signatories herein; the NPS and other Consulting Parties have been asked to execute this PA as Concurring Parties;

NOW, THEREFORE, NSF, the SHPO, and the ACHP agree that NSF will ensure that, if the Preferred Alternative (*Collaboration with Interested Parties for Continued Science- and Education-focused Operations with Reduced NSF Funding*) or one of the other Alternatives is selected, the following Stipulations are implemented to address adverse effects of the proposed undertaking on historic properties and agree that these Stipulations will govern the undertaking and all of its parts.

STIPULATIONS

NSF will ensure that the following measures are carried out:

The following Stipulations address adverse effects to historic properties associated with: continued operation of Green Bank Observatory under federal ownership (Stipulation I.A.) and demolition (partial or full), safe abandonment, or transfer to a non-federal entity (Stipulation I.B.)

I. Preservation Provisions

A. To the extent that Green Bank Observatory operations continue under NSF or new federal ownership:

1. **Avoidance of Adverse Effects.** NSF will make every effort to avoid adverse effects on historic properties by encouraging any collaborator(s) with operational responsibilities or new federal owner(s) to use as many historic properties as practicable, provided that such use facilitates continued operations.
2. **Preservation of the Reber Radio Telescope.** Provided that NSF continues to own Green Bank Observatory, NSF will ensure that any new collaborator(s) with operational responsibilities continue a program of cyclical maintenance to preserve the structural integrity and historic fabric of the NHL Reber Radio Telescope and that any telescope parts that need replacement in the future shall, to the extent feasible, be replaced in kind provided that NSF has sufficient resources available to reasonably carry-out such preservation activities. NSF will require that any new collaborator(s) submit a condition update on the NHL Reber Radio Telescope every two years. If long-term preservation of the NHL Reber Radio Telescope in place as set forth herein is

determined by NSF not to be feasible, NSF will consult with the NPS and SHPO on possible relocation of the NHL Reber Radio telescope. As part of that consultation, NSF will provide, in writing, the status of the NHL and the reason why long-term preservation is not feasible. NSF will encourage any new federal owner to preserve the NHL Reber Radio Telescope in accordance with this Stipulation.

3. **Preservation of the Jansky Replica Antenna, Ewen-Purcell Horn, and Calibration Horn.** Provided that NSF continues to own Green Bank Observatory, NSF will ensure that any new collaborator(s) with operational responsibilities continue a program of cyclical maintenance to preserve the structural integrity and historic fabric of the Jansky Replica Antenna, Ewen-Purcell Horn, and Calibration Horn, and that any parts that need replacement in the future shall, to the extent feasible, be replaced in kind provided that NSF has sufficient resources available to reasonably carry-out such preservation activities. NSF will require that any new collaborator(s) submit a condition update on the Jansky Replica Antenna, Ewen-Purcell Horn, and Calibration Horn to NSF every two years. NSF will encourage any new federal owner to preserve the Jansky Replica Antenna, Ewen-Purcell Horn, and Calibration Horn in accordance with this Stipulation.
4. **Consultation on Preservation Principles and Management Strategies.** As soon as practicable following selection of a new collaborator, NSF will consult with the SHPO and any new collaborator(s) with operational responsibilities to discuss the development and implementation of preservation principles and management strategies that permit continued science- and education-focused operations at Green Bank Observatory while preserving its historic integrity. The consultation would include consideration of modifications to instruments or buildings that may be needed to accommodate the operational needs of the facility.
5. **Training.** NSF will ensure that the key facility staff of any new collaborator with operational responsibilities receive an initial, one-time historic preservation awareness training to encourage awareness of the historic significance of Green Bank Observatory and to minimize the potential for adverse effects to historic properties. Such training, which will be funded by NSF, will be administered by a qualified historic preservation professional who is familiar with and knowledgeable about the Green Bank Observatory, and will occur within 180 days (or as soon as practicable thereafter) of the selection of the new collaborator. The training will be based on the Preservation Principles and Strategies that result from implementation of Stipulation I.A.4. NSF will provide the SHPO an opportunity to comment on the content of such training and to participate in the training..
6. **Mothballing in Accordance with Historic Preservation Standards.** In the event NSF identifies the need to temporarily mothball historic properties with the intent that operations would resume in the near future, NSF will follow the guidance in the NPS Preservation Brief 31, "*Mothballing Historic Buildings*" and *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring*

and Reconstructing Historic Buildings, as appropriate, with implementation of the following measures:

- a. All exterior elevations of the building or structure will be photographed, including at least one context photo. Archival-quality digital photographs will be produced in accordance with professional standards as set forth in the NRHP Photograph Policy Factsheet (dated 5/15/2013).
- b. To avoid an adverse effect caused by demolition by neglect, a cyclical maintenance plan that includes repairs as needed will be prepared and implemented.
- c. NSF will submit a condition update on any of the properties subject to this Stipulation to the SHPO every two years, for the duration of time there are mothballed properties at Green Bank Observatory.

B. To the extent that demolition (partial or full), safe abandonment, or transfer to a non-federal entity occurs:

1. **Preservation of the Reber Radio Telescope.** Prior to a change in disposition of the Reber Radio Telescope (or as soon as practicable thereafter), NSF will consult with the NPS, the SHPO, and any new collaborator with operational responsibilities on preservation principles and management strategies regarding the long-term preservation of the NHL Reber Radio Telescope. Should long-term preservation in place not be feasible or desirable, NSF will consult with the NPS and the SHPO on possible relocation of the Reber Radio Telescope, either onsite or offsite. If relocation to a suitable location is not feasible, then NSF will consider appropriate documentation for the Reber Radio Telescope, in consultation with the NPS and the SHPO. Such documentation would occur before any demolition or dismantling of the telescope.
2. **Documentation Required for the NRHP-Eligible Historic District.** Prior to a change in disposition (whether it be demolition, safe abandonment, or transfer to a non-federal entity) of any eligible property, NSF will ensure, in addition to the Historic Property Inventory Forms previously provided to the SHPO, that the following documentation occurs:
 - a. NSF will prepare appropriate and reasonable documentation (similar in level of effort to a National Register nomination form prepared in accordance with the National Register Bulletin, "Guidelines for Completing National Register of Historic Places Form" and consistent with Part 2 of the West Virginia National Register and Architecture/History Survey Manual) of the historic property. NSF will develop an approach to the documentation in the form of an outline of a report and will consult with the SHPO on the approach and outline. The documentation will include a discussion of the significance of the National Radio Quiet Zone in contributing to the setting of Green Bank Observatory and to the

important research accomplished there, as well as other locations on site such as the Drake Lounge where certain influential ideas in astronomy germinated.

- b. NSF will survey those buildings and structures built after 1969 that were not previously surveyed, including the 20-meter telescope, and will evaluate them for NRHP eligibility under Criterion Consideration G (a property achieving significance within the past 50 years if it is of exceptional importance). Historic Property Inventory Forms will be prepared for each resource. They will be evaluated for individual significance and as contributing elements to the Green Bank Observatory Historic District. NSF will submit the Historic Property Inventory Forms to the SHPO and request concurrence on the eligibility determinations.

3. Effort to Reuse or Donate Historically Significant Equipment and Artifacts.

In the event that NSF issues a final agency decision regarding changes to operations at Green Bank Observatory in which demolition, transfer, or mothballing of historic properties occurs, NSF will, prior to a change in disposition of the historic properties (or as soon as practicable thereafter), identify any historically significant equipment and artifacts associated with historic properties that will not be repurposed for further scientific or educational use, and if feasible, NSF will:

- a. Contact relevant scientific/educational institutions for possible reuse of the equipment and artifacts; or
- b. Contact an appropriate museum to determine if any of the equipment and/or artifacts can be donated to the museum's collection.

4. Consultation on Preservation Principles and Management Strategies. Prior to transfer to a non-federal entity (or as soon thereafter as practicable), NSF will consult with the SHPO and the new owner to discuss the development and implementation of preservation principles and management strategies that permit continued science- and education-focused operations at Green Bank Observatory while preserving its historic integrity.

5. Training. NSF will ensure that the key facility staff of any new owner will receive an initial, one-time historic preservation awareness training to encourage awareness of the historic significance of Green Bank Observatory and to minimize the potential for adverse effects to historic properties. Such training, which will be funded by NSF, will be administered by a qualified historic preservation professional who is familiar with and knowledgeable about the Green Bank Observatory, and will occur within 180 days (or as soon as practicable thereafter) of the transfer. The training will be based on the Preservation Principles and Strategies that result from implementation of Stipulation I.B.4. NSF will provide the SHPO an opportunity to comment on the content of such training and to participate in the training.

II. DELAYED TRANSFER OF OWNERSHIP

In the event NSF issues an award to a collaborator(s) to manage and operate Green Bank Observatory, and NSF plans to transfer ownership of Green Bank Observatory to a non-federal collaborator(s), Stipulation I.A. shall apply prior to the transfer, until reasonably practicable, at which point only Stipulation I.B. shall apply.

III. NEW FEDERAL OWNERSHIP AND SECTION 106

Should NSF transfer ownership to a new federal entity for continued operations, that entity would be required to comply with the NHPA for future undertakings and this PA would expire upon such a transfer, as stated in Section XII. A new federal entity, however, may elect to enter into a new PA that adopts the provisions of this PA in whole or in part.

IV. UNANTICIPATED EFFECTS

If unanticipated effects on historic properties occur during implementation of the undertaking, NSF will, in compliance with 36 C.F.R. § 800.13(b)(3), determine actions that it can take to resolve potential adverse effects and notify via phone and email the SHPO and other Consulting Parties, as appropriate, within two business days of NSF's awareness of the effects. The notification will describe the eligibility of the property and proposed actions to resolve any adverse effects. The SHPO and other Consulting Parties will respond with any comments within two business days of the notification by phone or email. NSF will take into account the Consulting Parties' recommendations regarding NRHP eligibility and proposed actions, and then carry out appropriate actions. NSF will provide the SHPO and other Consulting Parties, as appropriate, with a report of the actions when they are completed. This Stipulation shall not apply if NSF is no longer the owner of Green Bank Observatory.

V. POST-AGREEMENT DISCOVERIES

If NSF continues to own Green Bank Observatory and it is managed by a collaborator(s), all unanticipated discoveries of historic properties and human or burial remains within the APE revealed during any activity associated with implementation of the proposed undertaking will be addressed in the following manner:

- A. The contractor/collaborator(s) carrying out any such activities will promptly notify NSF, who will notify the SHPO of the discovery.
- B. If NSF determines, in consultation with the SHPO, that the discovery is eligible for listing in the NRHP, NSF will initiate consultation with the Consulting Parties to draft a plan with measures that will avoid, minimize, and/or mitigate adverse effects. If agreement is reached regarding such a plan, NSF will implement the plan. If the discovery is made during demolition activities (if any), demolition in the affected area must cease until the discovery process in this Stipulation has been concluded either through a finding that the property is not eligible for listing in the NRHP or through finalization of the plan referenced herein.
- C. If the Consulting Parties cannot reach agreement regarding the development of a treatment or mitigation plan, then the matter will be referred to the ACHP for guidance. NSF will address the ACHP's guidance in reaching a final decision regarding implementation of the plan.
- D. If any previously unidentified human or burial remains are discovered during implementation of the undertaking, the contractor/collaborator(s) will immediately cease any demolition work and adhere to applicable state and federal laws regarding the treatment of human or burial remains.

VI. RESPONSE TO EMERGENCY

- A. In the event NSF proposes an emergency undertaking as an essential and immediate response to a disaster or emergency declared by the President, or the Governor of West Virginia, or in response to another immediate threat to life or property, NSF shall notify the SHPO via telephone and email within two business days of commencing the emergency undertaking.
- B. NSF shall include a summary of all emergency undertakings in the status report required in Stipulation VII.
- C. This Stipulation applies only to undertakings that are implemented within 30 calendar days after the disaster or emergency has been formally declared by the appropriate authority. NSF may request an extension of the period of applicability from the ACHP prior to the expiration of the 30 calendar days.
- D. Immediate rescue and salvage operations conducted to preserve life or property are exempt from the provisions of Section 106 and this PA.

VII. REPORTING

- A. To keep the public and Consulting Parties apprised of the status of the implementation of the Stipulations in this PA, NSF will maintain a status report on the NSF Division of Astronomical Sciences website with relevant information, including any planned demolitions.
- B. Meetings or conference calls regarding the undertaking and/or implementation of the Stipulations in this PA may be requested at any time by the Signatories for the duration of this PA.
- C. If Green Bank Observatory is transferred out of NSF ownership, the terms of this Stipulation shall not apply after transfer.

VIII. DISPUTE RESOLUTION

A. Signatories

In the event one of the Signatories objects to the manner in which any term of this PA is implemented, the following dispute resolution process will be followed:

1. The objecting Signatory will notify all other Signatories to this PA, in writing, of the objection or disagreement, request written comments on the objection or disagreement within ten (10) business days following receipt of such notification, and then proceed to consult with the Signatories to resolve the objection. If at any time during consultation, NSF determines that the objection or disagreement cannot be resolved through consultation, NSF will forward all documentation relevant to the dispute to the SHPO, or if the objection is raised by the SHPO, NSF will forward all documentation relevant to the dispute to the ACHP. Within 30 calendar days after receipt of all pertinent documentation, the SHPO or, as appropriate, the ACHP, will provide NSF with comments and recommendations, which NSF will take into account in reaching a final decision

regarding the dispute. Any comment provided by the SHPO or, as appropriate, the ACHP, will be understood to pertain only to the subject of the dispute. All other actions under this PA that are not the subject of the dispute will remain unchanged.

2. Unless all Signatories agree that the dispute warrants a cessation of work, neither NSF nor its collaborator(s) will be required to cease work on the proposed undertaking while the dispute is being reviewed.

B. Continued Participation by the Public and Concurring Parties

At any time during the implementation of the Stipulations set forth in this PA, any member of the public, including any Consulting Party who has decided not to sign this PA as a Concurring Party, and any Concurring Party may continue to participate in the Section 106 consultation process as follows:

1. Any member of the public may raise an objection to NSF pertaining to the treatment of an historic property associated with implementation of the proposed undertaking, provided that title to Green Bank Observatory is retained by NSF. In the event such an objection is raised, NSF will consult with the SHPO regarding the objection, and following such consultation, will provide the objecting member of the public with a decision on the objection.
2. Any Concurring Party may raise an objection to NSF and the SHPO pertaining to the treatment of an historic property associated with implementation of the proposed undertaking. In the event such an objection is raised, NSF and the SHPO will consult regarding how to resolve the objection. If NSF and the SHPO are unable to resolve the objection, they will consult with the ACHP. NSF will consider any recommendation on the objection provided by the ACHP before making a final decision on the matter. NSF will communicate such a final decision to the objecting Concurring Party and the SHPO.

If an objection is made pursuant to either Stipulation VIII.B.1. or VIII.B.2., NSF, in consultation with the SHPO, will determine whether the objection warrants a cessation of work (if any) on the proposed undertaking while the objection is being reviewed.

- C. This Stipulation shall not apply if NSF is no longer the owner of Green Bank Observatory.

IX. PROFESSIONAL QUALIFICATIONS

All work carried out pursuant to this PA will be developed and/or implemented by or under the direct supervision of a person or persons meeting or exceeding the minimum professional qualifications, appropriate to the affected resource(s), listed in the *Secretary of the Interior's Professional Qualification Standards* (36 CFR Part 61, Appendix A) and amended in 1992.

X. ELECTRONIC COPIES

NSF will provide the SHPO, ACHP, and each Consulting Party with one legible, full-color, electronic copy of the fully executed PA and its Attachments no more than 30 calendar days after execution. If the electronic copy is too large to send via email, NSF will provide each Consulting Party with a copy of the executed PA via a CD, or in any reasonable medium available.

XI. AMENDMENT

Any Signatory may request that this PA be amended by informing NSF in writing of the reason for the request and the proposed amendment language. After receiving the request, NSF will notify all

Consulting Parties of the proposed amendment and consult to reach agreement. The amendment will be effective on the date a copy signed by all the Signatories is filed by NSF with the ACHP.

XII. EXPIRATION

If NSF retains ownership of Green Bank Observatory, this PA will expire ten years from the Effective Date of this PA as defined in Stipulation XV., herein. If ownership of Green Bank Observatory is transferred to a non-federal entity, upon completion of the terms in Stipulation I.B. this PA shall expire. If ownership of Green Bank Observatory is transferred to a federal entity, this PA shall expire upon transfer. Prior to such expiration date, NSF may consult with the SHPO and ACHP to reconsider the terms of this PA and amend it in accordance with Stipulation XI. If unresolved issues remain within two years of the expiration date of this PA, NSF will, at that time, consult with the SHPO and ACHP regarding the progress of implementation of this PA and consider the appropriateness of developing a subsequent agreement or amendment to the PA.

XIII. COMPLIANCE WITH APPLICABLE LAW AND ANTI-DEFICIENCY ACT PROVISION

This PA will be carried out consistent with all applicable federal and state laws. No provision of this PA will be implemented in a manner that would violate the Anti-Deficiency Act. NSF shall make reasonable and good faith efforts to secure the necessary funds to implement this PA in its entirety. All obligations on the part of NSF will be subject to the availability and allocation of appropriated funds for such purposes. Nothing in this PA may be construed to obligate NSF to any current or future expenditure of resources in advance of the availability of appropriations. Should NSF be unable to fulfill the terms of this PA due to funding constraints or priorities, NSF will immediately notify and consult with the SHPO and ACHP to determine whether to amend or terminate this PA pending the availability of resources.

XIV. TERMINATION

If any Signatory to this PA determines that the terms of this PA will not or cannot be carried out, that Signatory will immediately consult with the other Signatories to develop an amendment to this PA pursuant to Section XI., above. If this PA is not amended following that consultation, then it may be terminated by any Signatory through written notice to the other Signatories. Within 30 calendar days following any such termination and prior to work continuing on the undertaking, NSF will notify the SHPO and ACHP whether it will initiate consultation to execute a new PA under 36 C.F.R. § 800.14(b)(1)(ii) or request and consider the comments of the ACHP under 36 C.F.R. § 800.7 and proceed accordingly.

XV. EFFECTIVE DATE

This PA will be executed in counterparts, with a separate page for each Signatory, and NSF will ensure that each Signatory is provided with a fully executed copy. This PA will become effective upon obtaining the signatures of NSF, the SHPO, and the ACHP.

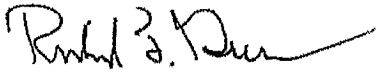
Execution of this PA by NSF, the SHPO, and the ACHP evidences that NSF has taken into account the effects of this proposed undertaking on historic properties and has afforded the ACHP an opportunity to comment on the proposed undertaking.

SIGNATORY PAGE

PROGRAMMATIC AGREEMENT
AMONG
THE NATIONAL SCIENCE FOUNDATION,
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION, AND
THE WEST VIRGINIA STATE HISTORIC PRESERVATION OFFICER
REGARDING
POTENTIAL CHANGES TO
GREEN BANK OBSERVATORY OPERATIONS
IN GREEN BANK, WEST VIRGINIA

Signatory:

National Science Foundation



Richard F. Green, Ph.D., Division Director
Division of Astronomical Sciences

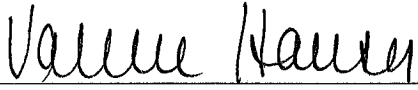
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SIGNATORY PAGE

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Signatory:

Advisory Council on Historic Preservation



John M. Fowler, Executive Director

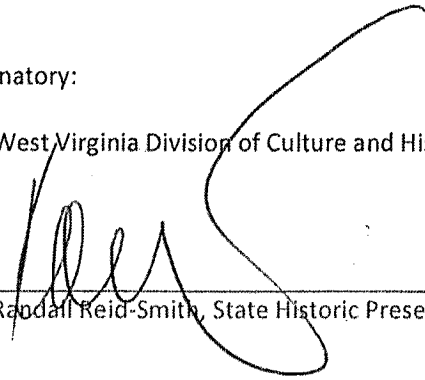
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SIGNATORY PAGE

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Signatory:

West Virginia Division of Culture and History's State Historic Preservation Office



Randal Reid-Smith, State Historic Preservation Officer

Date

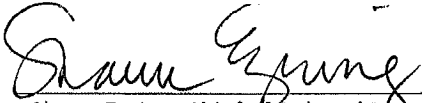
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CONCURRING PARTY SIGNATURE PAGE

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IN GREEN BANK, WEST VIRGINIA

Concurring Party:

National Park Service



Shaun Eyring, Chief of Cultural Resources
Northeast Regional Office

Date

8.2.13

CONCURRING PARTY SIGNATURE PAGE

PROGRAMMATIC AGREEMENT
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Concurring Party:

Green Bank Observatory



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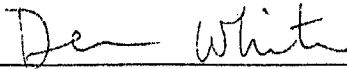
Date _____

Karen O'Neil, Ph.D., Director

CONCURRING PARTY SIGNATURE PAGE

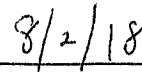
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IN GREEN BANK, WEST VIRGINIA

Concurring Party:



Deana White

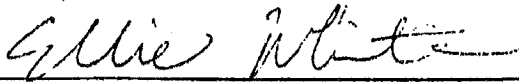
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CONCURRING PARTY SIGNATURE PAGE

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IN GREEN BANK, WEST VIRGINIA**

Concurring Party:



Ellie White

Date

8/2/2018

CONCURRING PARTY SIGNATURE PAGE

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IN GREEN BANK, WEST VIRGINIA

Concurring Party:

CITIZEN SCIENTIST

Grayg Ralphsnyder

W grayg Ralphsnyder

Date


2018 AUG 01

CONCURRING PARTY SIGNATURE PAGE

PROGRAMMATIC AGREEMENT
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IN GREEN BANK, WEST VIRGINIA

Concurring Party:

Pocahontas County Landmarks Commission



Robert Sheets

Date 8/1/18

Attachment A

Evaluated Resources

Evaluated Architectural Resources at Green Bank Observatory §

HPI Site Number	Resource Type	Resource Name	NRHP Status
PH-0907	Administrative/ Operational	Karl Guthe Jansky Laboratory	Eligible as a contributing resource to the GBO Historic District
PH-0908	Administrative/ Operational	Cafeteria Building and Residence	Eligible as a contributing resource to the GBO Historic District
PH-0909	Administrative/ Operational	Warehouse	Eligible as a contributing resource to the GBO Historic District
PH-0910	Other	Water Tower	Eligible as a contributing resource to the GBO Historic District
PH-0911	Administrative/ Operational	Works Area Building	Eligible as a contributing resource to the GBO Historic District
PH-0912	Administrative/ Operational	Telescope Mechanics Office (formerly Cable Storage Warehouse)	Eligible as a contributing resource to the GBO Historic District
PH-0913	Administrative/ Operational	Millimeter Array Experiment Building	Eligible as a contributing resource to the GBO Historic District
PH-0914	Administrative/ Operational	Outdoor Test Building	Eligible as a contributing resource to the GBO Historic District
PH-0915	Administrative/ Operational	Laser Lab (formerly 300' Telescope Control Building)	Eligible as a contributing resource to the GBO Historic District
PH-0916	Other	Airstrip	Eligible as a contributing resource to the GBO Historic District
PH-0917	Other	Recreation Area	Eligible as a contributing resource to the GBO Historic District
PH-0918	Other/Storage	Barn	Not eligible/non-contributing
PH-0919	Other/Storage	Barn	Not eligible/non-contributing
PH-0920	Other/Storage	Barn	Not eligible/non-contributing
PH-0921	Vacant	Slaven Hollow Orchard Cellar Building	Not eligible/non-contributing
PH-0922	Residential	Redwood House; Director's House (House 1)	Eligible as a contributing resource to the GBO Historic District

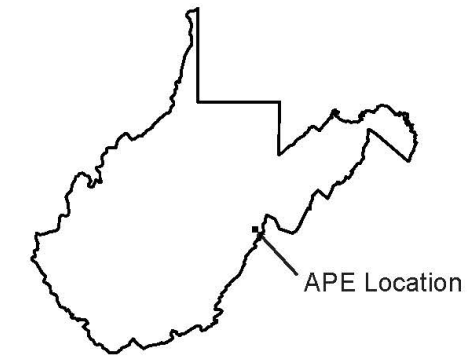
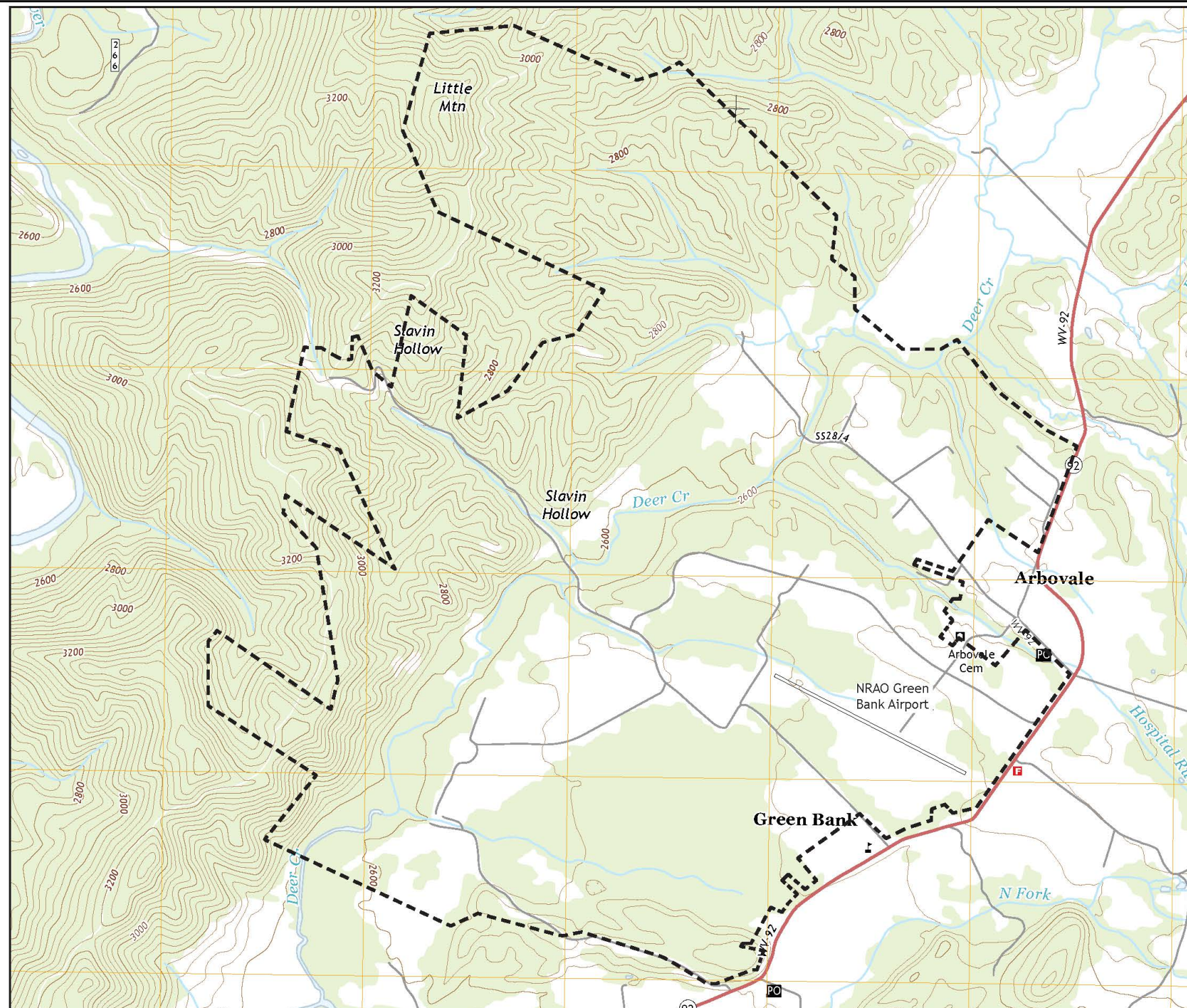
GBO = Green Bank Observatory
HPI = Historic Property Inventory
NHL = National Historic Landmark
NRHP = National Register of Historic Places

HPI Site Number	Resource Type	Resource Name	NRHP Status
PH-0923	Residential	House 2 (Rabbit Patch) - 2 Rabbit Patch	Eligible as a contributing resource to the GBO Historic District
PH-0924	Residential	House 3 (Rabbit Patch) - 3 Rabbit Patch	Eligible as a contributing resource to the GBO Historic District
PH-0925	Residential	House 4 (Rabbit Patch) - 4 Rabbit Patch	Eligible as a contributing resource to the GBO Historic District
PH-0926	Residential	House 5 (Rabbit Patch) - 5 Rabbit Patch	Eligible as a contributing resource to the GBO Historic District
PH-0927	Residential	House 6 (Rabbit Patch) - 6 Rabbit Patch	Eligible as a contributing resource to the GBO Historic District
PH-0928	Residential	House 7 (Rabbit Patch) - 7 Rabbit Patch	Eligible as a contributing resource to the GBO Historic District
PH-0929	Residential	House 8 (Rabbit Patch) - 8 Rabbit Patch	Eligible as a contributing resource to the GBO Historic District
PH-0930	Residential	House 9 (Rabbit Patch) - 9 Rabbit Patch	Eligible as a contributing resource to the GBO Historic District
PH-0931	Residential	House 10 (Rabbit Patch) - 10 Rabbit Patch	Eligible as a contributing resource to the GBO Historic District
PH-0932	Residential	House 11 (Rabbit Patch) - 11 Rabbit Patch	Eligible as a contributing resource to the GBO Historic District
PH-0933	Residential	House 14 - 14 Hannah Run Road	Eligible as a contributing resource to the GBO Historic District
PH-0934	Residential	House 16 - 16 Hannah Run Road	Eligible as a contributing resource to the GBO Historic District
PH-0935	Residential	House 19 - 19 Hannah Run Road	Eligible as a contributing resource to the GBO Historic District
PH-0936	Residential	House 21 - 21 Hannah Run Road	Eligible as a contributing resource to the GBO Historic District
PH-0937	Residential	House 23 - 23 Hannah Run Road	Eligible as a contributing resource to the GBO Historic District

HPI Site Number	Resource Type	Resource Name	NRHP Status
PH-0938	Residential	House No. 24 - 24 Hannah Run Road	Eligible as a contributing resource to the GBO Historic District
PH-0939	Residential	Shinnaberry House - 20 Route 28	Eligible as a contributing resource to the GBO Historic District
PH-0940	Residential	Nut Bin	Eligible as a contributing resource to the GBO Historic District
PH-0331 Updated	Residential	Riley House (15) - 15 Hannah Run Road	Eligible as a contributing resource to the GBO Historic District
PH-0941	Residential	Hill House (17) - 17 Hannah Run Road	Eligible as a contributing resource to the GBO Historic District
PH-0942	Residential	Tracy House (No. 18) - 18 Hannah Run Road	Eligible as a contributing resource to the GBO Historic District
PH-0943	Vacant	Beard House	Eligible as a contributing resource to the GBO Historic District
PH-0944	Residential	Hannah House	Eligible as a contributing resource to the GBO Historic District
PH-0945	Telescope/ Instrument (no longer in active use)	Calibration Horn	Eligible as a contributing resource to the GBO Historic District
PH-0946	Telescope/ Instrument (display)	Karl Guthe Jansky Replica Antenna	Eligible as a contributing resource to the GBO Historic District
PH-0947	Telescope/ Instrument (display)	Ewen-Purcell Horn	Eligible as a contributing resource to the GBO Historic District
PH-0948	Telescope/ Instrument (no longer in active use)	Interferometer Range: Includes Howard E. Tatel (85'-1) Telescope and 85'-1 control building; 85'-2 Telescope; 85'-3 Telescope; and the Interferometer Control Building	Individually eligible under Criterion A; contributes to the GBO Historic District
PH-0949	Telescope/ Instrument	40-foot Telescope and 40-foot Telescope Control Building	Individually eligible under Criterion A; contributes to the GBO Historic District
PH-0950	Telescope/ Instrument	140-foot Telescope (43-meter Telescope)	Individually eligible under Criteria A and C; contributes to the GBO Historic District
PH-0951	Telescope/ Instrument	45-foot Telescope	Eligible as a contributing resource to the GBO Historic District

HPI Site Number	Resource Type	Resource Name	NRHP Status
PH-0952	Telescope/ Instrument	Robert C. Byrd Green Bank Telescope (GBT)	Individually eligible under Criteria A and C and Criterion Consideration G; contributes to the GBO Historic District
PH-0953	Telescope/ Instrument (display)	Reber Radio Telescope	Listed in the NRHP in 1972; named a NHL in 1986; contributes to the GBO Historic District

Attachment B
Area of Potential Effects Map



LEGEND
 [Dashed Line] Area of Potential Effects (APE)



FIGURE 1
Area of Potential Effects (APE)
 Green Bank Observatory
 Pocahontas County
 Green Bank, West Virginia

Source: USGS, Green Bank Quadrangle, 2014
 ES1119141044236AC area_potential_effects_greenbank.ai 03-09-17 dash

Attachment C

References and Definitions

PA References:

- Proposed Changes to Green Bank Observatory Operations: Historic Properties Assessment of Effects* (CH2M HILL, 2017).
https://www.nsf.gov/mps/ast/env_impact_reviews/greenbank/section106/NSF_transmittal_of_historic_assess_of_effects_report_to_SHPO.pdf
- Park, Sharon C. 1993. *Preservation Brief 31: Mothballing Historic Buildings*, U.S. Department of the Interior, National Park Service. September. <https://www.nps.gov/tps/how-to-preserve/briefs/31-mothballing.htm>
- Grimmer, Anne E. 2017. *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Buildings*. U.S. Department of the Interior, National Park Service, Technical Preservation Services, Washington, D.C. <https://www.nps.gov/tps/standards/treatment-guidelines-2017.pdf>
- National Academies of Sciences, Engineering, and Medicine (NASEM). 2016. *New Worlds, New Horizons: A Midterm Assessment*. Washington, DC: The National Academies Press.
<https://doi.org/10.17226/23560>
- National Science Foundation (NSF) Division of Astronomical Sciences (AST). 2012. *Advancing Astronomy in the Coming Decade: Opportunities and Challenges* (Portfolio Review Committee Report). Prepared by the Portfolio Review Committee. August 14.
https://www.nsf.gov/mps/ast/portfolioreview/reports/ast_portfolio_review_report.pdf
- U.S. Department of the Interior, National Park Service. 2013. *Photograph Policy Factsheet*. Updated May 2013.
<https://www.nps.gov/Nr/publications/bulletins/photopolicy/index.htm>

PA Definitions:

Adverse Effect: a change to the characteristics that qualify a historic property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association (36 CFR 800.5(a)).

Area of Potential Effects (APE): the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking (36 CFR 800.16(d)). It is important to understand that the effects pertain to the effects on physical historic properties (eligible for or listed in the National Register of Historic Places [NRHP]) in a specific area.

Concurring Party: Any consulting party that has been invited by the federal agency (NSF) to concur in the PA. Concurring parties have the same rights with regard to seeking amendment or termination of the PA as other signatories. The refusal of any party invited to concur in the PA does not invalidate the document (36 CFR 800.16(d)).

Consultation: the process of seeking, discussing, and considering the views of other participants, and, where feasible, seeking agreement with them regarding matters arising in the Section 106 process (36 CFR 800.16(f)).

Consulting Party: Section 106 term that refers to organizations and/or individuals with a demonstrated interest in the undertaking due to the nature of their legal or economic relation to the undertaking or affected properties, or their concern with the undertaking's effects on historic properties. The participation of consulting parties is subject to approval by the federal agency (in this case, NSF). Consulting parties are actively informed of and able to participate in the Section 106 process, including consultation meetings. The views of consulting parties are actively sought by NSF during the Section 106 consultation process. (36 CFR 800.2(c)(5))

Effect: an alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the NRHP (36 CFR 800.16(i)).

Historic Property: Any resource, such as a building, structure, or historic district, included in or eligible for inclusion in the NRHP, maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the NRHP criteria (36 CFR 800.16(l)).

Signatory: Signatories include the federal agency (NSF), PR SHPO, and ACHP, and they have the sole authority to execute, amend, or terminate the PA (36 CFR 800.6(c)(1)).

Programmatic Agreement (PA): A document that records the terms and conditions agreed upon to resolve the potential adverse effects of a federal agency program or complex undertaking. For this undertaking, a PA is used to document the ways in which adverse effects are addressed because the result of the 2017 solicitation for new collaborators is undetermined and the needs of any new collaborator(s) are unknown (36 CFR 800.14(b)).

Undertaking: A project, activity, or program funded in whole or in part by a federal agency (36 CFR 800.16(y)).