Nationwide Public Safety Broadband Network
Final Programmatic Environmental Impact Statement for the Non-Contiguous United States

FirstNet®

First Responder Network Authority

Executive Summary

Alaska
Hawaii
American Samoa
Guam
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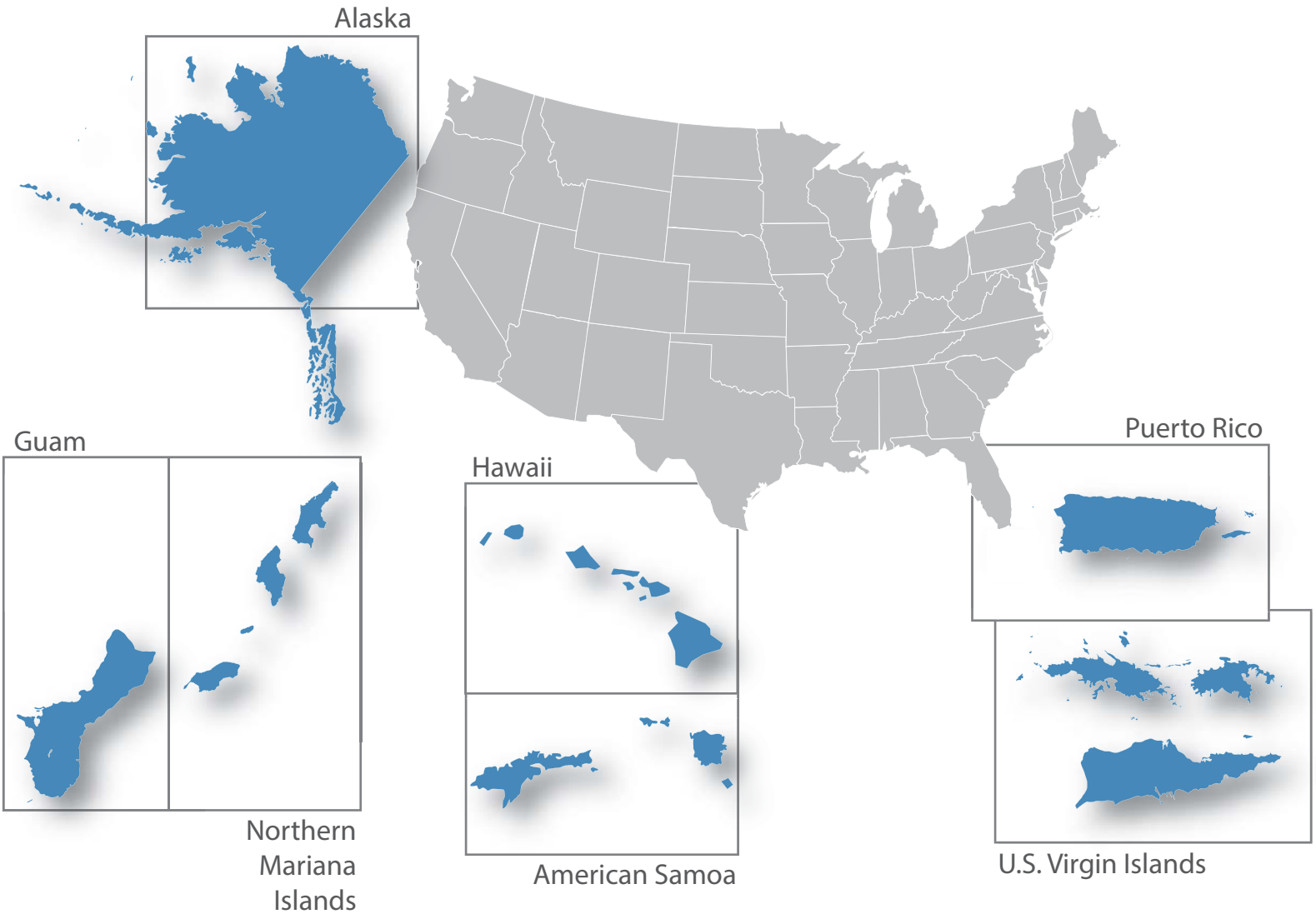
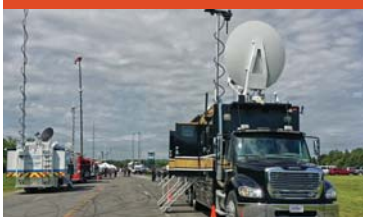
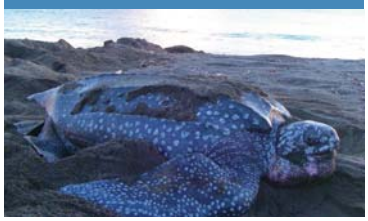
Puerto Rico
U.S. Virgin Islands



May 2017





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Final Programmatic Environmental Impact Statement
for the Non-Contiguous United States

Executive Summary

Amanda Goebel Pereira, AICP
NEPA Coordinator
First Responder Network Authority
U.S. Department of Commerce
12201 Sunrise Valley Dr. M/S 243
Reston, VA 20192

Cooperating Agencies
Federal Communications Commission
General Services Administration
U.S. Department of Agriculture—Natural Resource Conservation Service
U.S. Department of Agriculture—Rural Utilities Service
U.S. Department of Agriculture—U.S. Forest Service
U.S. Department of Commerce—National Telecommunications and Information Administration
U.S. Department of Defense—Department of the Air Force
U.S. Department of Energy
U.S. Department of Homeland Security

May 2017

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ES1. INTRODUCTION

Title VI of the Middle Class Tax Relief and Job Creation Act of 2012 (*Pub. L. No. 112-96, Title VI, 126 Stat. 156* (*codified at 47 USC § 1401 et seq.*) (the Act) created and authorized the First Responder Network Authority (FirstNet) to ensure the establishment of a nationwide public safety broadband network (NPSBN) based on a single, national network architecture (*47 USC § 1422(b)*). FirstNet is an independent authority within the United States (U.S.) Department of Commerce's National Telecommunications and Information Administration.

The NPSBN (i.e., the Proposed Action) is intended to cover all 50 states, 5 territories, and the District of Columbia. FirstNet has developed a series of five Programmatic Environmental Impact Statement (PEIS) documents, one for each of five geographic regions across the U.S. This Final PEIS fulfills some of FirstNet's responsibilities under the National Environmental Policy Act (NEPA) for the NPSBN for the non-contiguous region, which includes the states of Alaska and Hawaii, as well as the Commonwealths of the Northern Mariana Islands and Puerto Rico and the territories of American Samoa, Guam, and the U.S. Virgin Islands.

ES1.1. FIRSTNET AND THE NEPA PROCESS

The design, deployment (e.g., construction), and operation of the NPSBN is a broad action with nationwide implications. As a result, FirstNet has assessed potential impacts expected from the Proposed Action from the program as a whole. As part of a tiered approach to NEPA (see *40 CFR § 1502.20*), this Final PEIS also supports any subsequent site-specific environmental analyses that may be required for individual actions for specific projects at specific locations, once they are identified. Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work.

ES1.2. PUBLIC ENGAGEMENT AND TRIBAL CONSULTATION

Public comments on the Proposed Action have been and are being solicited as part of the NEPA process. In addition, in response to its obligations under the Section 106 of the National Historic Preservation Act, FirstNet has initiated consultations with the Advisory Council on Historic Preservation, State Historic Preservation Offices, federally recognized American Indian tribes, and Native Hawaiian organizations. Additionally, FirstNet has initiated consultation with Pacific Islanders on American Samoa, Guam, and the Northern Marina Islands as

well as communities in Puerto Rico and the U.S. Virgin Islands with consultation continuing throughout the NEPA and Section 106 process.

In a letter dated January 30, 2015, FirstNet contacted tribal leaders and Tribal Historic Preservation Officers, where applicable, to initiate formal, government-to-government consultation with all 567 federally recognized American Indian tribes. In a subsequent letter dated May 15, 2015, FirstNet initiated consultation with 17 Native Hawaiian Organizations.

The process for soliciting public comments on the Proposed Action initiated with the NEPA-mandated scoping process (as described in Section 1.7.2, Scoping, of this Final PEIS). Public engagement via the scoping process began with publication of a Notice of Intent (NOI) in the *Federal Register* (FR) to prepare five coordinated PEISs (*79 FR § 67156 [November 12, 2014]*). The NOI kicked off a 45-day public comment period, during which FirstNet received input from interested parties.

Following the publication of the NOI, FirstNet held a series of public meetings where participants had the opportunity to learn about the Proposed Action, talk directly with FirstNet environmental staff, and provide input regarding the scope and analysis of the Proposed Action. The public meetings were held in the following locations:

- Washington, D.C.—Tuesday, November 25, 2014
- Honolulu, HI—Tuesday, December 2, 2014
- San Francisco, CA—Thursday, December 4, 2014
- Tucson, AZ—Thursday, December 4, 2014
- Kansas City, MO—Tuesday, December 9, 2014
- New Orleans, LA—Thursday, December 11, 2014
- New York, NY—Monday, December 15, 2014

The Scoping Summary Report can be found in Appendix B, *First Responder Network Authority Nationwide Public Safety Broadband Network Programmatic Environmental Impact Statement Scoping Summary Report*.

The following major items were identified during the formal scoping comment period and in public meetings:

- Potential impacts of the NPSBN on sensitive natural resources;
- Concerns regarding the potential impacts of tower placement on culturally and ecologically sensitive areas such as Tumamoc Hill in Tucson, Arizona; and
- The potential impact of the NPSBN on existing public safety communications infrastructure and operations.

Additional comments were received after the formal scoping period and, as appropriate, are addressed within the relevant resource area and state/territory where the comment applied. The additional comments related to radio frequency (RF) exposure, tribal concerns, and general requests for updates.

An additional public comment period was held following publication of the Draft PEIS, which occurred on March 4, 2016. As with the scoping period, comments were solicited from cooperating agencies, state Single Points of Contact (SPOCs), elected officials, Indian tribes and Native Hawaiian Organizations, and the general public via traditional mail, e-mail, and the regulations.gov website. In addition, eight public meetings were held in the non-contiguous region where participants had the opportunity to talk directly with FirstNet environmental staff and its contractors to learn about the Proposed Action and the preliminary findings of the Draft PEIS, and to provide input on those findings. A summary of the public and agency comments received on the Draft PEIS, as well as a full listing of the comments themselves and FirstNet's responses to those comments, is provided in Chapter 14, Draft PEIS Public Comments.

ES1.3. Federal Agency Participation

FirstNet is the lead agency for the environmental review in accordance with NEPA, and the consultation requirements of the National Historic Preservation Act Section 106 and the Endangered Species Act Section 7. As the lead agency, FirstNet coordinates with cooperating agencies to ensure compliance with the laws, regulations, and Executive Orders (EOs) discussed in Section 1.8, Overview of Relevant Federal Laws and Executive Orders.

In letters dated January 16, 2015, FirstNet invited 37 federal agencies to participate in the development of the PEIS as cooperating agencies. Nine agencies accepted the invitation: the National Telecommunications and Information Administration; the Federal Communications Commission; the General Services Administration; the U.S. Department of Agriculture's (USDA) Rural Utilities Service; the USDA's U.S. Forest Service; the USDA's Natural

Resources Conservation Service; the U.S. Department of Defense Department of the Air Force; the U.S. Department of Energy; and the U.S. Department of Homeland Security, which includes the Federal Emergency Management Agency, the U.S. Coast Guard, and the U.S. Customs and Border Protection. Appendix A, *Invited Cooperating Agencies*, contains a complete list of those agencies invited to become cooperating agencies.

In a letter dated April 29, 2015, FirstNet invited all 56 state SPOCs to be consulting parties on the development of the PEISs in order to promote transparency and partnership. Fifteen SPOCs accepted the invitation, which afforded them the opportunity to review and comment on draft documents prior to public release.

ES2. PURPOSE OF AND NEED FOR THE FIRSTNET PROPOSED ACTION

The Act meets a long-standing and critical national infrastructure need to create a nationwide broadband network that would, for the first time, allow police officers, firefighters, emergency medical service professionals, and other public safety officials to effectively communicate with each other across agencies and jurisdictions.

ES2.1. PURPOSE OF THE FIRSTNET PROPOSED ACTION

The purpose of the Proposed Action is to design, deploy, and operate the NPSBN—a dedicated public safety communications network to provide first responders with the tools they need to do their jobs more effectively and to minimize the loss of life in the event of any future natural or manmade emergencies or disasters. FirstNet envisions the use of rugged, easy-to-use devices and plans to provide a set of applications and services on a single, interoperable platform built to open, non-proprietary, commercially available standards for emergency and daily public safety communications. These applications and services are intended to enhance the ability of the public safety community to perform more reliably, effectively, and safely. The NPSBN would also provide a backbone to allow for improved communications by carrying high-speed data, location information, images, and, eventually, streaming video. This capability would likely increase situational awareness during an emergency, thereby improving the ability of the public safety community to effectively engage and respond.

The FirstNet network would be "hardened" in terms of physical structure, user access, and cyber security considerations. These efforts would be designed not only to ensure that the network has greater resistance to system failure than what is currently available, but also that it could recover more rapidly should failure occur at any point in the system. The goal would be to provide not only interoperability, but also improved operability in the event of a natural or manmade disaster or emergency. The network operating standards are envisioned to also provide local control to public safety agencies, allowing for more control over the configuration, deployment, and management of multiple types of Information Technology resources, as well as device features and reporting.

ES2.2. NEED FOR THE FIRSTNET PROPOSED ACTION

The Proposed Action is needed to address existing deficiencies in public safety communications interoperability, durability, and resiliency that have been highlighted in recent years for the ways in which they have hindered response activities in high profile natural and manmade disasters or emergencies. Today, first responders rely on numerous separate, often incompatible, and often proprietary land mobile radio networks. This makes it difficult, and at times impossible, for emergency responders from different jurisdictions to communicate, especially during major emergencies that require a multi-jurisdictional response (*National Task Force on Interoperability 2005*).

The lack of interoperability in public safety communications and the hazards associated with it have been known within the public safety community and the telecommunications industry for quite some time. A1996 report on the state of public safety wireless communications (*Public Safety Wireless Advisory Committee 1996*) identified interoperability issues that hampered emergency response activities in the 1993 World Trade Center bombing in New York City and the 1995 bombing of the Alfred P. Murrah Federal Building in Oklahoma City.

Interoperability problems arose again during the terrorist attacks of September 11, 2001, the event that marks the true genesis of the NSPBN. As numerous onsite reports from public safety personnel at the World Trade Center, the Pentagon, and Somerset County, Pennsylvania, indicated, the lack of interoperable and resilient communications capability among the multiple police, fire, and emergency medical services personnel hampered rescue efforts and in many cases likely led to an increased loss of life, both among members of the public, as well as within the first responder community itself. Indeed, hundreds of police officers and firefighters, including off-duty personnel who reported to the scene to engage in rescue efforts upon learning of the events that were unfolding, lost their lives in

the line of duty; this amounted to the largest loss of first responders in a single event anywhere in U.S. history (*National Commission on Terrorist Attacks upon the United States 2004*).

Subsequent disasters, such as Hurricane Katrina in 2005 and Hurricane Sandy in 2013, have shown that public safety response is still often compromised by an inability of public safety responders to communicate with each other due to radio systems operating on different, incompatible frequencies. This is largely the result of the fragmented initial design and upgrades of public safety communications that were often planned and executed at the local level. These disasters, along with the preceding terrorist events, demonstrated that the nation lacked an overarching plan to connect all first responders under one dedicated interoperable system.

ES3. THE PROPOSED ACTION AND ALTERNATIVES

The Proposed Action would encompass the design, deployment, and operation of the NPSBN by FirstNet and/or their partners.[1] By statute, the network must have several characteristics, including:

- Security, resiliency, backwards compatibility with existing commercial networks, and integration with public safety answering points[2] or their equivalents;
- Substantial rural coverage;
- Deployment that adheres to open, non-proprietary, commercially available standards; and
- Use of existing infrastructure to the maximum extent economically desirable.

The FirstNet network would have two components, the core network and the radio access network. The core network is a key component for ensuring that users have a single interoperable platform nationwide, and would consist of a wide range of telecommunications infrastructure including fiber optic cable, towers, data centers, microwave technology, and others. The radio access network would consist of all radio base station infrastructure that would connect user devices.

[1] FirstNet's partners would assist in providing resources as necessary to deploy and operate the NPSBN.

[2] Public safety answering points are call centers responsible for answering calls to an emergency telephone number for police, fire, and emergency medical services.

FirstNet must also continue to maintain and improve the NPSBN to account for new and evolving technologies. In particular, the FirstNet network would be based on the minimum technical requirements on the commercial standards for Long Term Evolution (LTE) service, a proven upgradeable technology now in its fourth generation (4G).

In accordance with NEPA, FirstNet must examine a range of reasonable alternatives to design, construct, and operate the NPSBN. These alternatives must be reasonable ways in which FirstNet could meet the purpose and need for the Proposed Action. In addition to the range of reasonable alternatives, FirstNet is also required to "include the alternative of no action" as part of the alternatives analysis in the PEIS.

The "No Action Alternative" describes what would happen if FirstNet did not construct the NPSBN, and is used as a baseline against which the potential impacts of the action alternatives can be compared (see *40 CFR § 1502.14*). In addition to the alternatives described below, other alternatives were considered but not carried forward. Those alternatives are discussed in Section 2.3, Alternatives Considered but not Carried Forward.

ES3.1. Preferred Alternative

Under the Preferred Alternative, FirstNet and/or their partners would construct a nationwide broadband LTE network using a combination of the wired, wireless, deployable, and satellite technologies. There is currently a wide range of technologies that FirstNet may use to implement and deploy the NPSBN. Table ES3-1 provides a brief description of the types of wired, wireless, and deployable projects that FirstNet may consider. Full descriptions may be found in Section 2.1.2, Proposed Action Infrastructure.

Table ES3-1: Proposed Action Infrastructure Types

Project Type	Description
Wired Projects	
New Build – Buried Fiber Optic Plant	Plowing or trenching cable and/or cable conduit within public or (where necessary) private road, utility, or other rights-of-way (ROWs) or easements, along with new points of presence (POPs)[a], huts, or other facilities
Use of Existing Conduit – New Buried Fiber Optic Plant	Installation of new fiber optic cable in existing, buried conduit; ground disturbance would usually be limited to existing conduit entry and exit points
New Build – Aerial Fiber Optic Plant	Installation of new poles and new cables in previously disturbed or new ROWs or easements, or installing replacement poles in an existing ROW; deployment may include new access roads, POPs, huts, or other facilities to house plant equipment
Collocation on Existing Aerial Fiber Optic Plant	Installation of new fiber optic cable on existing poles; this may require structural hardening or reinforcement, and/or pole replacement

Project Type	Description
Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable	Activation of existing unused (dark) fiber; deployment may require the installation of new equipment, usually in existing equipment huts, as well as the installation of additional cable to reach the intended final destination
New Build – Submarine Fiber Optic Plant	Installation of sealed cables in limited near-shore or inland bodies of water, along with new onshore landings and facilities to accept cable, which are typically buried close to shore
Installation of Optical Transmission or Centralized Transmission Equipment	Installation of equipment as part of the core network deployment; this equipment is usually installed in small boxes or huts in the ROW of the utility corridor, and may involve construction of access roads
Wireless Projects	
New Wireless Communication Towers	Installation of new towers, antennas, and/or microwave dishes to support wireless infrastructure, along with generators, equipment sheds, fencing, lighting, electrical feeds, concrete foundations and pads, and/or access roads
Collocation on Existing Wireless Tower, Structure, or Building	Mounting or installation of equipment such as antennas or microwave dishes on existing towers, along with power units in some cases; existing towers, structures, or buildings may require structural hardening or increased physical security measures
Deployable Technologies (Technologies intended to provide service in areas where permanent, fixed infrastructure could not or would not be deployed)	
Cell on Wheels (COW)	A cellular base station on a trailer with an expandable antenna mast, designed to be part of a cellular network and augment existing capacity; COWs typically include a small generator and microwave or satellite link
Cell on Light Truck (COLT)	A cellular base station on a light truck platform with an expandable antenna mast, designed to be part of a cellular network and augment existing capacity; COLTs typically contain a small generator and microwave or satellite link
System on Wheels (SOW)	A full base station and controller on a large towable trailer or truck, with a large antenna mast, suitable to address larger localized coverage or capacity shortages in the event of large incidents; a SOW can support an island system with no need for satellite/microwave link back, and typically includes a generator
Deployable Aerial Communications Architecture (DACA)	Aerial vehicles such as drones, piloted aircraft, balloons, and blimps deployed at varying altitudes, capable of providing wide-area coverage, although with relatively low capacity/throughput; DACA would be generally used for addressing wide-scale loss of coverage after a major catastrophic event
Satellite Technologies	
Satellite-Enabled Devices and Equipment	Installation of permanent equipment on existing structures or the use of portable devices that use satellite technology, such as satellite phones or video cameras
Deployment of Satellites	FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes

[a] POPs are connections or access points between two different networks, or different components of one network.

ES3.2. Deployable Technologies Alternative

Under the Deployable Technologies Alternative, FirstNet and/or their partners would procure, deploy, and maintain a nationwide fleet of mobile communications systems, including ground-based and aerial deployable technologies, to provide temporary coverage in areas not covered by existing, usable infrastructure. This alternative is evaluated as a stand-alone alternative and would not involve collocations of other equipment or construction of facilities, although some staging or landing areas (depending on the type of technology) could require minor construction and maintenance within public road right-of-ways and utility corridors, heavy equipment movement, and minor excavation and paving near public roads. Generally, these units would be deployed at times of an incident to the affected area for either planned or unplanned incidents or events. Equipment would likely be stationed in every state and territory, often at multiple locations in each state or territory, to facilitate suitable response. These mobile communication units would be temporarily installed and may use existing satellite, microwave, or radio systems for backhaul.

ES3.3. No Action Alternative

Under the No Action Alternative, the NPSBN would not be constructed; there would be no nationwide, coordinated system dedicated to public safety interoperable communications. The existing multiplicity of communications networks would remain in place, as would the current, known limitations and problems of existing communication networks during times of emergency or disaster. This alternative would require Congress to revise the Act, which currently requires the NPSBN.

ES4. POTENTIAL IMPACTS OF THE PREFERRED ALTERNATIVE

This Final PEIS contains seven stand-alone chapters, each of which is devoted to one of the seven states or territories in the non-contiguous U.S. region. Each of these chapters discusses 15 separate resource areas, such as biological resources, land use, air quality, etc. For each state or territory, this Final PEIS provides an overview of the affected environment (i.e., existing conditions), and then discusses the potential impacts of the Proposed Action at the programmatic level in an environmental consequences section. The programmatic approach creates a comprehensive analytical framework that assesses potential impacts expected from the program as a whole at the regional level. It also supports any subsequent

site-specific environmental analyses that may be required for individual actions at specific locations, once they are identified. Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work.

Through the programmatic approach, FirstNet has identified four categories of potential impacts on these resources:

- *Potentially significant*
- *Less than significant with best management practices (BMPs) and mitigation measures incorporated*
- *Less than significant*
- *No impact*

The methodology used to determine these impact levels is provided for each resource within each state or territory. The sections below summarize in tabular form the impact categories for each potential impact type, within each resource, and within each state or territory. For ease of reference, each impact category is assigned a color and a corresponding number, as shown below:

1. Potentially significant
1-2. Range of potentially significant to less than significant with BMPs and mitigation measures incorporated
2. Less than significant with BMPs and mitigation measures incorporated
3. Less than significant
4. No impact

The sections below discuss the potential impacts of the Preferred Alternative, focusing on potential impacts at the programmatic level. At the programmatic level, and based on the impact significance ratings developed, there would be no *potentially significant* impacts as a result of the Preferred Alternative as a whole.[3] However, the same impact significance criteria used at the programmatic level may not apply to site-specific buildout activities and actions. This Final PEIS acknowledges that site-specific impacts have the potential to be more significant on a localized basis, and therefore could require site-specific assessments and mitigation. Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary

[3] Impacts of climate change of the Preferred Alternative could range, at the programmatic level, from *potentially significant* to *less than significant with BMPs and mitigation measures incorporated*.

to perform the work. For example, while potential impacts from specific FirstNet projects taking place in a wetland would not rise to the level of significance at the programmatic level, such impacts could be considered *potentially significant* at the site-specific level. This document provides examples of circumstances where impacts could approach significance; in doing so, clear distinctions are made between the purpose and usefulness of this PEIS and subsequent analyses (such as environmental assessments). Site-specific locations may be subject to an environmental review to help ensure environmental concerns are addressed. The need for and level of environmental review would be dependent on site conditions and the nature of the deployment activity.

Furthermore, the sections below include only certain select proposed BMPs or mitigation measures that are offered as examples.[4] The main body of this Final PEIS describes all of these potential impacts and BMPs or mitigation measures in detail.

ES4.1. INFRASTRUCTURE

This section describes potential impacts to infrastructure at the programmatic level including transportation, communications, and other utilities associated with deployment and operation of the Preferred Alternative, and discusses BMPs and mitigation measures that could avoid or minimize those potential impacts.

Deployment and operation of the Preferred Alternative could potentially impact transportation system safety and capacity through the creation of traffic congestion or delay, or result in the increase in transportation incidents (e.g., crashes, derailments) due to the transport of heavy equipment or deployment activities including plowing, directional boring, and trenching along roadways and within the public road right-of-ways. The presence of deployable technologies such as Cell on Wheels, Cell on Light Truck, System on Wheels, and Deployable Aerial Communications Architecture has the potential to impact air and land-based traffic congestion and safety. Submarine deployment activities in limited near-shore or inland bodies of water additionally have the potential to increase boat traffic and congestion on a short-term basis. These potential impacts to transportation capacity and safety would be *less than significant* at the programmatic level, as they would likely be short term, would be regionally based around the ongoing phase of deployment, and would likely return to normal conditions after a few months or less.

[4] BMPs and mitigation measures have been developed based on consultation with other agencies as well as independent research by FirstNet and their environmental contractors.

While potential impacts to health care and emergency health care systems are not certain, if they occurred, these potential impacts would be localized, short-term, and temporary and therefore *less than significant* at the programmatic level. Any potential localized or temporary access restrictions to or strains on health care and emergency health services would likely improve during the operations phase of the Preferred Alternative.

Effects on commercial telecommunication systems, communications, or level of service would be *less than significant* at the programmatic level due to deployment activities that could generate temporary and minor disruptions to the current commercial telecommunications system; minor decreased level of service could occur during deployment of the Preferred Alternative and during implementation of deployable technologies. Such deployment activities include plowing, directional boring, or trenching during the installation of fiber optic cable, as well as construction of wireless towers, structures and buildings. Potential impacts to underwater telecommunication infrastructure would also be *less than significant* due to submarine deployment activities in limited near-shore or inland bodies of water. During operations the new NPSBN is anticipated to improve commercial telecommunication systems, communications, and level of service by expanding the telecommunications service area to cover more areas.

Potential impacts to utilities during system deployment would be *less than significant* at the programmatic level (see Table ES4-1). Such potential impacts, if they occurred, would likely be temporary and minor.

Overall, implementation of FirstNet public safety telecommunications infrastructure would likely significantly improve public safety communications capabilities and response times in both urban and rural areas during operations. Upgrades to the current infrastructure during the deployment phase could result in a temporary, likely minor, disruption in emergency communications, generally lasting only as long as it takes to connect and begin utilizing the new system. It is anticipated that public safety communications interoperability, durability, and resiliency would significantly improve during operation in comparison to existing conditions.

Table ES4-1: Summary of Potential Impacts, Infrastructure

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Transportation system capacity and safety	3	3	3	3	3	3	3	• Follow all applicable federal, state/territory, and local requirements for construction on or near public roads. • Follow all applicable federal, state/territory, and local laws concerning traffic speed and safety during the transport of equipment. • Schedule deployment activities outside of peak traffic hours. • Avoid roads with heavy traffic volumes and peak travel hours, to the extent possible, when scheduling the transport of heavy equipment or construction materials. • Design staging areas to minimize unnecessary equipment and material mobilizations.
Strain on capacity of local health, public safety, and emergency response services	3	3	3	3	3	3	3	• Repave and restore disturbed roads and public road rights-of-way (ROWs), applicable to federal, state/territory, and local laws, as quickly as possible to avoid any traffic impediments that may potentially hinder access to local health, public safety, and emergency facilities, and so traffic capacity and safety conditions could return to their pre-construction condition. • Design new deployment activities within existing ROWs to the extent possible and outside of roadways and thoroughfares to minimize potential impacts on traffic flow or safety.
Modification to existing public safety that directly affects public safety communication capabilities and response times[b]	3	3	3	3	3	3	3	• Coordinate with federal, state/territory, and local government agencies as appropriate, as well as with public safety officials, emergency and medical facilities, and existing telecommunications providers to the extent practicable to facilitate awareness of deployment activities and accompanying schedule. • Schedule new construction outside of seasons known to cause more accidents (e.g., tsunami/ hurricane/tropical cyclone season or times of the year when wildfires are more likely to occur) so that potential service disruptions are less likely to coincide with times of increased demand.

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Effects on commercial telecommunication systems, communications, or level of service	3	3	3	3	3	3	3	• Confirm or otherwise install detection systems so that if and when a disruption to utility services or telecommunications systems occurs, it can be identified and repaired quickly. • Implement a backup telecommunications system, as needed, which allows first responders to communicate with each other and the public during deployment activities until the new nationwide public safety broadband network (NPSBN) has been successfully implemented.
Effects on utilities, including electric power transmission facilities and water and sewer facilities	3	3	3	3	3	3	3	• Complete deployment activities as quickly and safely as possible to avoid any possible disruptions to utility services. • Complete those deployment activities that could interrupt power during non-peak times for power or water. • Follow all applicable state/territory and local one-call laws and procedures for buildouts. • Follow all applicable federal, state/territory, or local requirements regarding utilities (water, sewer, power, and electricity) and construction within a utility ROW.

[a] Impact ratings are at the programmatic level, and colors are as follows:
1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact

[b] The discussion of impacts to public safety communication capabilities and response times focuses on potential adverse impacts during deployment. Overall, operation of the Preferred Alternative would result in—indeed, the purpose of the Proposed Action is to create—significant improvements in overall communications and response times.

ES4.1.1. Alaska

Infrastructure for public safety telecommunications within Alaska is minimal, particularly in rural areas. This, coupled with the broad distribution of communities across a very large geography, creates the potential for significant improvement in telecommunications conditions for both first responders and communities. The Proposed Action is intended to address existing deficiencies in public safety communications interoperability, durability, and resiliency, significantly improving public safety communications capabilities and response times in both urban and rural areas of Alaska during operations. As a result, the general effects on existing public safety in Alaska would likely be substantially beneficial, and any potential adverse effects would be considered *less than significant* at the programmatic level due to the temporary nature of deployment and the limited scale of each individual site (see Table ES4-1).

ES4.1.2. Hawaii

The limited availability of fixed infrastructure and public safety telecommunications infrastructure on the islands of Hawaii, due to factors including unique topography, disconnected geographies, and the lack of commercial electricity in some areas, enhances the potential of the Proposed Action to improve current conditions for first responders and potentially impacted individuals in emergency situations. As a result, the general effects on existing public safety in Hawaii would likely be substantially beneficial, and any potential adverse effects would be considered *less than significant* at the programmatic level due to the temporary nature of deployment and the limited scale of each individual site (see Table ES4-1).

ES4.1.3. American Samoa

Infrastructure potential impacts in American Samoa would be similar in nature to the general potential impacts described above for Hawaii. The general effects on existing public safety in American Samoa would be similarly beneficial, and any potential adverse effects would generally be considered *less than significant* at the programmatic level due to the temporary nature of deployment and the limited scale of each individual site (see Table ES4-1).

ES4.1.4. Guam

Infrastructure potential impacts in Guam would be similar in nature to the general potential impacts described above for Hawaii. The general effects on existing public safety in Guam would be similarly beneficial, and any potential adverse effects would generally be considered *less than significant* at the programmatic level due to the temporary nature of deployment and the limited scale of each individual site (see Table ES4-1).

ES4.1.5. Northern Mariana Islands

Infrastructure potential impacts in the Northern Mariana Islands would be similar in nature to the general potential impacts described above for Hawaii. The general effects on existing public safety in the Northern Mariana Islands would be similarly beneficial, and any potential adverse effects would generally be considered *less than significant* at the programmatic level (see Table ES4-1).

ES4.1.6. Puerto Rico

Puerto Rico's existing public safety communications interoperability, durability, and resiliency is inadequate due to many factors regarding notification and redundancy.[5] The Preferred Alternative would likely significantly improve public safety communications capabilities and response times in both urban and rural areas of Puerto Rico during operations. As a result, the general effects on existing public safety in Puerto Rico would likely be substantially beneficial, and any potential adverse effects would be considered *less than significant* at the programmatic level (see Table ES4-1).

ES4.1.7. U.S. Virgin Islands

Infrastructure potential impacts in U.S. Virgin Islands would be similar in nature to the general potential impacts described above for Hawaii. The general effects on existing public safety in the U.S. Virgin Islands would be similarly beneficial, and any potential adverse effects would generally be considered *less than significant* at the programmatic level (see Table ES4-1).

[5] In this context, notification refers to the ability of health care providers to be alerted in the event of a disaster. Redundancy refers to the duplication of equipment or processes to help maintain continuity of operations.

ES4.2. Soils

This section describes potential impacts to soil resources at the programmatic level associated with deployment and operation of the Preferred Alternative, and discusses BMPs and mitigation measures that could avoid or help minimize those potential impacts. Operation of the Preferred Alternative would involve minimal potential impacts to soils. Potential impacts, although *less than significant* at the programmatic level, would instead be more likely during deployment.

Construction activities associated with deployment could potentially impact sedimentation and soil erosion in areas where the slopes are steep and where the erosion potential is moderate to severe as indicated by soil characteristics. Increased sedimentation in waterways, for example, may alter natural sediment transport processes, which could impair water and habitat quality and potentially affect aquatic plants and animals. Potential impacts associated with erosion and sedimentation would be *less than significant* at the programmatic level, as the impacts would likely be short term, would be localized to the deployment locations of individual facilities, and would return to normal conditions as soon as revegetation occurs, often by the next growing season (see Table ES4-2).

The potential for the loss of topsoil (i.e., organic and mineral topsoil layers) by mixing would be present during deployment of the proposed facilities or infrastructure and during trenching, grading, and/or foundation excavation activities. It is anticipated that topsoil mixing would likely be minimal and isolated to specific locations; as a result, the potential impacts from topsoil mixing would be *less than significant* at the programmatic level.

The movement of heavy equipment required to support any land clearing, drilling, and construction activities, as well as installation of equipment or modification of structures needed to support network deployment could potentially impact soil resources by causing the compaction and rutting of susceptible soils. Potential impacts associated with compaction and rutting would be *less than significant* at the programmatic level, as they would likely be short term, localized to the routes used to access off-road deployment locations, and would only be likely to occur in a limited range of soil types.

Table ES4-2: Summary of Potential Impacts, Soils

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Soil erosion	3	3	3	3	3	3	3	• Follow all applicable federal, state/territory, and local requirements for soil erosion and sedimentation control and permitting to avoid or minimize erosion and sedimentation and restore disturbed soil. • Avoid construction in areas with steep or unstable slopes or with soils known to be particularly susceptible to soil erosion, and construct facilities in alternate locations to avoid these areas, if practical. • Develop a soil erosion and sedimentation control plan for disturbed areas, and use silt fences, erosion control blankets, retention ponds, straw and sandbag barriers, and/or other controls as needed to reduce soil erosion, storm water runoff, and sedimentation. • Schedule construction activities to avoid, to the extent possible, soil disturbance activities during periods or months with heavy rainfall and snowmelt. • Cover exposed areas with tarps or similar materials to prevent rainfall exposure to the extent possible. • Minimize the area of bare soil exposed at any one time as much as possible by constructing in stages. • Revegetate disturbed areas with native plants, to the extent practicable, as progressively and quickly as practicable to achieve stabilization. • Minimize soil disturbance to the extent practicable, especially in wetland and designated natural resource areas. • Maintain topsoil by segregating topsoil or surface soil from subsurface layers and implementing temporary topsoil storage areas during construction.
Topsoil mixing	3	3	3	3	3	3	3	

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Soil compaction and rutting	3	3	3	3	3	3	3	• Replace topsoil as soon as possible following construction. • Pay particular attention to areas identified as having soils that are vulnerable to compaction and select alternate locations to construct facilities if practical. • Implement deep tillage procedures where practical to loosen compacted soils. • Restore soil surface to original or improved contours. • Use timber mats or similar infrastructure as deemed necessary to distribute vehicle and heavy equipment weight. • Use existing roads or previously disturbed areas to the maximum extent practicable.

[a] Impact ratings are at the programmatic level, and colors are as follows:
1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact

ES4.2.1. Alaska

Prime farmland soils are not present in Alaska; soil temperatures do not meet the required threshold established by law. Given that steep slopes are present throughout much of Alaska, some limited amount of infrastructure may be unavoidable in these areas that have severe erosion potential, in which case BMPs and mitigation measures could help avoid or minimize the potential impacts. Although 12 of the 21 soil suborders present in Alaska (over half) are poorly drained or include hydric soils, it is anticipated that soil compaction and rutting as a result of deployment of the Preferred Alternative would be temporary in nature and disturbances would be minor, isolated, and reversed in a period of a few months or less. As a result, the general effects on soils in Alaska would be considered *less than significant* at the programmatic level (see Table ES4-2).

ES4.2.2. Hawaii

Prime farmland comprises approximately 200,000 acres in Hawaii, or less than 5 percent of the state's total land area. To the extent practicable, FirstNet and/or their partners would likely attempt to avoid areas with severe erosion potential due to sensitivity and constructability limitations associated with erosion-prone sensitive areas and/or steep slopes (up to 90 percent). Soil compaction and rutting in Hawaii would likely not be perceptible over a widespread area since soils with high potential for compaction and rutting are present to varying degrees within only 3 of the 18 soil suborders present in Hawaii. As a result, the general effects on soils in Hawaii would be considered *less than significant* at the programmatic level (see Table ES4-2).

ES4.2.3. American Samoa

Minimal prime farmland is present in American Samoa. Given that steep slopes are present throughout much of American Samoa, some limited amount of infrastructure may be unavoidable in these areas that have severe erosion potential, in which case BMPs and mitigation measures could help avoid or minimize the potential impacts. Soil compaction and rutting as a result of deployment of the Preferred Alternative would likely not be perceptible over a widespread area since soils with high potential for compaction are present to varying degrees within only one soil type in American Samoa. As a result, the general effects on soils in American Samoa would be considered *less than significant* at the programmatic level (see Table ES4-2).

ES4.2.4. Guam

Prime farmland in Guam only exists in three of the eight soil types, and only when irrigated. However, given that steep slopes are present throughout much of Guam, deployment of some limited amount of infrastructure may be unavoidable in these areas that have severe erosion potential, in which case BMPs and mitigation measures could help avoid or minimize the potential impacts. Soil compaction and rutting as a result of deployment of the Preferred Alternative would be minor, isolated, and likely not perceptible in Guam. As a result, the general effects on soils in Guam would be considered *less than significant* at the programmatic level (see Table ES4-2).

ES4.2.5. Northern Mariana Islands

Prime farmland in the Northern Mariana Islands only exists in 3 of the 13 soil types, and only when irrigated. Given that steep slopes are present throughout much of the Northern Mariana Islands, deployment of some limited amount of infrastructure may be unavoidable in these areas that have severe erosion potential, in which case BMPs and mitigation measures could help avoid or minimize the potential impacts. Soil compaction and rutting as a result of deployment of the Preferred Alternative would likely not be perceptible over a widespread area since soils with high potential for compaction are present to varying degrees within only 3 of the 13 soil types present in the Northern Mariana Islands. As a result, the general effects on soils in the Northern Mariana Islands would be considered *less than significant* at the programmatic level (see Table ES4-2).

ES4.2.6. Puerto Rico

Prime farmland comprises approximately 175,000 acres in Puerto Rico, or approximately 8 percent of the territory's total land area. Given that steep slopes are present throughout much of Puerto Rico, deployment of some limited amount of infrastructure may be unavoidable in these areas that have severe erosion potential, in which case BMPs and mitigation measures could help avoid or minimize the potential impacts. Soil compaction and rutting as a result of deployment of the Preferred Alternative would likely not be perceptible over a widespread area, although soils with high potential for compaction are present to varying degrees within 8 of 20 soil types present in Puerto Rico. As a result, the general effects on soils in Puerto Rico would be considered *less than significant* at the programmatic level (see Table ES4-2).

ES4.2.7. U.S. Virgin Islands

Prime farmland is not present in the U.S. Virgin Islands. However, given that steep slopes are present throughout much of the U.S. Virgin Islands, deployment of some limited amount of infrastructure may be unavoidable in these areas that have severe erosion potential, in which case BMPs and mitigation measures could help avoid or minimize the potential impacts. Soil compaction and rutting as a result of deployment of the Preferred Alternative would likely not be perceptible over a widespread area since soils with high potential for compaction are present to varying degrees within only 2 of the 17 soil types in the U.S. Virgin Islands. As a result, the general effects on soils in the U.S. Virgin Islands would be considered *less than significant* at the programmatic level (see Table ES4-2).

ES4.3. GEOLOGY

Deployment and operation of the Preferred Alternative could affect and/or be affected by geologic conditions and processes. This Final PEIS considers the following aspects of geology:

- The potential for impacts to surface geology, bedrock, topography, physiography, and geomorphology, particularly as a result of trenching, grading, and/or foundation excavation activities;
- Potential impacts to mineral and fossil fuel resources, generally more likely in states or territories with a higher density of extraction areas (compared to the nation as a whole);
- The potential for impacts to paleontological resources, particularly during trenching, grading, and/or foundation excavation activities, and particularly in areas of a state or territory where known paleontological resources are highly prevalent;
- The effects of seismic hazards on the Preferred Alternative;
- The effects of volcanic activity on the Preferred Alternative; and
- Land subsidence due to the Preferred Alternative activities, particularly soil compaction and rutting from the movement of heavy equipment.

Operation of the Preferred Alternative would involve minimal potential impacts to geology at the programmatic level. The potential impacts described in this section and in Table ES4-3 would instead be more likely during deployment. These potential impacts would generally be *less than significant* at the programmatic level, as they would likely be short term and would be localized to the deployment locations of individual facilities.

Table ES4-3: Summary of Potential Impacts, Geology

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Potential Impacts of the Preferred Alternative								• Avoid, to the extent practicable, deployment in areas that undergo significant geomorphological changes, such as within active glacial valleys (in Alaska) or streams and rivers. • Avoid construction in seismically active areas, locations with karst topography or that have shown recent subsidence, or steep or unstable slopes that are susceptible to erosion; construct facilities in alternate locations if practical. • Construct all infrastructure to standards that meet or exceed state/territory seismic requirements. • Avoid rock ripping to the extent practicable to preserve bedrock resources, topography, and physiography. • Minimize the area/volume of disturbed/removed terrain during deployment/construction. • Restore topographic features and grades to pre-construction/ deployment conditions. • Limit construction to areas that are not actively mined or undergoing mineral or other material or petroleum extraction activities, or coordinate planning and deployment with mining and extraction plans and activities in active areas. • Follow all relevant federal, state/territory, and local laws and regulations as they apply to paleontological, mineral, and fossil fuel resources. • Develop a Paleontological Monitoring and Mitigation Plan outlining areas with high likelihood for encountering significant fossil resources and plans for avoidance and appropriate response if previously unknown resources are encountered. • Avoid areas with significant fossil resources, if practicable.
Surface geology, bedrock, topography, physiography, and geomorphology	3	3	3	3	3	3	3	
Mineral and fossil fuel resource impacts	3	3	3	3	3	3	3	
Paleontological resources impacts	3	3	3	3	3	3	3	
Potential Impacts to the Preferred Alternative								
Seismic hazard	3	3	3	3	3	3	3	
Volcanic activity	3	3	3	4	3	4	4	

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Landslide	3	3	3	3	3	3	3	• Suspend all work if paleontological resources are encountered on a project construction site until a certified paleontologist has been brought on-site to oversee project activities and ensure that fossil resources are handled properly. • Locate construction/deployment activities outside of high risk seismic hazard zones, active faults, and away from low coastal areas that could potentially be impacted from tsunamis. • Follow all applicable federal, state/territory, and local requirements for construction codes, seismic criteria, and geotechnical designs, and construct/deploy all infrastructure to standards that meet or exceed state/territory seismic requirements. • Design and deploy resilient infrastructure to withstand earthquakes typical to the region.
Land subsidence	3	3	3	3	3	3	3	• Locate construction/deployment activities outside of high-risk volcanic hazard zones. • Locate construction/deployment activities away from steep slopes with unconsolidated material and other areas prone to landslides, to the extent practicable. • Locate construction/deployment activities outside of areas identified as having karst topography, loosely compacted soils, and low density sediments prone to subsidence or compaction, to the extent practicable. • Consider alternate methods to trenching for placement of fiber optic cable and transmission lines in sensitive areas.

[a] Impact ratings are at the programmatic level, and colors are as follows:
1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact

ES4.3.1. Alaska

It is anticipated that the Preferred Alternative's potential impacts to surface geology, bedrock, topography, physiography, and geomorphology in Alaska would be minor and would not result in measurable changes at the programmatic level, and could be further reduced with implementation of BMPs and mitigation measures. FirstNet and/or their partners would work, as practicable or feasible, to avoid areas that undergo significant geomorphological changes, such as active glacial valleys. Although Alaska ranked 7th among the 50 states in mineral production values in 2015, and 14th for total energy production in 2014, the state is about 21 percent of the size of the entire contiguous U.S. (*USGS 2016; EIA 2015a),* which means the density of extraction areas is relatively low. Because of this, minor potential impacts to mineral and fossil fuel resources are anticipated as a result of the Preferred Alternative.

As discussed in detail in Section 3.1.3, Geology, some of the most scientifically significant fossils in the U.S. have been discovered in Alaska, and its geographic location along with the former land bridge that connected Asia and North America make the state rich in paleontological resources. Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. However, it is anticipated that potential impacts to specific areas with known significant paleontological resources would likely be avoided or minimized, and could be further reduced with the implementation of BMPs and mitigation measures.

One of the most active seismic boundaries in the world is located in Alaska and the state is susceptible to earthquakes, particularly in its southern portions. Volcanoes in Alaska exist primarily just north of the Aleutian Trench. The Preferred Alternative is unlikely to affect seismic activity, but rather seismic hazards could have the potential to impact the Preferred Alternative. Although some potential impacts to the Preferred Alternative infrastructure could occur during significant earthquake events, FirstNet and/or their partners would likely work, as practicable or feasible, to design the network to reasonably withstand the seismic activity typical in the state of Alaska, thereby limiting potential impacts. For the reasons stated above, effects on geology in Alaska would be considered *less than significant* at the programmatic level (see Table ES4-3).

ES4.3.2. Hawaii

It is anticipated that the Preferred Alternative's potential impacts to surface geology, bedrock, topography, physiography, and geomorphology in Hawaii would be minor and would not result in measurable changes at the programmatic level, and could be further reduced if BMPs and mitigation measures are implemented. It is anticipated that FirstNet and/or their partners would work to avoid or bore under areas that undergo significant geomorphological changes, such as active stream or river channels.

Hawaii does not produce or have any proven recoverable reserves of petroleum, natural gas, or coal; in 2015 the state ranked 46th among the 50 states for non-fuel mineral production (*USGS 2016; EIA 2015b*). As a result, *no impacts* to fossil fuel resources and *less than significant* potential impacts to mineral resources at the programmatic level could occur as a result of the Preferred Alternative.

Fossils known to exist in Hawaii include various reefs, corals and other sea animals, and birds. Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work It is anticipated that potential impacts to specific areas with known significant paleontological resources would be avoided or minimized, and could be further reduced with implementation of BMPs and mitigation measures.

Hawaii's geology and its associated volcanic hotspot make the state susceptible to earthquakes, particularly within the island of Hawaii where seismic hazards are the highest and where the state's active volcanoes are found. Landslides in Hawaii can be caused by combinations of geology, excessive rainfall, seismic activity, and/or volcanic activity. The Preferred Alternative is unlikely to affect seismic, volcanic, or landslide activity in Hawaii, but rather these hazards could have the potential to impact the Preferred Alternative. As practicable or feasible, FirstNet and/or their partners would work to avoid areas that are more prone to these hazards. Overall, effects on geology in Hawaii would be considered *less than significant* at the programmatic level (see Table ES4-3).

ES4.3.3. American Samoa

It is anticipated that the Preferred Alternative's potential impacts to surface geology, bedrock, topography, physiography, and geomorphology in American Samoa would be minor and would not result in measurable changes at the programmatic level, and could be further reduced if BMPs and mitigation measures are implemented. It is anticipated that FirstNet and/or their partners would work to avoid or bore under areas that undergo significant geomorphological changes, such as active stream or river channels.

American Samoa does not produce natural gas, petroleum, or coal, and has very limited mineral resources (*EIA 2015c*). In addition, very few fossil resources are preserved in American Samoa.

American Samoa resides near active plate boundaries and is susceptible to earthquakes, particularly in the northern islands of Ofu and Ta'ū, where seismic hazards are the highest. Three volcanoes exist in American Samoa, with one on each of the three islands of Ofu, Ta'ū, and Tutuila. The most recent eruptions occurred in 1866 and 1905 on the island of Ofu. Landslides in American Samoa can be caused by combinations of geology, excessive rainfall, seismic activity, and/or volcanic activity. The Preferred Alternative is unlikely to affect seismic, volcanic, or landslide activity in American Samoa, but rather these hazards could have the potential to impact the Preferred Alternative. As practicable or feasible, FirstNet and/or their partners would work to avoid areas that are more prone to these hazards. Overall, effects on geology in American Samoa would be considered *less than significant* at the programmatic level (see Table ES4-3).

ES4.3.4. Guam

It is anticipated that the Preferred Alternative's potential impacts to surface geology, bedrock, topography, physiography, and geomorphology in Guam would be minor and would not result in measurable changes at the programmatic level, and could be further reduced with implementation of BMPs and mitigation measures. It is anticipated that FirstNet and/or their partners would work to avoid or bore under areas that undergo significant geomorphological changes, such as active stream or river channels in southern Guam.

Guam does not produce natural gas, coal, or petroleum, and has limited mineral resources (*USGS 2015a; EIA 2015d*). Few paleontological studies of Guam have been widely circulated, but fossils do exist in various limestone formations including fossilized algae, corals, and mollusks. Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. However, potential impacts to paleontological resources would be *less than significant* at the programmatic level.

Guam is located near the Pacific Plate - Philippine Sea Plate boundary. According to the U.S. Geological Survey, the entire island of Guam has a high seismic hazard risk (*Mueller et al. 2012*). There are no active volcanoes on Guam. Landslides in Guam can be caused by combinations of geology, excessive rainfall, and/or seismic activity. The Preferred Alternative is unlikely to affect seismic or landslide activity in Guam, but rather these hazards could have the potential to impact the Preferred Alternative. As practicable or feasible, FirstNet

and/or their partners would work to avoid areas that are more prone to these hazards. Overall, effects on geology in Guam would be considered *less than significant*, except for volcanic activity, where there would be *no impact* at the programmatic level (see Table ES4-3).

ES4.3.5. Northern Mariana Islands

It is anticipated that the Preferred Alternative's potential impacts to surface geology, bedrock, topography, physiography, and geomorphology in the Northern Mariana Islands would be minor and would not result in measurable changes at the programmatic level, and could be further reduced if BMPs and mitigation measures are implemented.

The Northern Mariana Islands does not produce fossil fuel resources and mineral resources are limited (*USGS 2014; EIA 2015e*). Fossil resources exist primarily in the southern islands of the Northern Mariana Islands, and fossils of various reptiles, birds, rodents, as well as algae deposits have been discovered in the limestone formations of those islands. Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. It is anticipated that potential impacts to specific areas with known significant paleontological resources would be avoided or minimized, and could be further reduced with implementation of BMPs and mitigation measures.

The Northern Mariana Islands is located near the Pacific Plate - Philippine Sea Plate boundary, and seismic hazard risks are high throughout the entire territory, but particularly on the islands of Rota, Aguijan, and the northernmost (largely uninhabited) islands. Volcanoes in the Northern Mariana Islands primarily occur in the northern, largely uninhabited islands. Landslides can be caused by combinations of geology, excessive rainfall, seismic activity, and/or volcanic activity. The Preferred Alternative is unlikely to affect seismic or landslide activity in the Northern Mariana Islands, but rather these hazards could have the potential to impact the Preferred Alternative. As practicable or feasible, FirstNet and/or their partners would work to avoid areas that are more prone to these hazards. Overall, effects on geology in the Northern Mariana Islands would be considered *less than significant* at the programmatic level (see Table ES4-3).

ES4.3.6. Puerto Rico

It is anticipated that the Preferred Alternative's potential impacts to surface geology, bedrock, topography, physiography, and geomorphology in Puerto Rico would be minor and would not result in measurable changes at the programmatic level, and could be further reduced if BMPs and mitigation measures are

implemented. It is anticipated that FirstNet and/or their partners would work to avoid or bore under areas that undergo significant geomorphological changes, such as active stream or river channels.

Puerto Rico does not produce petroleum, natural gas, or coal and ranked equivalent to 49th out of the 50 states in non-fuel mineral production (*USGS 2015a; EIA 2016*). However, numerous geologic formations in Puerto Rico, particularly those in the northern portion of the territory, contain plant and animal fossils, particularly preserved mollusks. Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. It is anticipated that potential impacts to specific areas with known significant paleontological resources would be avoided or minimized, and could be further reduced if BMPs and mitigation measures are implemented.

Puerto Rico is located near the North American and Caribbean Plate boundary. The great majority of the territory has a moderate seismic hazard risk. There are no active volcanoes in Puerto Rico. Landslides in Puerto Rico can be caused by combinations of geology, excessive rainfall, and/or seismic activity. The Preferred Alternative is unlikely to affect seismic or landslide activity in Puerto Rico, but rather these hazards could have the potential to impact the Preferred Alternative. As practicable or feasible, FirstNet and/or their partners would work to avoid areas that are more prone to these hazards. Overall, effects on geology in Puerto Rico would be considered *less than significant* at the programmatic level, except for volcanic activity, where there would be *no impact* (see Table ES4-3).

ES4.3.7. U.S. Virgin Islands

It is anticipated that the Preferred Alternative's potential impacts to surface geology, bedrock, topography, physiography, and geomorphology in the U.S. Virgin Islands would be minor and would not result in measurable changes at the programmatic level, and could be further reduced if BMPs and mitigation measures were implemented. It is anticipated that FirstNet and/or their partners would work to avoid or bore under areas that undergo significant geomorphological changes, such as active stream or river channels.

The U.S. Virgin Islands does not produce petroleum, natural gas, or coal, although it does produce crushed stone (*USGS 2015a; EIA 2015f*). Few paleontological studies of the U.S. Virgin Islands have been widely circulated. However, fossil resources do exist, and numerous fossils can be found, among other places, on Coki Point Cliffs in St. Thomas, and Vagthus Point in St. Croix. Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the

work. It is anticipated that potential impacts to specific areas with known significant paleontological resources would be avoided or minimized, and could be further reduced with implementation of the BMPs and mitigation measures.

The U.S. Virgin Islands is located near the North American and Caribbean Plate boundary. St. Croix has a low to moderate seismic hazard risk, and the islands of St. John and St. Thomas have a moderate seismic hazard risk. There are no active volcanoes on the U.S. Virgin Islands. Landslides can be caused by combinations of geology, excessive rainfall, and/or seismic activity. The Preferred Alternative is unlikely to affect seismic or landslide activity in the U.S. Virgin Islands, but rather these hazards could have the potential to impact the Preferred Alternative. As practicable or feasible, FirstNet and/or their partners would work to avoid areas that are more prone to these hazards. Overall, effects on geology in the U.S. Virgin Islands would be considered *less than significant* at the programmatic level, except for volcanic activity, where there would be *no impact* (see Table ES4-3).

ES4.4. Water Resources

This section describes potential impacts to water resources at the programmatic level associated with deployment and operation of the Preferred Alternative, and discusses BMPs and mitigation measures that could avoid or minimize those potential impacts. Operation of the Preferred Alternative would likely involve minimal potential impacts to water resources. Potential impacts would instead be more likely during deployment (see Table ES4-4). Construction activities associated with deployment of the Preferred Alternative could affect water quality primarily as a result of ground-disturbing activities (both within and outside of floodplains) and alteration of drainage patterns. These potential impacts to water resources would generally be *less than significant* at the programmatic level since they would be isolated and short-term, and would likely return to baseline conditions once revegetation of disturbed areas is complete. These potential impacts could be further reduced by implementation of BMPs and mitigation measures. Groundwater or aquifer characteristics could potentially be impacted if Preferred Alternative activities involved contamination of groundwater with petroleum, lubricants, or other fluids from heavy equipment. Spills from vehicles or machinery used during deployment tend to be associated with refueling activities, and as such, would likely be a few gallons or less in volume, an amount that would likely be easily contained and/or cleaned up on site. As a result, potential impacts to groundwater are not anticipated, while potential impacts to surface water quality due to spills would be minor, sporadic, and isolated, and therefore would be *less than significant* at the programmatic level.

Table ES4-4: Summary of Potential Impacts, Water Resources

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Water quality: sedimentation, pollutants, water temperature	3	3	3	3	3	3	3	• Minimize ground disturbance in or near waterbodies during construction, as practicable, particularly in areas prone to erosion. • Follow all applicable federal, state/territory, and local requirements for soil erosion and sedimentation control and permitting to avoid or minimize inputs of eroded materials into waterbodies. • Develop a storm water pollution prevention plan. • Include engineered or site-designed methods to control storm water. • Include any forested riparian areas along the stream in the length of the bore to minimize impacts to forested habitat when using directional bores to cross a stream. • Ensure the cleared width through any forested area is the minimum needed to install the line; the width should be no more than 20 feet wide through the forested area to allow the canopy to close over the line. • Restore disturbed stream banks using bioengineering bank stabilization methods and revegetate disturbed banks with native trees, shrubs, and herbaceous plants. • Restore stream bank slopes after project completion to stable-slope steepness (not steeper than 2:1). • Use graded stone or riprap to protect the section of trench below the normal water level from scour or erosion if using directional boring under a stream. Any stone or riprap fill in the streambed must not be placed above the existing streambed elevation to avoid creating a fish passage obstruction. As an alternative to using stone or riprap, allow sufficient separation distance between the directional boring and the stream bottom to minimize the potential for scour or erosion to affect the installed line. • Implement storm water reduction methods for large-scale construction activities, including minimizing impervious surfaces, using porous materials, or collecting and reusing storm water (e.g., extended detention ponds, storm water wetlands, filtration structures, and infiltration [or recharge] basins).

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Floodplain degradation	3	3	3	3	3	3	3	• Direct water to storm water drains for large-scale construction activities or to constructed bioretention areas, rain gardens, or other storage and retention areas designed to slow water and allow sediments to settle out. • Stabilize and revegetate disturbed areas as progressively and quickly as practicable to achieve stabilization and minimize the potential for erosion. • Avoid construction of roads and other impervious surfaces in floodplain areas to the extent practicable; where necessary in floodplains, construct roads and other impervious surfaces level with existing grades, as practicable, to not change or restrict water flow. • Station all deployables and aboveground structures outside of floodplains, to the extent practicable; if deployables or aboveground structures must be placed in floodplains, station them such that they are not vulnerable to be damaged by flood flows and do not themselves impede or restrict flood flows, as practicable. • Restore native vegetation/wetlands to stabilize stream banks and stop erosion. • Minimize the use of riprap and the use of alternative erosion protection materials whenever possible. • Place only enough riprap to provide stream bank toe protection, such as from the toe of the bank, where riprap must be used. Consider using bioengineered bank stabilization methods instead of riprap. • Meet state/territory or local regulations for development proposed in a floodway or floodplain. • Avoid construction, where feasible, in areas with steep or unstable slopes with soils known to be particularly susceptible to soil erosion and construct facilities in alternate locations if practical. • Develop a soil erosion and sedimentation control plan for disturbed areas, and implement BMPs, as appropriate, including the use of silt fences, erosion control blankets, progressive revegetation, and other controls as needed to reduce soil erosion, storm water runoff, and sedimentation.

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Drainage pattern alteration	3	3	3	3	3	3	3	• Seed and protect disturbed stream banks that are 3:1 or steeper with heavy-duty, net-free biodegradable erosion control blankets to minimize the entrapment and snaring of small wildlife such as snakes and turtles (follow manufacturer's recommendation for installation); seed and apply mulch on all other disturbed areas. • Use weed-free erosion control mechanisms (such as straw wattles or straw or hay bales). • Avoid construction activities (especially activities resulting in soil disturbance), to the extent possible, during rainy or snowmelt seasons when streamflow, rainfall, and runoff are highest. • Minimize the total area of bare soil exposed at any one time as much as possible by constructing in stages. • Minimize clearing of riparian and streamside vegetation, including trees, as practicable. • Establish and clearly mark all waterbody buffers in the field with signs or highly visible flagging until construction-related ground disturbing activities are complete. • Stabilize and revegetate disturbed areas as progressively and quickly as practicable to achieve stabilization. • Monitor site restoration following ground disturbance activities, as required by law or permit; implement contingency measures if site restoration should fail and soil erosion occurs. • Retain vegetative buffers, wherever possible, to prevent runoff into waterbodies. • Revegetate all bare and disturbed areas along stream banks or shorelines with a mixture of grasses (excluding all varieties of tall fescue), legumes, and native shrub and hardwood tree species as soon as possible upon completion. • Minimize in-stream work to the extent practicable, and when working in streams, restore streambeds and banks to original contours. • Construct all stream crossings (roads and trenching) as close as perpendicular to the axis of the waterbody channel as engineering and routing conditions permit.

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Flow alteration	4	4	4	4	4	4	4	• Use standard upland construction techniques when crossing waterbodies when they are dry or frozen and not flowing or as required by permit or law, provided that it is not likely for flow to resume during construction and prior to post-construction stabilization. • Route the stream crossing to minimize the number of waterbody crossings where waterbodies meander or have multiple channels, as practicable. • Prepare a Spill Prevention, Control, and Countermeasure (SPCC) Plan to prevent, contain, and report accidental spills. • Inspect and maintain tanks and equipment containing oil, fuel, or chemicals for drips or leaks to prevent spills to the ground or directly into waterbodies. • Maintain and repair all equipment and vehicles on impervious surfaces, as practicable, away from all sources of surface water. • Park vehicles at least 50 feet from any stream or wetland unless authorized by a permit or on an existing roadway, as practicable. • Deposit and stabilize all excavated material not reused in an upland area outside of floodplains and streams. • Design any structures located in floodplains, as feasible, with structural hardening to withstand flooding and to not increase the risk of flooding for other areas of the floodplain. • Space and size culverts properly. • Stabilize approaches to streams and stream crossings with clean rock or steel plates during construction to minimize erosion and sedimentation, as practicable. • Place materials storage and staging areas outside of waterways and floodplain. • Maintain adequate waterbody flow rates to protect aquatic life and prevent the interruption of existing downstream users, as practicable, if conducting in-stream construction (trenching or roads if necessary) during times that streams have flow. • Do not permit underwater blasting and pile driving activities in any waterbody.
Changes in groundwater or aquifer characteristics	3	3	3	3	3	3	3	

[a] Impact ratings are at the programmatic level, and colors are as follows:
1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact

ES4.4.1. Alaska

Of Alaska's approximately 700,000 miles of rivers and streams, 99.9 percent are currently considered unimpaired (*ADEC 2013*). The pristine nature of these resources highlights the significance of any potential impacts to water quality within Alaska, including sedimentation or pollutants due to ground disturbance, disruption of streamside soils or vegetation, or spills of fluids from motorized equipment. A return to baseline sedimentation levels may take longer in Alaska, particularly in northern Alaska due to the area's shorter growing seasons. As practicable or feasible, FirstNet and/or their partners would likely work to avoid stream crossings, limit crossings to times of the year that they are dry or frozen, or reduce potential impacts to flowing streams by scheduling crossings for the times of the year when stream flow is lowest. Further, to the extent practicable or feasible, limiting deployment in areas with severe erosion potential due to sensitivity and constructability limitations associated with steep slopes could also reduce potential water quality impacts. However, because steep slopes are present throughout much of Alaska, some limited amount of infrastructure is likely to be built in these areas, in which case BMPs and mitigation measures could help avoid or minimize the potential impacts. As a result, effects on water resources in Alaska would be considered *less than significant* at the programmatic level (see Table ES4-4).

ES4.4.2. Hawaii

Hawaii has 3,326 miles of rivers and streams, 37 square miles of bays and harbors, and 5 square miles of lakes and reservoirs. Turbidity due to sedimentation is a particular water quality concern in Hawaii (*HDOH 2014*). This would be especially true during the state's wet season. Although spills (e.g., of petroleum products used in vehicle fueling) in Hawaii could affect groundwater due to the state's porous underlying geology, they are likely to be small and rare (a few gallons or less in volume). Effects on water resources in Hawaii would be considered *less than significant* at the programmatic level as potential adverse effects would likely be temporary and localized at the subwatershed level (see Table ES4-4).

ES4.4.3. American Samoa

The sensitive Malaeimi Valley is a major recharge area for the Tafuna-Leone aquifer. As such, special groundwater protections may apply to ensure that the quality of its water is not impacted by the Preferred Alternative. Although spills (e.g., of petroleum products used in vehicle fueling) in the Malaeimi Valley (and, to a lesser degree, in other parts of American Samoa) could affect

groundwater, such spills are likely to be small and rare (a few gallons or less in volume). As practicable or feasible, FirstNet and/or their partners would likely work to avoid stream crossings when streams are dry or at minimal flow. Effects on water resources in American Samoa would be considered *less than significant* at the programmatic level (see Table ES4-4).

ES4.4.4. Guam

Streams occur only in southern Guam, constraining potential impacts to water quality in northern Guam to marine and groundwater bodies. In northern Guam, however, porous, limestone geology enhances the vulnerability of groundwater to spilled contaminants including chemicals or petroleum products. Activities with the potential to generate spills would be minor and localized, and would not involve large numbers of vehicles (a potential source of spills).

In southern Guam, intense flooding occurs due to climate and geology, enhancing potential impacts to floodplains, particularly if a large amount of the buildout/deployment locations would be located in floodplains, involve floodplain fill, have substantial increases in impervious surfaces that reduce filtration, or would impede or redirect flood flows or potentially impact floodplain hydrology. As it is anticipated there would be minimal aboveground facilities built, effects on water resources in Guam would be considered *less than significant* at the programmatic level (see Table ES4-4).

ES4.4.5. Northern Mariana Islands

Potential impacts to water resources in Tinian, Saipan, and Rota are constrained to marine and groundwater bodies, because streams do not occur on Tinian, and no perennial streams occur on Saipan or Rota.

The risk of potential impacts to floodplains is minimal in the Northern Mariana Islands, as the high-permeability geology inhibits flow during flood events, and floodplains from streams are rare. Effects on water resources in the Northern Mariana Islands would be considered *less than significant* at the programmatic level (see Table ES4-4).

ES4.4.6. Puerto Rico

Although likely to be small and rare (a few gallons or less in volume), spills could infiltrate the groundwater aquifer in areas with porous geology if they are not contained. Areas in Puerto Rico where groundwater is most likely vulnerable to these pollutants are in its alluvial valley aquifers; however, activities with the potential to generate spills would be minor and localized, and would not involve large numbers of vehicles (a potential source of spills). Additionally, turbidity

arising from erosion or insufficient sediment control could potentially impact surface waters. However, FirstNet and/or their partners would comply with all local regulations or requirements associated with erosion and sediment control thereby minimizing this potential impact. As a result, effects on water resources in Puerto Rico would be considered *less than significant* at the programmatic level (see Table ES4-4).

ES4.4.7. U.S. Virgin Islands

Potential sources of water quality impacts include vehicle travel on dirt or gravel roads, or off-road construction activity outside of the dry season. It is anticipated that these activities would be infrequent and would cause only minimal potential impact to water resources. BMPs and mitigation measures would be implemented, as practicable or feasible, during deployment to help further minimize soil erosion and storm water runoff. For these reasons, effects on water resources in the U.S. Virgin Islands would be considered *less than significant* at the programmatic level (see Table ES4-4).

ES4.5. WETLANDS

This section describes potential impacts to wetland resources at the programmatic level associated with deployment and operation of the Preferred Alternative, and discusses BMPs and mitigation measures that could help avoid or minimize those potential impacts. Operation of the Preferred Alternative would involve minimal potential impacts to wetlands. Potential impacts would instead be more likely during deployment.

Direct and indirect wetland loss or alteration could be caused by a variety of activities often associated with deployment activities, such as the placement of fill into wetlands, changes in hydrology, vegetation clearing, ground disturbance, changes to soils, or hydrologic alteration such as flooding or draining.

The loss or alteration of either high- or low-quality wetlands associated with deployment of the Preferred Alternative would be considered *less than significant* at the programmatic level given the small amount of land disturbance associated with the project locations (generally less than an acre) and the short timeframe of deployment activities (see Table ES4-5). Additionally, site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. Potential wetlands impacts could be further reduced by implementing BMPs and mitigation measures.

Table ES4-5: Summary of Potential Impacts, Wetlands

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Direct wetland loss (fill or conversion to non-wetland), other direct and indirect effects	3	3	2	3	3	3	3	• Follow all BMPs and mitigation measures related to minimizing soil erosion, sedimentation, and soil compaction presented in Table ES4-2. • Develop management plans such as, but not limited to, wetland and vegetation management and restoration, water quality protection, and erosion and sediment control plans for the management of wetland habitat, vegetation, water quality, and soils/erosion control. • Follow any BMPs and mitigation measures for work in or near wetlands developed by state/territory and local agencies, such as state/territory departments of transportation. • Conduct a detailed baseline study of the wetland to be impacted to aid in restoration of pre-impact condition, including, as appropriate or required by law, a survey of wetland contours; soil texture and profile; plant species, structure, and cover; and hydrology. • Develop a storm water pollution prevention plan. • Time construction to outside the breeding and migratory seasons of wetland wildlife when construction is unavoidable. • Preserve existing tree canopies and natural areas in and around wetlands as much as possible. • Cut wetland vegetation by hand (chain or hand saw) instead of using large equipment when cutting is unavoidable. • Use timber mats when working in or near wetlands. • Use weed-free erosion control mechanisms (such as straw wattles or straw or hay bales). • Prepare an SPCC Plan to prevent, contain, and report accidental spills. • Avoid both above and belowground wetland crossings unless necessary. • Take advantage of already disturbed areas such as easements, roads, roadway shoulders, bridges, or old railroad beds when crossing a wetland is unavoidable.

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Direct wetland loss (fill or conversion to non-wetland), other direct and indirect effects (continued)	3	3	2	3	3	3	3	• Span a wetland by locating telecommunication poles on either side of the wetland instead of disturbing the interior, where practicable or feasible. • Avoid diversion of surface water and groundwater sources, which could affect nearby wetlands. • Include engineered or site-designed methods to control storm water. • Create and maintain buffer zones around wetlands to protect their functions and values. • Follow all applicable federal, state/territory, and local requirements related to potential wetland impacts and permitting to avoid or minimize potential wetland impacts, compensate for unavoidable impacts to wetlands, and restore impacted wetlands. • Position deployment activities to avoid wetlands to the greatest extent practicable and to minimize the project footprint while safely and practically implementing the Proposed Action. • Clearly mark the boundaries of wetland areas to be avoided during construction using flagging, and maintain markers until reclamation is complete (as applicable). Train equipment operators on the activities to avoid within or near wetlands. • Segregate and salvage all topsoil up to a maximum of 12 inches of topsoil from the area disturbed in dry wetlands, where practicable, and restore topsoil to its approximate original stratum after backfilling is complete. • Avoid temporarily storing or stockpiling materials in wetland areas or in areas that could alter wetland hydrology (causing damming and flooding) or impede or divert water (causing drying). When unavoidable, place temporary fill on geotextile fabric. • Minimize vegetation clearing in or near wetlands. If vegetation clearing is required, minimize ground disturbance and maintain low groundcover vegetation, as well as the roots of taller vegetation.

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Direct wetland loss (fill or conversion to non-wetland), other direct and indirect effects (continued)	3	3	2	3	3	3	3	• Install and maintain sediment barriers, as appropriate, at saturated wetlands or wetlands with standing water across the entire construction ROW upslope of the wetland boundary and where saturated wetlands or wetlands with standing water are adjacent to the construction ROW as necessary to prevent sediment flow into the wetland. • Time construction using heavy equipment to avoid periods of heavy moisture, as appropriate, when construction within wetlands is unavoidable. • Do not maintain, store, wash, or repair equipment in or near (within 100 feet of) wetland areas to avoid spills or contamination, where practicable. Do not use heavy equipment within wetlands, even temporarily, and do not travel through wetlands, where practicable. Use wide-tracked or low-ground pressure construction equipment and/or conventional equipment operating from the ROW, timber mats, or prefabricated equipment mats. Prohibit storage of hazardous materials, chemicals, fuels, and lubricating oils in wetlands. Use existing access roads whenever possible. Where construction is required, maintain natural drainage patterns to the extent practicable by installing culverts in sufficient number and size to prevent ponding, diversion, or concentrated runoff. Use gravel for road surfaces where possible to avoid an increase in permeable surfaces and use proper drainage structures to minimize sedimentation and erosion to adjacent wetlands. • Consult local wetland restoration guidance, including communicating with the appropriate local agency, if one exists. Use suggested up-to-date published restoration manuals to ensure that appropriate wetland restoration measures are followed and to increase restoration success. • Conduct a detailed baseline study of the wetland to be impacted to aid in restoration of pre-impact condition, including, as appropriate or required by law, a survey of wetland contours; soil texture and profile; plant species, structure, and cover; and hydrology.

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Direct wetland loss (fill or conversion to non-wetland), other direct and indirect effects (continued)	3	3	2	3	3	3	3	• Stockpile wetland topsoil and sod mats used during facility installation after initial use when working in areas where wetlands would be restored. Use standard reclamation protocol. Re-use the topsoil and sod mats in the post-construction wetland restoration. • Revegetate, as applicable, bare areas as progressively and quickly as possible (preferably within the same growing season) to stabilize soils, reduce sedimentation, and avoid the spread of invasive species. Install erosion protection and leave in place until the area is revegetated and the soil is stabilized. • Prohibit use of herbicides or pesticides within 100 feet of any wetland (unless allowed or required by the appropriate land management, tribal, or state/territory agency). • Conduct post-construction monitoring inspections after the first growing season to determine success of revegetation, as applicable, unless otherwise required by a permit. • Determine restoration to be successful if the surface condition is similar to adjacent undisturbed communities or found acceptable by the applicable regulatory body. • Avoid, as appropriate, stockpiling material from directional drilling in a wetland, or where the stockpile could cause sedimentation into a wetland or dam water, causing flooding of a wetland area; avoid, as appropriate, setting up drilling equipment in a wetland. • Conduct dewatering in a manner to prevent erosion and to prevent heavily silt-laden water from flowing directly into any wetland or waterbody if dewatering an excavation. • Replace topsoil and restore original contours to the greatest extent practicable. • Install buried cable along existing road ROWs wherever possible to minimize vegetation clearing and other potential impacts to wetlands.

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Direct wetland loss (fill or conversion to non-wetland), other direct and indirect effects (continued)	3	3	2	3	3	3	3	• Use structures or devices to prevent subdraining or groundwater movement along new trenched-in buried conduit such as anti-seepage collars, intermittent clay barriers, trench plugs, or clay saddles. • Coordinate with U.S. Fish and Wildlife Service (USFWS) during site-specific reviews as required to assess whether it may be preferable and less impactful to implement line burial instead of installing lines overhead. However, depending on site conditions, installation of overhead transmission lines along existing road ROWs may minimize vegetation clearing and other potential impacts to some (but not all) wetlands.

[a] Impact ratings are at the programmatic level, and colors are as follows:
1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact

ES4.5.1. Alaska

Effects on wetlands in Alaska would be considered *less than significant* at the programmatic level (see Table ES4-5). Wetlands are extensive in Alaska, particularly in the interior and within the Arctic region. As stated above, site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. Direct and indirect potential wetland impacts may therefore be unavoidable; however, to the extent practicable or feasible, FirstNet and/or their partners would likely work to avoid or minimize deployment in wetland areas. Where deployment in wetlands cannot be avoided, mitigation measures, as defined through permitting and/or consultation with the appropriate resource agency, would be implemented to help avoid or reduce potential impacts. In addition, any potential impacts to wetlands are expected to be isolated and mostly short term, although some impacts could be permanent. Implementation of BMPs, as practicable or feasible, could further reduce the potential for impacts.

ES4.5.2. Hawaii

Effects on wetlands in Hawaii would be considered *less than significant* at the programmatic level (see Table ES4-5). Wetlands comprise less than 3 percent of the area on the Hawaiian islands (*USFWS 2015b*) and are considered a rare, highly valued habitat type to be preserved (*HCZMP 2014*), both due to their rarity and due to their important natural functions. As stated above, site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. To the extent practicable or feasible, FirstNet and/or their partners would work to avoid or minimize deployment in wetland areas. Where deployment in wetlands cannot be avoided, mitigation measures, as defined through permitting and/or consultation with the appropriate resource agency, would be implemented to help avoid or reduce potential impacts. In addition, any potential impacts to wetlands are expected to be isolated and mostly short term, although some impacts could be permanent. Implementation of BMPs, as practicable or feasible, could further reduce the potential for impacts.

ES4.5.3. American Samoa

Effects on wetlands in American Samoa would be considered *less than significant with BMPs and mitigation measures* at the programmatic level (see Table ES4-5). Wetlands comprise less than 1 percent of the area on American Samoa (the lowest percentage of any state or territory in the non-contiguous region; *BioSystems 1992; ASCMP 2008*) and are therefore a rare habitat type. In

addition, most wetlands on American Samoa are considered high-quality habitats due to the amount of natural functions they provide (*BioSystems 1992; USGS 1996*). As stated above, site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. To the extent practicable or feasible, FirstNet and/or their partners would likely work to avoid or minimize deployment in wetland areas. Where deployment in wetlands cannot be avoided, mitigation measures, as defined through permitting and/or consultation with the appropriate resource agency, and/or BMPs would be implemented to help avoid or reduce potential impacts. In addition, while potential impacts to wetlands are expected to be isolated and short term during deployment, due to the small amount of wetlands present in American Samoa, any impact to wetlands would be *potentially significant* without implementation of BMPs and mitigation measures.

ES4.5.4. Guam

Effects on wetlands in Guam would be considered *less than significant* at the programmatic level (see Table ES4-5). Wetlands comprise less than 3 percent of the area on Guam (*USFWS 2015b*), and are therefore considered a rare, highly valued habitat type to be preserved (*GCMP 2008; Government of Guam 1978*). *The Guam Coastal and Estuarine Land Conservation Program Plan* includes wetland areas as one class of areas to be protected. As stated above, site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. To the extent practicable or feasible, FirstNet and/or their partners would likely work to avoid or minimize deployment in wetland areas. Where deployment in wetlands cannot be avoided, mitigation measures, as defined through permitting and/or consultation with the appropriate resource agency, would be implemented to help avoid or reduce potential impacts. In addition, any potential impacts to wetlands are expected to be isolated and mostly short term, although some impacts could be permanent. Implementation of BMPs, as practicable or feasible, could further reduce the potential for impacts.

ES4.5.5. Northern Mariana Islands

Effects on wetlands in the Northern Mariana Islands would be considered *less than significant* at the programmatic level (see Table ES4-5). Wetlands comprise less than 5 percent of the area on the Northern Mariana Islands (*USFWS 2015c*), and are therefore considered a rare highly valued habitat type to be preserved (*CNMI CRMO 2008*). As stated above, site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. The Coastal and Estuarine

Land Conservation Program Plan for the Northern Mariana Islands expresses concern about the protection of drinking water, and specifically discusses the role of wetland preservation in addressing this concern (*CNMI CRMO 2008*). To the extent practicable or feasible, FirstNet and/or their partners would likely work to avoid or minimize deployment in wetland areas. Where deployment in wetlands cannot be avoided, mitigation measures, as defined through permitting and/or consultation with the appropriate resource agency, would be implemented to help avoid or reduce potential impacts. In addition, any potential impacts to wetlands are expected to be isolated and mostly short term, although some impacts could be permanent. Implementation of BMPs, as practicable or feasible, could further reduce the potential for impacts.

ES4.5.6. Puerto Rico

Effects on wetlands in Puerto Rico would be considered *less than significant* at the programmatic level (see Table ES4-5). Wetlands comprise just over 5 percent of the area in Puerto Rico, and are therefore considered a rare, highly valued habitat type to be preserved. As stated above, site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. The *Draft Puerto Rico Coastal and Estuarine Land Conservation Plan* developed by the Puerto Rico Department of Natural and Environmental Resources identifies wetland habitats as one of the "principal habitats of concern" for their "contribution to the ecological integrity of the overall coastal environment" (*PRDNER 2010*). To the extent practicable or feasible, FirstNet and/or their partners would likely work to avoid or minimize deployment in wetland areas. Where deployment in wetlands cannot be avoided, mitigation measures, as defined through permitting and/or consultation with the appropriate resource agency, would be implemented to help avoid or reduce potential impacts. In addition, any potential impacts to wetlands are expected to be isolated and mostly short term, although some impacts could be permanent. Implementation of BMPs, as practicable or feasible, could further reduce the potential for impacts.

ES4.5.7. U.S. Virgin Islands

Effects on wetlands in the U.S. Virgin Islands would be considered *less than significant* at the programmatic level (see Table ES4-5). Wetlands comprise less than 2 percent of the area of the U.S. Virgin Islands, and are considered a rare, highly valued habitat type to be preserved (*Conservation Data Center 2010; Platenberg 2006; UVI 2009*). In addition to habitat and shoreline stabilization functions, mangroves in the U.S. Virgin Islands are also particularly important for processing and export of naturally-derived organic matter (e.g., leaf litter) to other

habitats such as seagrass beds and coral reefs, which contribute to the high productivity of these environments, in turn creating important fish and wildlife habitat. To the extent practicable or feasible, FirstNet and/or their partners would likely work to avoid or minimize deployment in wetland areas, including mangrove habitats. Where deployment in wetlands cannot be avoided, mitigation measures, as defined through permitting and/or consultation with the appropriate resource agency, would be implemented to help avoid or reduce potential impacts. In addition, any potential impacts to wetlands are expected to be isolated and mostly short term, although some impacts could be permanent. Implementation of BMPs, as practicable or feasible, could further reduce the potential for impacts.

ES4.6. Biological Resources

This section describes potential impacts to biological resources at the programmatic level including terrestrial vegetation; wildlife; fisheries; and federal, state/territory, or agency listed plant and animal species associated with deployment and operation of the Preferred Alternative, and discusses BMPs and mitigation measures that could avoid or minimize those potential impacts (see Table ES4-6). Preferred Alternative activities that do not require new ground disturbance or substantial construction activity (Use of Existing Conduit – New Buried Fiber Optic Plant, Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable, Satellite-Enabled Devices and Equipment, and Deployment of Satellites) would have *no effect* on biological resources. The development scenarios or deployment activities that could result in potential effects on biological resources include: New Build Scenarios (Buried Fiber Optic Plant, Aerial Fiber Optic Plant, or Submarine Fiber Optic Plant); New Wireless Communication Towers; Deployable Technologies; and Deployable Aerial Communications Architecture. The primary actions related to these components that could cause potential impacts to biological resources include land/vegetation clearing; excavation and trenching; construction of access roads; installation or restructuring of towers and poles; installation of underwater cables in limited near-shore or inland bodies of water; installation of security/safety lighting and fencing; radio frequency emissions, and deployment of aerial platforms.

Potential impacts of the Preferred Alternative to biological resources (including wildlife, fisheries, and threatened and endangered species and species of conservation concern) are assessed separately for deployment and operation in this Final PEIS, but include the same categories of potential impacts:

- Direct injury or mortality—includes injury or death of an individual or localized population due to physical injuries, extreme stress, or injury or death of an individual from interactions associated with the Preferred Alternative;
- Indirect effects from disturbance or displacement—includes changes in an individual or population's habitat use or life history pattern due to disturbance from increased noise and vibration, human activity, visual disturbance, and transportation activity; increased competition for resources or habitat due to displacement of individuals from the affected area into the territory of other animals; or other indirect effects that ultimately cause mortality, decreased fitness, or reduced breeding and recruitment in the future population; and
- Direct or indirect effects on habitats that affect population size and long-term viability of species—direct habitat effects are primarily physical disturbances that result in alterations in the amount or quality of a habitat. Indirect habitat loss could occur through preventing an animal from accessing a regular (e.g., migratory route) or optimal habitat (e.g., breeding, forage, or refuge), either by physically preventing use of a habitat or by causing an animal to avoid a habitat, either temporarily or long-term.

An example of a potential impact to wildlife and vegetation is RF exposure. Preliminary studies have indicated that RF exposure has the potential to adversely impact wildlife, particularly birds and bats that nest, roost, forage, or otherwise spend considerable time in areas with RF exposure. Experts emphasize that targeted field research needs to be conducted to more fully document the nature and extent of effects of RF exposure on wildlife and the implications of those effects on wildlife populations over the long term. FirstNet concurs with the need for further research. In addition, impacts to birds could occur from collisions with new towers. As a precaution, FirstNet and/or their partners would implement BMPs and mitigation measures, as practicable or feasible, that focus on siting towers away from known high bird or bat use areas (described in Chapter 11, BMPs and Mitigation Measures).

Any species with individuals, populations, or habitat in the vicinity of activities related to the Preferred Alternative could be subject to one or more of the potential impacts from the Preferred Alternative; however, implementation of BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, could help avoid potential impacts on some species and reduce potential impacts on others. The nature and extent of potential impacts to biological resources would vary depending on many factors, including but not limited to, the species; the nature, location, and extent of the Preferred Alternative activity; the time of year in relation to species life history; and the duration of deployment.

Table ES4-6: Summary of Potential Impacts, Biological Resources

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Vegetation								
Vegetation and habitat loss, alteration, or fragmentation	3	3	3	3	3	3	3	• Engage in early consultation with appropriate agencies and stakeholders, including but not limited to the USFWS and state/territory agencies. • Consolidate facilities as much as possible (collocation and use of existing ROWs) to reduce vegetation loss. • Avoid high-quality habitat. • Minimize construction of all roads, fences, and other ancillary facilities to reduce overall vegetation loss and habitat fragmentation. • Control fugitive dust generated by the use of unpaved roads and construction. • Limit construction equipment and vehicles to approved roads or ROWs. • Avoid construction/deployment in areas with sensitive vegetation (i.e., woodlots and wetlands), unique habitat (i.e., shorelines and stream banks), or designated natural resources, if practical. • Close and revegetate any temporary and unnecessary roads after project completion. • Segregate topsoil or surface soil from subsurface layers during construction for reuse during post-construction seeding. • Restore disturbed areas as progressively and quickly as possible to pre-construction use; grade and apply vegetation cover using appropriate and certified seed mixes and seed dispersal, management, and maintenance processes, as applicable. • Revegetate with native species that approximate pre-disturbance plant community composition. • Use existing roads and regularly maintained areas when conducting routine maintenance and inspections to the extent feasible. • Follow all applicable federal, state/territory, and local requirements for vegetation removal, disturbance, and restoration. • Obtain all appropriate permits and comply with conditions to minimize or avoid impacts to vegetation.

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Invasive species effects	3	3	3	3	3	3	3	• Minimize or avoid forest removal whenever possible. • Identify all areas within the proposed construction footprint that contain noxious or invasive plants and use pre-construction treatments such as mowing or herbicide applications (in consultation with appropriate agencies and stakeholders) prior to ground disturbance activities. • Store soil containing noxious or invasive plants in a location away from clean topsoil and subsoil. • Inspect and clean all construction equipment and deployable vehicles with high-pressure washing equipment to remove soil and plant matter prior to moving to the next job site or staging location. • Locate staging areas and construction sites in previously disturbed areas.
Wildlife								
Amphibians and Reptiles	3	3	3	3	3	3	3	• Engage in early consultation with appropriate agencies and stakeholders as necessary, including but not limited to USFWS, the National Marine Fisheries Service (NMFS), and relevant state/territory wildlife and natural resource agencies. • Give preference to development options that involve use of existing physical infrastructure, and/or that do not involve new aboveground structures (e.g., collocation on existing structures, etc.). • Minimize vehicular harm of animals migrating between seasonal habitats by locating activities, roads, and infrastructure away from these areas or installing barriers along roadsides. • Locate project activities, facilities, and roads away from key habitats (e.g., wetlands, cays, and stream sites) for amphibians and reptiles. • Control the spread of invasive animals and plants by coordinating mowing schedules and assisting agencies and groups with ROW permits, washing mowers and equipment between sites, and educating staff. • Consolidate facilities as much as possible (e.g., collocation and use of existing ROWs). • Avoid known calving/lambing areas in Alaska during critical life stages when undertaking deployment and associated activities (these times vary greatly depending on region, species, and habitat).

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Terrestrial Mammals	3	3	3	3	3	3	3	• Assess locations of roost sites for bats and timing of critical life stages (e.g., maternity and weaning periods), hibernation for deployment and associated activities (these times vary greatly depending on region, species, and habitat). • Minimize construction of all roads, fences, and other ancillary facilities to reduce overall habitat fragmentation. • Instruct all construction employees to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship, lambing/calving, pupping and molting [haulout period], spring/fall migrations) seasons. • Do not permit pets on site in order to avoid harassment and disturbance of wildlife. • Report observations of potential wildlife interactions, including wildlife mortality, to the appropriate agency immediately. • Avoid known marine mammal haulouts or concentration areas as locations for deployment and associated activities. • Provide for passage of fish and wildlife in new crossings and avoid reducing the efficiency of a structure to allow passage.
Marine Mammals	3	3	3	3	3	3	3	• Avoid roads and ROWs that provide access to critical wildlife habitat and near known migration routes (especially terrestrial and semi-aquatic wildlife routes), stopover sites, and large blocks of habitat. • Assess critical life stages of marine mammals hauled out near locations (1 mile) selected for deployment and associated activities. • Avoid development in areas that contain high densities of breeding or wintering birds, in high wildlife use areas, migratory staging areas, woodlots, riparian corridors, Audubon Important Bird Areas, nature preserves, state and national parks, state forests, fish and wildlife areas, and other publicly owned properties. • Reduce habitat fragmentation, minimize the number of new roads constructed, and maximize use of existing corridors, roads, disturbed or developed areas. • Assess potential noise impacts to migrating whales and local pinnipeds if deployment and activities would occur over sea ice.

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Birds and bats (deployment)	3	3	3	3	3	3	3	• Control the spread of invasive animals and plants by coordinating mowing schedules, assisting agencies and groups with ROW permits, washing mowers and equipment between sites, and educating staff. • Develop "good housekeeping" procedures to ensure that sites are kept clean of debris, garbage, and or waste. • Follow food and waste management protocols to minimize attractants to proposed network deployment sites. • Restore habitat in construction zones, staging areas, etc. once construction is complete. • Install bat exclusions and/or deterrents on existing and new structures. • Turn off all unnecessary lighting at night. • Minimize or avoid the need for or use of specific types of illumination (e.g., sodium vapor lights) at site facilities to reduce attraction of migratory birds. • Determine during site-specific reviews the feasibility and effectiveness of implementing construction timing windows to avoid or minimize adverse effects to bird nests, eggs, and young birds and implement if practicable or feasible. • Monopole structures should be considered in place of lattice structures, to the extent practicable or feasible. If lattice structures are to be used, FirstNet and/or their partners would work with the USFWS to incorporate anti-nesting devices into project design, as practicable or feasible. • Work with USFWS to choose appropriate makers when towers requiring guy wires are necessary. Markers should be regularly maintained for the life of the project. • Use outdoor security or safety lights, as practicable or feasible, that are motion-triggered, downcast and/or down-shielded, and directed inward whenever possible to prevent "star" effects when viewed offsite during construction/deployment and operation, particularly in coastal areas.

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Birds and bats (operations)[6]	2	2	2	2	2	2	2	• Use structures containing the fewest perching options in areas where raptors and raven predation of sensitive resources is a concern. • Use structures and components compatible with the guidance in *APLIC 2006* where raptor electrocution is a concern. • Follow, as practicable or feasible, the suggested practices by the APLIC to minimize impacts to migratory birds through collision and electrocution. • Avoid activities within migratory bird flyways and in the immediate vicinity of bat roosts to the extent practicable. • Site towers away from known communal bat use areas and high bird use areas to the extent practicable or feasible. • Do not operate aircraft at an altitude that could disturb known natural roosting sites of bats, with the exception only for severe weather conditions. • Do not operate aircraft at an altitude lower than 1,500 feet within 0.5 mile of known walrus observed on land or ice, with the exception only for severe weather conditions. • Install bat and/or deterrents exclusions on existing and new structures. • Follow USFWS Guidelines For Recommendations On Communications Tower Siting, Construction, Operation, and Decommissioning (*USFWS 2016*). • Insert anti-nesting devices on existing or new structures. • Site towers away from known communal bat use areas and high bird use areas to the extent practicable or feasible.

[6] Additional BMPs and mitigation measures will be required to further reduce potential impacts to migratory birds.

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Terrestrial Invertebrates	3	3	3	3	3	3	3	• Construct new towers more than 3 miles from any ocean (or Great Lake shoreline), as practicable or feasible. If towers must be closer than 3 miles from the shoreline: – Conduct site-specific studies; – Ensure towers are self-standing (un-guyed); and – Ensure towers are short enough to not require lighting, as practicable or feasible. If towers do require lighting, install lighting that does not include steady-burning lights, as practicable or feasible. • Follow the FAA requirements to eliminate steady-burning flashing obstruction lights and use only flashing obstruction lights in accordance with FAA Advisory Circulars AC 70/7460-1L and AC 150/5345-43H (*FAA 2016a; FAA 2016b; FCC 2017*).
Fisheries								
Direct injury/mortality	3	3	3	3	3	3	3	• Avoid construction, as practicable, during sensitive seasons for fish such as migration, spawning, egg development (including intra-gravel development) and larval fish (benthic or pelagic) development (sensitive seasons/time periods vary by species and location). • Consolidate facilities as much as possible. • Use site-appropriate native plants and invasive-free materials (e.g., seed mixes, rock, mulch, soil) for revegetation and restoration efforts. • Revegetate and restore riparian areas and other vegetated areas around aquatic resources to the extent possible once construction activities are complete. • Report spills or other observed pollutants to the appropriate agency immediately. • Prepare an SPCC Plan to prevent, contain, and report accidental spills. • Instruct all construction employees to avoid harassment and disturbance of fish and other aquatic species, and report any signs of mortality to the appropriate agency immediately. • Avoid productive habitats to the extent practicable, such as coastal wetlands, inland waterways, essential fish habitats, spawning areas, and reefs.
Vegetation and habitat loss, alteration, or Fragmentation	3	3	3	3	3	3	3	

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Indirect injury/mortality	3	3	3	3	3	3	3	• Minimize sedimentation and turbidity in fish habitats by implementing sediment and erosion control measures, as practicable; the use of such measures (e.g., silt fences, silt curtains, and erosion control blankets) could reduce erosion and sedimentation. • Minimize the amount of fill placed in wetlands and streams when constructing access roads by installing bridges and or culverts; work with the appropriate agency to use culverts and bridges that are appropriately designed and sized for fish passage. • Use set-backs when clearing vegetation for construction, where appropriate, from riparian zones to avoid removal of important fish cover such as vegetation, boulders, and large woody debris. • Perform regular maintenance checks of equipment near coastal areas, waterways, and other protected areas to minimize detachment of components reaching critical habitat. • Consider tidal regimes when deploying near coastal areas to help prevent loss of equipment and marine debris in nearby coastal fish habitat. • Utilize buffer zones, temporary or permanent native seeding on disturbed ground, ground cover, plastic sheeting, and/or matting to minimize sedimentation. • Develop a storm water pollution prevention plan.
Effects on migration or migratory patterns	3	3	3	3	3	3	3	• Avoid construction/deployment, as practicable, in productive riparian zones, marine preserves, and wetlands since construction could potentially result in less refuge for fish, fundamental changes in channel structure (e.g., loss of pool habitats), instability of stream banks, and alteration of nutrient and prey sources within the shoreline aquatic community (*Hanson et al. 2003*). • Implement an emergency response plan for fuel spills and environmental emergencies. • Include secondary containment for hazardous materials such as fuels and use uplands, as feasible, away from streams and waterbodies for refueling of construction or operations equipment. • Implement invasive species plans to minimize introduced aquatic plant and animal species into the Preferred Alternative areas (e.g., wash and inspect equipment and vehicles before moving from one drainage basin or watershed to the next). • Minimize construction noise in and near fish habitats, as practicable. • Avoid physical barriers in waterbodies, to the extent practicable, during installation and operation to allow for the migration of invertebrates and other aquatic fauna.

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Reproductive effects	3	3	3	3	3	3	3	• Follow all applicable federal and state/territory requirements for construction activities near fish and fish habitat. • Use horizontal directional drilling where possible and appropriate for stream crossings to avoid potential impacts to the streambed, banks, and associated fish habitat.
Invasive species effects	3	3	3	3	3	3	3	
Threatened and Endangered Species and Species of Conservation Concern[b]								
Marine mammals	2	2	2	2	2	2	2	• Fully adhere to the compliance requirements of the Endangered Species Act. • Engage in early consultation with appropriate agencies and stakeholders including, but not limited to, USFWS, NMFS, and state/territory wildlife and natural resources agencies. • Avoid conducting deployment activities in areas with known locations or habitats for threatened and endangered plants. • Instruct all construction employees to identify and report any sightings of listed species, to avoid harassment and disturbance of wildlife, and to not disturb or enter any nearby caves or mines. • Follow food and waste management protocols to minimize attractants to the deployment site. • Minimize construction of all roads, fences, and other ancillary facilities to reduce overall habitat fragmentation. • Use site-appropriate native plants and invasive-free materials (e.g., seed mixes, rock, mulch, soil) for revegetation and restoration efforts. • Prohibit any pets on site during construction or deployment. • Report observations of sensitive species that are injured, dead, or entangled to the appropriate agency immediately. • Consolidate Preferred Alternative facilities as much as possible (e.g., collocation and use of existing ROWs). • Implement seasonal and spatial buffer zones for construction and other potentially disturbing activities during sensitive periods for listed species such as breeding, nesting, calving/pupping, haulout, migration, spawning, and egg development as identified by USFWS, the NMFS, and/or relevant state/territory agency.

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Terrestrial mammals[7]	2	2	2	2	2	NA	NA	• Avoid removal or disturbance of forest to the maximum extent practicable and ensure that any unavoidable forest impacts do not result in the loss of listed snails, butterflies, bird breeding habitat, or bat roost sites or hibernacula. • Avoid activities within seagrass beds and control turbidity to minimize potential indirect impacts on seagrass. • Avoid potential impacts to known grouper spawning sites. • Avoid potential impacts within coastal estuarine habitats. • Train construction and deployment staff in the Preferred Alternative BMPs and mitigation measures and incentivize reporting of any lapses in BMP and mitigation measure implementation. • Implement a strict policy prohibiting pets on site and prohibiting hunting or fishing or any other action that would result in any avoidable disturbance of listed species. • Use setbacks from riparian zones when clearing vegetation for construction to avoid removal of important fish cover such as vegetation boulders and large woody debris. • Follow all applicable federal and state/territory requirements for construction activities near fish and fish habitat. • Use appropriate sediment and erosion control measures to minimize sedimentation and turbidity in fish habitats. • Minimize the use of coastal lighting, particularly in the vicinity of known turtle nesting areas. If the use of coastal lighting in sea turtle use areas is unavoidable, use turtle safe lighting instead of normal lights (low-pressure sodium-vapor lighting or red lights that emit a very narrow portion of the visible light spectrum) and consult with local sea turtle experts on the design of the coastal lighting plan. • Implement an emergency response plan for fuel spills and environmental emergencies. • Include secondary containment for hazardous materials and use non-wetland sites away from streams and waterbodies for refueling of construction or operations equipment.
Birds[8]	2	2	2	2	2	2	2	

[7] See the Wildlife section in this table above (Table ES4-6) for potential impacts to bats from RF emissions.

[8] See the Wildlife section in this table above (Table ES4-6) for potential impacts to birds from RF emissions.

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Reptiles	NA	2	2	2	2	2	2	• Implement invasive species plans to minimize introduced aquatic plant and animal species into the areas affected by the Preferred Alternative (e.g., wash and inspect equipment and vehicles before moving from one drainage basin or watershed to the next). • Implement the same construction and deployment BMPs and mitigation measures for any operational activities that involve any major infrastructure replacement as part of ongoing system maintenance. • Implement seasonal and spatial buffer zones for operational activities that involve potentially disturbing activities in listed species use areas. • Implement "good housekeeping" procedures to ensure that during operation the sites would be kept clean of debris, garbage, and fugitive trash or waste. • Turn off all unnecessary lighting at night. • Avoid or minimize the use of sodium vapor lights at site facilities to reduce attraction of migratory birds. • Develop and implement operational monitoring and adaptive management procedures. • Prepare an SPCC Plan to prevent, contain, and report accidental spills. • Post and enforce speed limits on access roads, particularly within areas where a listed animal may be struck by construction and/or maintenance vehicles. • Minimize underwater construction noise in all aquatic habitats by minimizing vessel speed, using quieter equipment or technologies, or deploying bubble curtains or other noise screens during underwater work.
Invertebrates	NA	2	2	2	2	2	2	

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Fish	2	NA	2	2	2	2	2	• Implement a marine observer program during construction and operation to avoid and minimize boat strikes to whales, sea turtles, seals, and dugongs. • Restrict aircraft operation at altitudes lower than 1,500 feet within 0.5 mile of known pupping or haulout areas during critical life stages, with the exception only for severe weather conditions. • Keep aircraft above altitudes higher than 1,500 feet within 0.5 mile of walruses and seals hauled out on land or ice, with the exception only for severe weather conditions.
Plants	2	2	2	2	2	2	2	

[a] Impact ratings are at the programmatic level, and colors are as follows:
1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact

[b] Note that the impact ratings used for Threatened and Endangered Species and Species of Conservation Concern are a distinct set of impact categories, based on those in the *Endangered Species Consultation Handbook* (*USFWS and NMFS 1998*), in order to facilitate impact evaluation under Section 7 of the Endangered Species Act. These impact categories used in Table ES4-6 are as follows:
1. (Red) May affect, likely to adversely affect
2. (Orange) May affect, but is not likely to adversely affect
4. (Green) No effect

NA: Taxa not present (Note that no amphibians with threatened/endangered/conservation concern status were present in any of the locations evaluated in this Final PEIS).

ES4.6.1. Alaska

Effects on most biological resources in Alaska would be considered *less than significant* at the programmatic level (see Table ES4-6). As discussed in Section 3.1.6.3, Terrestrial Vegetation, some invasive plants such as the Canada thistle (*Cirsium arvense*), giant hogweed (*Heracleum mantegazzianum*), leafy spurge (*Euphoriba esula*), and others thrive in disturbed soil environments and could be aggravated by the Preferred Alternative, although soil disturbance would be temporary and disturbed soils would likely be revegetated shortly after deployment (*ADNR 2010*). In addition, habitat loss or fragmentation and other wildlife effects could be a source of mortality or injury to terrestrial mammals in Alaska, particularly larger migratory mammals such as moose and caribou. Marine mammals could also be affected by project activities onshore if done near terrestrial haulout locations or near polar bear dens. Additionally, activities in near-shore water environments could disturb or displace marine mammals in Alaska, including whales and pinnipeds, although FirstNet anticipates deployment activities would be limited to near-shore and inland waters, not on the open ocean.

Effects on birds and bats would be considered *less than significant with BMPs and mitigation measures incorporated* for operations. Birds could be adversely affected by RF exposure or collision with lines, poles, or aerial platforms. Habitat fragmentation could also potentially affect birds through the loss of nesting, brood rearing, and feeding after and before long migratory flights and/or reproduction. Bats could be similarly affected by RF exposure.

There are 39 federally listed species and 1 candidate species for federal listing in Alaska. Of the 39 federally listed species, 1 is a plant, 4 are birds, 15 are mammals (of which all but one are marine or live on the sea ice), 4 are marine reptiles (sea turtles), and 15 are fish. With full and effective implementation of BMPs and mitigation measures, the Preferred Alternative *may affect, but is not likely to adversely affect* listed plants, birds, mammals, reptiles, and fish at the programmatic level. Site-specific analysis may be required to determine the potential impacts on listed species at specific proposed locations depending on the site conditions and the type of deployment.

ES4.6.2. Hawaii

Effects on most biological resources in Hawaii would be considered *less than significant* at the programmatic level (see Table ES4-6). Removal or loss of forest also decreases foraging habitat and would potentially impact insect-eating bats like the Hawaiian hoary bat that are dependent on the forest for the diversity and numbers of flying insects. Displacement of migratory birds is of particular

concern in Hawaii because the islands are important stopovers for resting and replenishing energy stores as well as wintering habitats. Hawaii bird communities are vulnerable to introduced predators such as rats and feral cats.

The waters of the South Pacific serve as primary habitat for a range of critical activities for marine mammals (such as humpback whales), including feeding, mating, and calving. Hawaii provides highly productive coral habitats, as well as other aquatic habitats that provide breeding, spawning, feeding, and cover for fish and invertebrate species. FirstNet anticipates deployment activities would be limited to near-shore and inland waters, not on the open ocean.

Effects on birds and bats would be considered *less than significant with BMPs and mitigation measures incorporated* for operations. Birds could be adversely affected by RF exposure or collision with lines, poles, or aerial platforms. Habitat fragmentation could also potentially affect birds through the loss of nesting, brood rearing, and feeding after and before long migratory flights and/or reproduction. Bats could be similarly affected by RF exposure.

There are 522 federally and/or state-listed species in Hawaii (*USFWS 2015c*; *DLNR 2014*). These include 390 plants, 41 birds, 9 mammals (all but 1 are marine), 5 reptiles (all marine), and 77 invertebrates. There are no Federal Candidate Species in Hawaii. With full and effective implementation of BMPs and mitigation measures as defined through consultation with the appropriate resource agency, the Preferred Alternative *may affect, but is not likely to adversely affect* listed species at the programmatic level. Site-specific analysis would be required to determine the potential impacts on listed species at specific proposed locations depending on the site conditions and the type of deployment.

ES4.6.3. American Samoa

Effects on most biological resources in American Samoa would be considered *less than significant* at the programmatic level (see Table ES4-6). The loss of suitable habitat is a concern for bat populations in American Samoa, with almost all the lowland rainforest of the Tafuna Plains (Tutuilia) replaced by urban development and plantations (*NRCS 2009*; *Lindsay et al. 2008*). The waters of the South Pacific serve as primary habitat for a range of critical activities for marine mammals (such as humpback whales), including feeding, mating, and calving. Displacement of migratory birds is of particular concern in American Samoa because the islands are important stopovers for resting and replenishing energy stores as well as wintering habitats.

American Samoa provides one of the healthiest coral reef habitats in the southernmost U.S. Pacific Territory (*NOAA 2008*). Several sanctuaries, preserves, and wildlife conservation areas in American Samoa focus on the

conservation of coral reefs, mangroves, wetlands, fish spawning areas, commercial finfish, shellfish, and areas with high species abundance (*Territory of American Samoa 2010*). FirstNet anticipates deployment activities would be limited to near-shore and inland waters, not on the open ocean.

Effects on birds and bats would be considered *less than significant with BMPs and mitigation measures incorporated* for operations. Birds could be adversely affected by RF exposure or collision with lines, poles, or aerial platforms. Habitat fragmentation could also potentially affect birds through the loss of nesting, brood rearing, and feeding after and before long migratory flights and/or reproduction. Bats could be similarly affected by RF exposure.

There are 21 federally listed animal species in American Samoa, including 3 bird, 6 mammals, 3 reptiles (all marine turtles), 1 fish, and 8 invertebrates. Additionally, four species are listed in the territory's Comprehensive Wildlife Conservation Strategy (*DMWR 2006*) and Samoa's 4th National Report to the Convention on Biological Diversity (*Government of Samoa 2009*) as critically endangered, endangered, or vulnerable. The potential impacts associated with the Preferred Alternative *may affect, but are not likely to adversely affect* listed species at the programmatic level. The full and effective implementation of BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, could further reduce potential impacts. Site-specific analysis would be required to determine the potential impacts on listed species at specific proposed locations depending on the site conditions and the type of deployment.

ES4.6.4. Guam

Effects on most biological resources in Guam would be considered *less than significant* at the programmatic level (see Table ES4-6). The waters of the South Pacific serve as primary habitat for a range of critical activities for marine mammals (such as humpback whales), including feeding, mating, and calving. Guam is located along the Central Pacific Flyway between North American breeding sites and South Pacific wintering grounds, and is an important stopover for resting and replenishing energy stores as well as wintering habitats.

Guam provides highly productive coral reef habitats, submerged vegetation (i.e., algae), rivers, and complex benthic substrates that harbor many diverse freshwater and marine fishes, invertebrates, mollusks, and other aquatic fauna (*Burdick et al. 2008*). The major cause of fish habitat decline in Guam is due to coastal development. Guam has established five marine protected areas, national wildlife refuges, and ecological research areas that should be avoided because these areas provide critical habitat, essential fish habitat, and niche specific ranges

occupied by freshwater and marine fishes. FirstNet anticipates that deployment activities would be limited to near-shore and inland waters, not on the open ocean.

Effects on birds and bats would be considered *less than significant with BMPs and mitigation measures incorporated* for operations. Birds could be adversely affected by RF exposure or collision with lines, poles, or aerial platforms. Habitat fragmentation could also potentially affect birds through the loss of nesting, brood rearing, and feeding after and before long migratory flights and/or reproduction. Bats could be similarly affected by RF exposure.

There are 50 federally and/or territory-listed plant and animal species in Guam, including 16 plants, 5 birds, 8 mammals, 10 reptiles, 1 fish, 8 invertebrates, and 2 critical habitats (Mariana fruit bat [*Pteropus m. mariannus*] and Mariana crow [*Corvus kubaryi*] habitats). With full and effective implementation of BMPs and mitigation measures as defined through consultation with the appropriate resource agency, the Preferred Alternative *may affect, but is not likely to adversely affect* listed species at the programmatic level. Site-specific analysis would be required to determine the potential impacts on listed species at specific proposed locations depending on the site conditions and the type of deployment.

ES4.6.5. Northern Mariana Islands

Effects on most biological resources in the Northern Mariana Islands would be considered *less than significant* at the programmatic level (see Table ES4-6). The waters of the South Pacific serve as primary habitat for a range of critical activities for marine mammals (such as humpback whales), including feeding, mating, and calving. Displacement of migratory birds is of particular concern. The Northern Mariana Islands is located along the Central Pacific Flyway between North American breeding sites and South Pacific wintering grounds, and is an important stopover for resting and replenishing energy stores as well as wintering habitats.

The Northern Mariana Islands provides one of the most productive habitats of the Indo-West Pacific. Habitat within this volcanic chain of islands includes complex coral reefs, submerged vegetation (i.e., algae, seagrasses), and benthic substrates that harbor many diverse freshwater and marine fishes, invertebrates, mollusks, and other aquatic fauna (*Williams 1996*). Several sanctuaries, preserves, and wildlife conservation areas in the Northern Mariana Islands focus on the conservation of coral reefs, mangroves, seagrasses, algal beds, wetlands, bays and estuaries, fish spawning areas, commercial finfish, shellfish, and areas with high species abundance (*NOAA 2007*). FirstNet anticipates deployment activities would be limited to near-shore and inland waters, not on the open ocean.

Effects on birds and bats would be considered *less than significant with BMPs and mitigation measures incorporated* for operations. Birds could be adversely affected by RF exposure or collision with lines, poles, or aerial platforms. Habitat fragmentation could also potentially affect birds through the loss of nesting, brood rearing, and feeding after and before long migratory flights and/or reproduction. Bats could be similarly affected by RF exposure.

There are 52 federally and/or territory-listed plant and animal species in the Northern Mariana Islands, including 12 plants, 11 birds, 8 mammals, 10 reptiles, 1 fish, 8 invertebrates, and 2 critical habitats (Rota bridled white-eye and Marian crow habitats). With full and effective implementation of BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, the Preferred Alternative *may affect, but is not likely to adversely affect* listed or candidate species at the programmatic level. Site-specific analysis would be required to determine the potential impacts on listed species at specific proposed locations depending on the site conditions and the type of deployment.

ES4.6.6. Puerto Rico

Effects on most biological resources in Puerto Rico would be considered *less than significant* at the programmatic level (see Table ES4-6). The loss of foraging and roosting habitats is a common problem for bat populations in the Caribbean (*Gannon et al. 2005*). The waters of the Caribbean serve as primary habitat for a range of critical activities for marine mammals (such as humpback whales), including feeding, mating, and calving. The Caribbean's location between North American breeding sites and South American wintering grounds makes Puerto Rico an important stopover for resting and replenishing energy stores.

Puerto Rico provides highly productive coral habitats, submerged vegetation (i.e., seagrasses), wetlands, rivers, and complex hardbottom substrates harboring many marine fishes, invertebrates, mollusks, colonization and other aquatic organisms and related activities (*CFMC 2015*). The National Oceanic and Atmospheric Administration and the regional fishery management councils have identified more than 100 habitat areas of particular concern in Puerto Rico. FirstNet anticipates deployment activities would be limited to near-shore and inland waters, not on the open ocean.

Effects on birds and bats would be considered *less than significant with BMPs and mitigation measures incorporated* for operations. Birds could be adversely affected by RF exposure or collision with lines, poles, or aerial platforms. Habitat fragmentation could also potentially affect birds through the loss of nesting, brood rearing, and feeding after and before long migratory flights and/or reproduction. Bats could be similarly affected by RF exposure.

There are 95 federally and territory-listed species in Puerto Rico. Of the 95 federally listed species, 50 are plants, 8 are birds, 6 are marine mammals, 4 are marine reptiles (sea turtles), 7 are terrestrial reptiles, 6 are amphibians, 4 are fish, and 10 are marine invertebrates (*USFWS 2015a; NMFS 2015; PRDNER 2005*). With full and effective implementation of BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, the Preferred Alternative *may affect, but is not likely to adversely affect* listed species at the programmatic level. Site-specific analysis would be required to determine the potential impacts on listed species at specific proposed locations depending on the site conditions and the type of deployment.

ES4.6.7. U.S. Virgin Islands

Effects on most biological resources in the U.S Virgin Islands would be considered *less than significant* at the programmatic level (see Table ES4-6). The waters of the Caribbean serve as primary habitat for a range of critical activities for marine mammals (such as humpback whales), including feeding, mating, and calving. The Caribbean's location between North American breeding sites and South American wintering grounds makes the U.S. Virgin Islands an important stopover for resting and replenishing energy stores.

There are approximately 500 different species of fish associated with the U.S. Virgin Islands, each with its own ecological niche (*NPS 2015*). Coral reefs, seagrass meadows, and mangrove prop roots are all important habitats that support fish, providing food, shelter, and nursery areas for fish at various stages of their lives (*CFMC 2014*). FirstNet anticipates deployment activities would be limited to near-shore and inland waters, not on the open ocean.

Effects on birds and bats would be considered *less than significant with BMPs and mitigation measures incorporated* for operations. Birds could be adversely affected by RF exposure or collision with lines, poles, or aerial platforms. Habitat fragmentation could also potentially affect birds through the loss of nesting, brood rearing, and feeding after and before long migratory flights and/or reproduction. Bats could be similarly affected by RF exposure.

There are 118 federally and/or territory-listed plant and animal species in the U.S. Virgin Islands, including 62 plants, 33 birds, 6 mammals, 8 amphibians and reptiles, 2 fish, and 7 invertebrates. With full and effective implementation of BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, the Preferred Alternative *may affect, but is not likely to adversely affect* listed species at the programmatic level. Site-specific analysis would be required to determine the potential impacts on listed species at specific proposed locations depending on the site conditions and the type of deployment.

ES4.7. Land Use, Airspace, and Recreation

This section describes potential impacts to land use, airspace, and recreation at the programmatic level, and discusses BMPs and mitigation measures that could avoid or minimize those potential impacts (see Table ES4-7).

Deployment and operation of new aboveground facilities associated with the Preferred Alternative, such as new towers, antennae, or other structures, could result in direct changes to land use where such deployment occurs on land not already used for telecommunications, industrial, or public utility activity. As discussed in Section 4.2.9, Socioeconomics, the presence of permanent aboveground facilities could lead to reduced property values due to adverse aesthetic characteristics or concerns about potential health impacts. Purchases of land for the Preferred Alternative buildout could also affect localized real estate market values. These potential impacts would generally be *less than significant* at the programmatic level because they would likely be localized to the deployment locations of individual facilities, and individual structures or facilities could often be screened to further minimize any potential impacts.

Deployment and operation of new aboveground facilities associated with the Preferred Alternative, particularly taller structures such as new towers and antennae, could add new obstructions to existing airspace. These potential impacts would generally be *less than significant* at the programmatic level, due to the sporadic location of such aboveground facilities and the Federal Aviation Administration (FAA) limitations on such structures.

Deployment of the Preferred Alternative could temporarily block or hinder access to recreation lands, or could reduce the enjoyment that residents and visitors experience while using those recreation lands—particularly in areas where high-quality visual conditions (see Section ES4.8, Visual Resources) are expected. Potential impacts from the loss of access would generally be *less than significant* at the programmatic level due to only minimal or small reductions in visitation or duration of recreational activities (as opposed to total loss of enjoyment); potential impacts from diminished enjoyment of recreation areas would generally also be *less than significant* at the programmatic level as the geographic extent of this potential impact would likely be limited to a relatively small number of recreational sites.

Table ES4-7: Summary of Potential Impacts, Land Use, Airspace, and Recreation

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Direct land use change (site of FirstNet facility installation or deployable base)	3	3	3	3	3	3	3	• Give preference to development options that involve use of existing physical infrastructure, and/or that do not involve new aboveground structures (e.g., collocation on existing structures, new buried or undersea infrastructure, etc.), especially near recreation lands. • Give preference to development options that are compatible with existing zoning and applicable comprehensive plans. • Select infrastructure locations that are screened from view by topography and/or vegetation, that do not require noticeable permanent changes in landforms (i.e., cut and fill) or vegetation, and that are as far from surrounding residences as possible. • Select infrastructure designs that minimize contrast with the surrounding landscape and land uses. • Retain existing vegetation wherever possible to provide visual screening of new infrastructure. • Avoid infrastructure locations on easements established for wildlife habitat and other conservation purposes, to the extent practicable and feasible, and ensure compliance with applicable conditions and restrictions for locations on conservation lands. • Select infrastructure designs that minimize contrast with the surrounding landscape and land uses.
Indirect land use change (site of FirstNet facility installation or deployable base)	3	3	3	3	3	3	3	
Use of airspace (at and near site of FirstNet facility installation or deployable base)	3	3	3	3	3	3	3	
Loss of access to public or private recreation land	3	3	3	3	3	3	3	

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Loss of enjoyment of public or private recreation land	3	3	3	3	3	3	3	• Avoid infrastructure locations on easements established for wildlife habitat and other conservation purposes, to the extent practicable and feasible, and ensure compliance with applicable conditions and restrictions for locations on conservation lands. • Select infrastructure locations that are as far from recreation lands as practicable and feasible. • Select infrastructure designs that minimize construction footprints. • Give preference to infrastructure locations that are compatible with existing park or recreation planning documents. • Avoid or minimize, as practicable and feasible, construction activities in areas covered by existing incompatible easements. • Select the shortest possible structures necessary to meet the FirstNet system's needs, and only deploy towers less than 200 feet in height. • Place new infrastructure near existing similar infrastructure where possible, to minimize the total number of new aerial navigation hazards. • Avoid placing new infrastructure near airports or the areas regulated under the FAA's Part 77 regulations (*FAA 2016a*). • Avoid placing new infrastructure within Military Operations Areas or under Military Training Routes. • Work closely with the National Park Service (NPS) to address any concerns they might have if a tower needs to be placed in an area that might affect the nighttime sky at an NPS unit. • Limit the use of Deployable Airborne Communications Architecture to areas less likely to be used by commercial, military, or private aviation (to the degree feasible, and in consultation with the FAA and Department of Defense).

[a] Impact ratings are at the programmatic level, and colors are as follows:
1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact

ES4.7.1. Alaska

Aviation, and particularly general aviation (i.e., smaller aircraft that typically fly at lower altitudes than commercial aircraft) plays an important role in day-to-day transportation in Alaska (*Alaska DOT 2013*). The addition of new aerial hazards could therefore have a greater effect than in other territories. The presence of new aboveground facilities or deployment activity could be perceived as a potential adverse recreational impact, particularly in Alaska where land is valued for its pristine, relatively undeveloped characteristic. Such potential impacts would generally occur in a limited number of areas, generally within sight of Project-related aboveground facilities. As the geographic extent of potential impacts would likely be limited, effects on land use, airspace, and recreation in Alaska would be considered *less than significant* at the programmatic level (see Table ES4-7).

ES4.7.2. Hawaii

Hawaii is renowned for its scenic and recreational lands. Hawaii residents often choose to live near such lands—and, along with visitors, to visit those lands—because of their scenic beauty and environmental quality. Placement of new aboveground facilities within sight of such lands, including beaches, could create a perceived diminution of those aesthetic and environmental values in the eyes of Hawaii residents and visitors, thus potentially reducing the enjoyment they derive from living near or visiting recreation lands and facilities. However, given the relative proximity of existing development to many recreational lands and facilities in Hawaii, such potential impacts are unlikely to be overly noticeable. For this reason, effects on land use, airspace, and recreation in Hawaii would be considered *less than significant* at the programmatic level (see Table ES4-7).

ES4.7.3. American Samoa

Less than 4 percent of land is developed in American Samoa. As mentioned above, deployment and operation of facilities such as new towers, antennas, or other structures could result in direct changes to land use where they occur on land not already used for telecommunications, industrial, or public utility activity. However, to the extent practicable or feasible, new aboveground facilities would likely be constructed in locations where such structures are consistent with local land use regulations. Additionally, once deployment locations are known, the location could be subject to an environmental review to help ensure environmental concerns are identified.

Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. For these reasons, potential land use, airspace, and recreation impacts in American Samoa would be *less than significant* at the programmatic level (see Table ES4-7).

ES4.7.4. Guam

Land Use, Airspace, and Recreation potential impacts in Guam would be as described in the introduction section (see Section ES4.7 above) and similar to those in American Samoa, and would be considered *less than significant* at the programmatic level (see Table ES4-7).

ES4.7.5. Northern Mariana Islands

Land Use, Airspace, and Recreation potential impacts in the Northern Mariana Islands would be as described in the introduction section (see Section ES4.7 above) and similar to those in American Samoa, and would be considered *less than significant* at the programmatic level (see Table ES4-7).

ES4.7.6. Puerto Rico

Land Use, Airspace, and Recreation potential impacts in Puerto Rico would be as described in the introduction section (see Section ES4.7 above). In addition, Puerto Rico has relatively high residential vacancy rates and relatively low property values. These factors imply the ability to relocate to avoid adverse impacts associated with FirstNet, although the territory's relatively low incomes could tend to make such relocations difficult. Nonetheless, most impacts to land use, airspace, and recreation are not anticipated to be widespread and would likely be short-term. As a result, like the other states and territories, potential land use, airspace, and recreation impacts would be considered *less than significant* at the programmatic level (see Table ES4-7).

ES4.7.7. U.S. Virgin Islands

Scenic and recreational lands are an intrinsic aspect of the U.S. Virgin Islands identity. Placement of new aboveground facilities within sight of such lands, including beaches, could create a perceived diminution of those aesthetic and environmental values in the eyes of U.S. Virgin Islanders and visitors, thus reducing the enjoyment they derive from living near or visiting recreation lands and facilities. Given the importance of offshore recreation in the U.S. Virgin Islands (as evidenced, in part, by the presence of two protected coral reef areas), the visibility of the Preferred Alternative's onshore aboveground facilities from the water could have a similar effect. Given the relative proximity of existing

development to many recreational lands and facilities in the U.S. Virgin Islands, such potential impacts are unlikely to be overly noticeable. Effects on land use, airspace, and recreation in the U.S. Virgin Islands would be considered *less than significant* at the programmatic level (see Table ES4-7).

ES4.8. Visual Resources

This section describes potential impacts to visual resources at the programmatic level associated with deployment and operation of the Preferred Alternative, and discusses BMPs and mitigation measures that could avoid or minimize potential adverse impacts, and/or that would preserve or enhance potential substantially beneficial impacts (see Table ES4-8).

Deployment and operation of new aboveground facilities, such as new towers, antennae, or other structures, could add new permanent elements to the visual landscape (what observers can readily see from a given vantage point), while deployment of options other than aboveground facilities could create only temporary changes to the landscape—such as construction scars or the presence of construction equipment. Observers are more likely to perceive Preferred Alternative facilities negatively in or near areas managed for public recreational or cultural activities, such as local, state or national parks; state or national forest areas; waterways that are used for fishing or for recreational purposes including sports fishing or wildlife viewing; communities of historic character; and coastlines. While such preferences are not necessarily codified in law or regulation, observers tend to prefer or demand higher levels of scenic quality and an absence of human-built structures in such areas.

Potential real estate purchasers (individuals who wish to purchase a home or property, investors, developers, etc.) and renters could see the presence of aboveground facilities as an adverse aesthetic element—a perception that could affect property values. These visual potential impacts would generally be *less than significant* at the programmatic level, since they would likely be localized to the deployment locations of individual facilities, and individual structures or facilities could often be screened or otherwise blocked from view.

Taller aboveground facilities, such as towers, would likely require nighttime and possibly daytime lighting. The visual potential impacts of that lighting would generally be *less than significant* at the programmatic level in more developed areas, where new light sources would be less noticeable, but would be *less than significant with BMPs and mitigation measures incorporated* at the programmatic level in rural areas or near local, state, or national parks where the new light sources might interfere with enjoyment of the night sky.

Table ES4-8: Summary of Potential Impacts, Visual Resources

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Adverse change in aesthetic character[b]	3	3	3	3	3	3	3	• Take the scenic character of the surrounding area into account in the proposed design to reasonably minimize or avoid visual impacts to the surrounding area when viewed from existing roadways or shorelines. • Utilize non-reflecting coatings on towers, antennas, buildings, and associated structures where possible. • Implement sensitive grading techniques that blend grading with the natural terrain. • Treat all disturbed slopes for erosion control. • Minimize the area of bare soil at any one time as much as possible by constructing in stages. • Revegetate disturbed areas as progressively and quickly as practicable to restore vegetative cover. • Reduce or eliminate the need for lighting on poles or structures, or to restrict the duration and directionality of needed lighting. • Give preference to development options that involve use of existing physical infrastructure (e.g., collocation on existing structures, new buried or undersea infrastructure, etc.), and specifically avoid the construction of new aerial fiber optic plant and/or new wireless communication towers within, or in locations within sight of, federal or other lands where visual resources are regulated (e.g., units of the National Park System, or areas where local zoning regulations emphasize protection of views or aesthetic conditions), or where residents and visitors have come to expect high visual quality and the absence of human-built structures.

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Nighttime lighting (overall)	3	3	3	3	3	3	3	• Select infrastructure locations that are screened from view by topography and/or vegetation, that do not require noticeable permanent changes in landforms (i.e., cut and fill) or vegetation, and that are as far from surrounding residences as possible. • Select infrastructure designs that minimize construction footprints. • Retain existing vegetation wherever possible to provide visual screening of new infrastructure. • Select infrastructure designs that minimize contrast with the surrounding landscape. • Comply with all relevant and applicable federal regulations and guidance regarding visual and aesthetic conditions and impacts. • Work closely with the NPS to address any concerns they might have if a tower needs to be placed in an area that might affect the nighttime sky at an NPS unit. • Select parking locations for deployable technologies that are screened from view by topography or vegetation, that are as far away from as many observers as possible, and that are not in or near areas considered scenic, such as shorelines, ridgelines, or scenic roads. • Select deployable designs that minimize the use of nighttime lighting, that include shielded or directional nighttime lighting, and/or that use the minimum nighttime lighting required for safe operations.
Nighttime lighting (isolated rural areas)[c]	2	2	2	2	2	2	2	

[a] Impact ratings are at the programmatic level, and colors are as follows:
1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact

[b] Additional BMPs and mitigation measures may be required for towers.

[c] Potential nighttime lighting impacts during deployment would be *less than significant* due to the temporary nature of the potential impacts but would be *less than significant with BMPs and mitigation measures incorporated* during operations in isolated rural areas or if sited near a national park.

ES4.8.1. Alaska

Large portions of Alaska are managed for visual resources—including units of the National Park System and national forests—and/or for recreational or cultural activities, such as local and state parks; state or national forest areas; waterways that are used for subsistence fishing or for recreational purposes including sports fishing or wildlife viewing; Alaska Native villages or communities of historic character; and coastlines and a variety of state lands. Outside of these areas, Alaskans and Alaska visitors have generally come to expect high scenic quality and pristine, undeveloped terrestrial and marine spaces. As a result, the Preferred Alternative facilities that extend above the horizon are likely to be perceived more negatively than in other parts of the U.S. In addition to high-quality daytime views and dark nighttime skies, Alaskans and Alaska visitors are likely to be concerned about the Preferred Alternative's effects on the visibility of the nighttime skies and the *aurora borealis*.

Effects on visual resources would be considered *less than significant* at the programmatic level during the daytime, and for those projects that require nighttime lighting, *less than significant with BMPs and mitigation measures incorporated* at the programmatic level at night, particularly in rural areas where new light sources might interfere with enjoyment of the night sky (see Table ES4-8).

ES4.8.2. Hawaii

Hawaii is renowned for its high quality scenery and overall visual attractiveness, particularly (but not exclusively) in areas managed for visual resources (such as units of the National Park System) and/or recreation. Because Hawaii residents and visitors have come to expect high scenic quality, new aboveground facilities are likely to be perceived more negatively than in other parts of the U.S. Effects on visual resources in Hawaii would be considered *less than significant* at the programmatic level during the daytime, and for those projects that require nighttime lighting, *less than significant with BMPs and mitigation measures incorporated* at the programmatic level at night, particularly in rural areas where the new light sources might interfere with enjoyment of the night sky (see Table ES4-8).

ES4.8.3. American Samoa

Visual Resource potential impacts in American Samoa would be similar in nature to the general potential impacts described in Hawaii, and would be considered *less than significant* at the programmatic level during the daytime, and for those projects that require nighttime lighting, *less than significant with BMPs*

and mitigation measures incorporated at the programmatic level at night, particularly in rural areas where the new light sources might interfere with enjoyment of the night sky (see Table ES4-8).

ES4.8.4. Guam

Visual Resource potential impacts in Guam would be similar in nature to the general potential impacts described in Hawaii, and would be considered *less than significant* at the programmatic level during the daytime, and for those projects that require nighttime lighting, *less than significant with BMPs and mitigation measures incorporated* at the programmatic level at night, particularly in rural areas where the new light sources might interfere with enjoyment of the night sky (see Table ES4-8).

ES4.8.5. Northern Mariana Islands

Visual Resource potential impacts in the Northern Mariana Islands would be similar in nature to the general potential impacts described in Hawaii, and would be considered *less than significant* at the programmatic level during the daytime, and for those projects that require nighttime lighting, *less than significant with BMPs and mitigation measures incorporated* at the programmatic level at night, particularly in rural areas where the new light sources might interfere with enjoyment of the night sky (see Table ES4-8).

ES4.8.6. Puerto Rico

Puerto Rico is known for its scenic quality and attracts tourism in part due to that character (*USFS 2016, 1997*); adverse effects on visual resources, including topography and vistas, may be perceived more acutely as a result. Effects on visual resources in Puerto Rico would be considered *less than significant* at the programmatic level during the daytime, and for those projects that require nighttime lighting, *less than significant with BMPs and mitigation measures incorporated* at the programmatic level at night, particularly in rural areas where the new light sources might interfere with enjoyment of the night sky (see Table ES4-8).

ES4.8.7. U.S. Virgin Islands

The U.S. Virgin Islands has a reputation for scenic quality and attracts and relies on tourism in part due to this character. Visitors and residents alike tend to prefer or even demand higher levels of scenic quality in such areas. Because of this, new aboveground facilities in U.S. Virgin Islands are likely to be perceived more negatively than in other parts of the U.S. Effects on visual resources in the U.S. Virgin Islands would be considered *less than significant* at the programmatic

level during the daytime, and for those projects that require nighttime lighting, *less than significant with BMPs and mitigation measures incorporated* at the programmatic level at night, particularly in rural areas where the new light sources might interfere with enjoyment of the night sky (see Table ES4-8).

ES4.9. Socioeconomics

Deployment and operation of the Preferred Alternative may have a variety of potential socioeconomic impacts (both beneficial and adverse), including potential direct and indirect impacts at the programmatic level. Operation of the Preferred Alternative would involve minimal impacts to socioeconomics. Potential impacts would instead be more likely during deployment (see Table ES4-9). Deployment and operation of new aboveground facilities, such as new towers, antennae, or other structures, could adversely affect local real estate values, due to the diminishment of surrounding aesthetic character. These potential impacts would generally be *less than significant* at the programmatic level as recent studies have shown a minimal impact on property prices due to the presence of a nearby tower, with some cases showing no effect beyond 100 meters (328 feet) (*Bond et al. 2013*). Similarly, potentially adverse impacts on tourism could be experienced, which would also be l*ess than significant* at the programmatic level.

Potential impacts to economic activity would generally be *less than significant*, at the programmatic level due to the relatively small amount of economic activity associated with the Preferred Alternative. Deployment and operation could additionally affect the state or territory's economy through changes in tax revenue, wages, and spending. The Preferred Alternative could additionally create direct, indirect, and induced employment, through new jobs associated with the Preferred Alternative (direct), its contractors and subcontractors (indirect), and other businesses that serve the Preferred Alternative employees, contractors, or subcontractors (induced). Economic effects are typically beneficial impacts, although potential adverse economic impacts are possible. Increases in employment associated with deployment and operation of the NPSBN would be temporary, and would likely consist at least in part of local labor. The potential impacts of land acquisition for Preferred Alternative activities would generally have no potential impacts to land or natural resources available for subsistence activities; however, site-specific evaluation may be required to confirm the absence of impacts. Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. Potential impacts would generally be *less than significant* at the programmatic level, due to the relatively small amount of economic activity in any given area associated with the Preferred Alternative.

Table ES4-9: Summary of Potential Impacts, Socioeconomics

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Potential impacts to real estate	3	3	3	3	3	3	3	• Avoid development of new wireless communication towers in or near residential areas to reduce the potential that such activities could have adverse impacts on residential property values. • Avoid development or enlargement of storage, staging, and launch/landing areas for deployable technologies in or near residential areas to reduce the potential that such activities could have adverse impacts on residential property values. • Give preference to development options that involve use of existing physical infrastructure (e.g., collocation on existing structures, new buried or undersea infrastructure, etc.). • Select infrastructure locations that are screened from view by topography and/or vegetation, that do not require noticeable permanent changes in landforms (i.e., cut and fill) or vegetation and that are as far from surrounding residences as possible. • Retain existing vegetation wherever possible to provide visual screening of new infrastructure. • Select infrastructure designs that minimize contrast with the surrounding landscape. • Give preference to hiring workers who are local residents, where practicable. • Share deployment plans with public service providers, especially first responders, as early in the process as possible, and throughout the deployment process.
Economic benefits or adverse impacts related to changes in tax revenues, wages, or direct spending (could be beneficial or adverse)	3	3	3	3	3	3	3	
Employment	3	3	3	3	3	3	3	
Increased pressure on existing public services	3	3	3	3	3	3	3	
Diminished social cohesion/disruption related to influx	3	3	3	3	3	3	3	
Reduced opportunities for subsistence practices	3	3	3	3	3	3	3	

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Reduced opportunities for subsistence practices	3	3	3	3	3	3	3	• Consult with subsistence users (including Indigenous Peoples and other individuals or groups for whom subsistence is a way of life) to understand the species and habitats used for subsistence activities, as well as the seasonal cycle of subsistence activity. • Select infrastructure locations that minimize or avoid disturbance of subsistence species habitat.

[a] Impact ratings are at the programmatic level, and colors are as follows:
1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact

ES4.9.1. Alaska

Because Alaska is such a highly scenic state and has such a comparably small real estate market, the adverse aesthetic perception of large aboveground facilities such as towers could influence potential real estate activity to a greater degree than in other states or territories. Similarly, direct purchases of land by the Preferred Alternative could affect Alaska real estate markets more directly than in other locations. The same potential visual impacts that could affect real estate (see above) in Alaska could also adversely affect tourist activity, which is based at least in part on the state's visual characteristics. These effects would be limited to areas near new-build projects. Conversely, beneficial effects of construction activity associated with FirstNet deployment could include additional jobs, wages, spending, and/or tax revenues. As discussed in Section 3.1.9, Socioeconomics, subsistence is an important way of life in Alaska; thus, Preferred Alternative potential impacts on subsistence practices could be stronger here than in other locations. Overall, effects on socioeconomics in Alaska would be considered *less than significant* at the programmatic level (see Table ES4-9).

ES4.9.2. Hawaii

While Hawaii is a highly scenic state, it also has a constrained real estate market (i.e., little space for new development). As a result, the adverse real estate effects of the adverse aesthetic perception of large aboveground facilities such as towers would likely be offset by a relative inability to choose housing away from such structures. These same potential visual impacts could also adversely affect tourist activity in Hawaii, which is based at least in part on the state's visual characteristics. These effects in Hawaii would be limited to areas near new-build projects. Construction activity associated with FirstNet deployment could also create beneficial effects of additional jobs, wages, spending, and/or tax revenues. As discussed in Section 4.1.9, Socioeconomics, subsistence activity in Hawaii is largely focused around fishing; subsistence activities may account for as much as 28 percent of all food for state residents. However, given the limited amount of construction anticipated in any one area, it is anticipated that potential impacts to subsistence activities would be minimal. Overall, effects on socioeconomics in Hawaii would be considered *less than significant* at the programmatic level (see Table ES4-9).

ES4.9.3. American Samoa

Potential adverse visual impacts associated with the Preferred Alternative could adversely affect tourist activity in American Samoa (which the territory is working to increase); tourism in American Samoa is based at least in part on the territory's visual characteristics. Residents of American Samoa could also experience potential adverse visual impacts due to changes in views considered locally or personally important. These effects in American Samoa would be limited to areas near new-build projects. Beneficial effects from construction activity associated with FirstNet deployment could include additional jobs, wages, spending, and/or tax revenues. Subsistence practices in American Samoa include the harvesting[9] of wild or feral animals and uncultivated plants for food and cultural purposes on both land and in the sea. However, given the limited amount of construction anticipated in any one area, it is anticipated that potential impacts to subsistence activities would be minimal. Overall, effects on socioeconomics in American Samoa would be considered *less than significant* at the programmatic level (see Table ES4-9).

ES4.9.4. Guam

Potential adverse visual impacts associated with the Preferred Alternative could adversely affect tourist activity in Guam, a principal activity in the territory's economy. Residents of Guam could also experience potential adverse visual impacts due to changes in views considered locally or personally important. These effects in Guam would be limited to areas near new-build projects. Construction activity associated with FirstNet deployment could also create beneficial effects including additional jobs, wages, spending, and/or tax revenues. Research did not identify any readily available subsistence data or information; however, given the limited amount of construction anticipated in any one area, it is anticipated that potential impacts to subsistence activities would be minimal. Overall, effects on socioeconomics in Guam would be considered *less than significant* at the programmatic level (see Table ES4-9).

[9] Harvesting is the act or process to take or kill wildlife for food, sport, or population control; or to gather crops for consumption.

ES4.9.5. Northern Mariana Islands

Potential adverse visual impacts associated with the Preferred Alternative could adversely affect tourist activity in the Northern Mariana Islands, which is based at least in part on the territory's visual characteristics and which comprises nearly one quarter of all employment. Residents of the Northern Mariana Islands could also experience potential adverse visual impacts due to changes in views considered locally or personally important. These effects in the Northern Mariana Islands would be limited to areas near new-build projects. Conversely, construction activity associated with FirstNet deployment could be beneficial by creating additional jobs, wages, spending, and/or tax revenues. Research did not identify any readily available subsistence data or information; however, given the limited amount of construction anticipated in any one area, it is anticipated that potential impacts to subsistence activities would be minimal. Overall, effects on socioeconomics in the Northern Mariana Islands would be considered *less than significant* at the programmatic level (see Table ES4-9).

ES4.9.6. Puerto Rico

Potential adverse visual impacts associated with the Preferred Alternative could adversely affect tourist activity in Puerto Rico, which is based at least in part on the territory's visual characteristics. Residents of Puerto Rico could also experience potential adverse visual impacts due to changes in views considered locally or personally important. These effects in Puerto Rico would be limited to areas near new-build projects. Construction activity associated with FirstNet deployment could also be beneficial by creating additional jobs, wages, spending, and/or tax revenues. While subsistence actives may occur among some residents of Puerto Rico, research did not identify any specific subsistence data or information. However, given the limited amount of construction anticipated in any one area, it is anticipated that potential impacts to subsistence activities would be minimal. Overall, effects on socioeconomics in Puerto Rico would be considered *less than significant* at the programmatic level (see Table ES4-9).

ES4.9.7. U.S. Virgin Islands

Potential adverse visual impacts associated with the Preferred Alternative could adversely affect tourist activity in the U.S. Virgin Islands, which is a principal economic activity. Residents of the U.S. Virgin Islands could also experience potential adverse visual impacts due to changes in views considered locally or personally important. These effects would be limited to areas near new-build projects. In contrast, beneficial effects of construction activity associated with FirstNet deployment could include the creation of additional jobs, wages,

spending, and/or tax revenues. Although past research shows that subsistence activity has occurred in the U.S. Virgin Islands, no recent data or studies of current practices were readily available. However, given the limited amount of construction anticipated in any one area, it is anticipated that potential impacts to subsistence activities would be minimal. Overall, effects on socioeconomics in the U.S. Virgin Islands would be considered *less than significant* at the programmatic level (see Table ES4-9).

ES4.10. Environmental Justice

Potential environmental justice impacts could occur if minority (race or ethnicity) or low-income groups are disproportionately affected by adverse social, health, or environmental consequences of the Preferred Alternative. Given that these potential impacts could only occur if these particular groups are present and that the specific locations within states and territories of deployment and operations activities of the Preferred Alternative have not been identified, this Final PEIS mapped the potential for impacts to environmental justice communities to occur within each of the states and territories considered. Impact potential was rated as low, moderate, or high.

The impacts from deployment activities would be *less than significant* at the programmatic level as the potential impacts would be short-term and could potentially involve objectionable dust, noise and vibration, traffic, or other localized impacts due to construction activities (see Table ES4-10). Potential environmental justice impacts associated with routine maintenance and inspection of the facilities are anticipated to have *less than significant* impacts at the programmatic level if the same roads are used to perform inspections and maintenance activities. Any major infrastructure replacement as part of ongoing system maintenance would result in potential impacts similar to the deployment impacts described above.

Table ES4-10: Summary of Potential Impacts, Environmental Justice[a]

Potential Impact	Impact Rating[b]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Effects associated with other resource areas (e.g., cultural resources) that have environmental justice implications due to the affected parties (as defined by EO 12898)	3	3	3	3	3	3	3	• Identify specific communities (i.e., neighborhoods or populations that may be contained within individual block groups), where possible, that are at risk of experiencing environmental justice impacts. Conduct targeted outreach to these communities, tailored to the specific racial, ethnic, financial, and/or cultural background, as early in the development process as possible to explain the nature and extent of specific potential impacts, and to gain feedback on those impacts. • Consult with subsistence users to understand the species and habitats used for subsistence activities, as well as the seasonal cycle of subsistence activity. • Give preference to development options that involve use of existing physical infrastructure. • Select infrastructure locations, where possible, that are not within or near environmental justice communities, particularly new build options. • Follow BMPs that reduce adverse impacts of construction activities, such as generation of noise, dust, and traffic. • Avoid siting deployment activities and facilities requiring construction in proximity to environmental justice communities to reduce the potential that such activities would be seen as disproportionately affecting environmental justice communities.

Potential Impact	Impact Rating[b]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Effects associated with other resource areas (e.g., cultural resources) that have environmental justice implications due to the affected parties (as defined by EO 12898) (continued)	3	3	3	3	3	3	3	• Avoid development of new wireless communication towers in proximity to environmental justice communities because of their potential impacts on property values and to reduce the potential that such activities would be seen as disproportionately affecting environmental justice communities. Proximity could be defined variably depending on the nature of the aesthetic impacts, nature of other objectionable effects that influence property values, and other factors such as local concern over aesthetics, desire for improved wireless communications, local media response, and more.

[a] Since potential environmental justice impacts occur at the site-specific level, analyses of individual proposed projects would be required to determine potential impacts to specific environmental justice communities. Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work. BMPs and mitigation measures may be required to address potential impacts to environmental justice communities at the site-specific level.

[b] Impact ratings are at the programmatic level, and colors are as follows:

1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact

ES4.10.1. Alaska

Approximately 33 percent of Alaska's population identifies itself as a racial minority (i.e., a race other than white or Caucasian), while approximately 10 percent of the state's population lives in poverty, as defined by the U.S. Census Bureau. A substantial portion of Alaska's block groups has a high potential for environmental justice communities, and therefore a high potential for impacts to those communities. These high potential areas are found on all of Alaska's populated islands and cover a substantial portion of the mainland. Moderate-potential block groups are found near Fairbanks, Anchorage, Sitka, and Juneau. Moderate- and low-potential block groups appear to be clustered near major population centers such as Anchorage, Fairbanks, Juneau, and Sitka. Effects on environmental justice in Alaska would be considered *less than significant* at the programmatic level (see Table ES4-10), although analyses of individual proposed projects would be required to determine potential impacts to specific environmental justice communities, and BMPs and mitigation measures may be required to address potential impacts to environmental justice communities at the site-specific level. Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work.

ES4.10.2. Hawaii

Approximately 75 percent of Hawaii's population identifies itself as a racial minority (i.e., a race other than white or Caucasian), while approximately 11 percent of the state's population lives in poverty, as defined by the U.S. Census Bureau. A substantial portion of Hawaii's block groups has a high potential for environmental justice communities, and therefore a high potential for impacts to those communities. These high potential areas are found on all of Hawaii's populated islands and cover all or nearly all of Kauai, Lanai, and Molokai. Moderate-potential block groups are found on the largest islands—Hawaii, Maui, Molokai, Oahu, and Kauai. There is no apparent correlation between major population centers and any specific level of potential environmental justice concerns. Effects on environmental justice in Hawaii would be considered *less than significant* at the programmatic level (see Table ES4-10). Analyses of individual proposed projects would be required to determine potential impacts to specific environmental justice communities, and BMPs and mitigation measures may be required to address potential impacts to environmental justice communities at the site-specific level. Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work.

ES4.10.3. American Samoa

Approximately 93 percent of American Samoa's population identifies itself as Native Hawaiian or Other Pacific Islander,[10] a racial minority for the purposes of this analysis, while approximately 58 percent of the territory's population lives in poverty, as defined by the U.S. Census Bureau. Block groups within the populated Eastern, Manu'a and Western Districts have a high potential for environmental justice impacts; Rose Island and Swain's Island have a low potential for these impacts, based on population density. Effects on environmental justice in American Samoa would be considered *less than significant* at the programmatic level (see Table ES4-10). Analyses of individual proposed projects would be required to determine potential impacts to specific environmental justice communities, and BMPs and mitigation measures may be required to address potential impacts to environmental justice communities at the site-specific level. Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work.

ES4.10.4. Guam

Approximately 93 percent of Guam's population identifies itself as a racial minority (i.e., a race other than white or Caucasian), including 49 percent of the population that identifies itself as Native Hawaiian or Other Pacific Islander;[10] approximately 23 percent of the territory's population lives in poverty, as defined by the U.S. Census Bureau. A substantial portion of Guam's block groups has a high potential for environmental justice communities, and therefore a high potential for impacts to those communities. These high potential areas include Guam's outlying islands, most of the central portion of the main island (including the urban area in and around Tamuning), and portions of the southwestern and northwestern coastlines. Moderate-potential block groups are found in the northeastern and southeastern area of the main island, as well as the area near Naval Base Guam, southwest of Tamuning. Low-potential block groups are found along the northern coast and south-central portion of the main island. Effects on environmental justice in Guam would be considered *less than significant* at the programmatic level (see Table ES4-10). Analyses of individual proposed projects would be required to determine potential impacts to specific environmental justice communities, and BMPs and mitigation measures may be required to address potential impacts to environmental justice communities at the site-specific level. Site-specific analysis may be required depending on the site

[10] "Native Hawaiian or Other Pacific Islander" is an official U.S. Census Bureau category.

conditions, the type of deployment, or any other permits or permissions necessary to perform the work.

ES4.10.5. Northern Mariana Islands

Approximately 63 percent of the Northern Mariana Islands' population identifies itself as a racial minority (i.e., a race other than white or Caucasian), including 35 percent of the population who identify themselves as Native Hawaiian or Other Pacific Islander;[11] approximately 52 percent of the commonwealth's population lives in poverty, as defined by the U.S. Census Bureau. All of the Northern Mariana Islands' block groups have a high potential for environmental justice communities, due primarily to poverty statistics, and therefore a high potential for impacts to those communities. Effects on environmental justice in the Northern Mariana Islands would be considered *less than significant* at the programmatic level (see Table ES4-10). Analyses of individual proposed projects would be required to determine potential impacts to specific environmental justice communities, and BMPs and mitigation measures may be required to address potential impacts to environmental justice communities at the site-specific level. Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work.

ES4.10.6. Puerto Rico

Approximately 30 percent of Puerto Rico's population identifies itself as a racial minority (i.e., a race other than white or Caucasian, not including Hispanic), while 99 percent of the population identify themselves as Hispanic; approximately 45 percent of the territory's population lives in poverty, as defined by the U.S. Census Bureau. Areas of high potential for environmental justice impacts areas are found on all of Puerto Rico's populated islands and cover all or nearly all of the islands. Moderate- and low-potential block groups are only found on the main island of Puerto Rico. Moderate- and low-potential block groups appear to generally be clustered near major population centers, such as San Juan, Carolina, Caguas, and Bayamon. Effects on environmental justice in the Puerto Rico would be considered *less than significant* at the programmatic level (see Table ES4-10). Analyses of individual proposed projects would be required to determine potential impacts to specific environmental justice communities, and BMPs and mitigation measures may be required to address potential impacts to environmental justice communities at the site-specific level. Site-specific analysis

[11] "Native Hawaiian or Other Pacific Islander" is an official U.S. Census Bureau category.

may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work.

ES4.10.7. U.S. Virgin Islands

Approximately 84 percent of the U.S. Virgin Islands' population identifies itself as a racial minority (i.e., a race other than white or Caucasian), while approximately 23 percent of the territory's population lives in poverty, as defined by the U.S. Census Bureau. High-, moderate-, and low-potential environmental justice areas are found on all three of the major populated islands in the U.S. Virgin Islands (St. Croix, St. Thomas, and St. John). High-potential block groups cover approximately 50 percent of the land area of St. Croix and St. Thomas, while moderate-potential block groups cover over 50 percent of the land area of St. John. Major population centers such as Christiansted, Frederiksted, Charlotte Amalie, and Cruz Bay appear to correlate to high-potential block groups. Effects on environmental justice in the U.S. Virgin Islands would be considered *less than significant* at the programmatic level (see Table ES4-10). Analyses of individual proposed projects would be required to determine potential impacts to specific environmental justice communities, and BMPs and mitigation measures may be required to address potential impacts to environmental justice communities at the site-specific level. Site-specific analysis may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work.

ES4.11. Cultural Resources

As discussed in the Cultural Resources sections of this Final PEIS, the evaluation of potential impacts to cultural resources uses a distinct set of impact categories, comparable to those defined in *36 CFR § 800*, *Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation*, and the U.S. National Park Service's *National Register Bulletin: How to Apply the National Register Criteria for Evaluation* (*NPS 1995*). These impact categories (and the equivalent impact categories and numeric ratings used throughout the rest of this Executive Summary) are:

- Adverse effect (1, *potentially significant*);
- Mitigated adverse effect (2, *less than significant with BMPs and mitigation measures incorporated*);
- Effect, but not adverse (3, *less than significant*); and
- No effect (4, *no impact*).

The primary cultural resource concern during deployment and operation activities is physical damage to and/or destruction of historic properties, traditional cultural properties, or significant sites of religious and/or cultural significance (see Table ES4-11). For the purposes of brevity, the term "historic property" is used here to refer to either historic properties, significant sites of religious and/or cultural significance, or traditional cultural properties. Indirect effects on historic properties could include changes to the views to and from a resource (potential viewshed impacts); increased noise levels at a resource; vibration; and/or visual or atmospheric effects caused by dust, emissions, or pollutants. The goal of historic preservation is not only to preserve and protect historic properties, but also to provide access to cultural resources, especially to those who value them.

To the extent practicable, FirstNet does not expect to remove, adversely affect, or permanently restrict access to any historic structures, historic properties, traditional cultural properties, or other cultural resources. If the proposed deployment activities would have the potential to adversely affect historic properties, FirstNet and/or their partners would apply BMPs and mitigation measures, as practicable or feasible, and consult with appropriate federal, state/territory, and interested parties to apply appropriate mitigation measures to resolve adverse effects. Potential residual impacts (those occurring after consultation and implementation of BMPs and mitigation measures) would generally be temporary and limited to the area near individual Preferred Alternative deployment sites. Based on the analysis of deployment activities to cultural resources, the impact rating as a result of direct and indirect effects are anticipated to be *effect, but not adverse* at the programmatic level.

As a federal entity, FirstNet has obligations under the National Historic Preservation Act of 1966 to understand and address the potential impacts of its proposed undertakings on historic properties; one of the ways in which this is accomplished is through consultation with State Historic Preservation Offices and government-to-government consultation with federally recognized American Indian tribes. As the lead agency for compliance with Section 106 of the National Historic Preservation Act, FirstNet is committed to meaningful engagement with Tribal Nations. FirstNet has begun consultation with affected American Indian tribes, Native Hawaiian organizations, Pacific Islanders, and communities in Puerto Rico and the U.S. Virgin Islands as part of the NHPA and NEPA processes, and these consultations have informed the development of the cultural resources sections of this Final PEIS.

Table ES4-11: Summary of Potential Impacts, Cultural Resources

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Direct Effects to Historic Properties[b]	3	3	3	3	3	3	3	• Comply with the requirements of Section 106 of the National Historic Preservation Act. • Follow all applicable federal and state requirements if inadvertent discoveries of human remains are made during deployment or operations. • Ensure usage of an appropriate indirect effects APEs as part of pre-siting or pre-deployment surveys to sufficiently account for potential indirect effects to cultural resources. • Establish procedures for monitoring if a project has the potential to adversely indirectly affect historic properties. Develop BMPs and mitigation measures as part of a Memorandum of Agreement or Programmatic Agreement to address any potential effects, if they were to occur. • Use low-impact construction alternatives, when feasible. For instance, ripping could be used as an alternative to blasting near structures or archaeological sites identified as at risk of effects from vibration. • Restrict the timing of deployment activities so as not to disturb the use of historic properties, as applicable. Stop work at certain times when traditional and/or religious properties are in use, such as during significant events (e.g., religious festivals or ceremonies). • Design projects to mitigate potentially adverse visual and auditory impacts of facilities. The following visual and noise abatement techniques should be considered: noise-reducing barriers, low-profile constructions, proper siting to maximize the use of topography and vegetation, screening, blending with topographic forms and existing vegetation patterns, and use of environmental coloration or advanced camouflage techniques to limit visual effects. • Consult with site users through a community liaison team to understand site usage and how the project could affect user access.
Indirect effects on historic properties (i.e., visual, noise, vibration, atmospheric)	3	3	3	3	3	3	3	

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Loss of access to historic properties	3	3	3	3	3	3	3	• Arrange alternative access using stakeholder input if access to an important cultural heritage site is restricted or blocked. Notify the public of the blockage and alternate means of access. • Follow all applicable federal requirements for agency and tribal consultation on the identification of and assessment of effects to cultural resources. • Avoid deployment in areas with known historic properties and deploy equipment and facilities in alternate locations if practical.

APE = Area of Potential Effect

[a] Impact ratings are at the programmatic levels, and colors are as follows:

1. (Red) Adverse effect
2. (Orange) Mitigated adverse effect
3. (Yellow) Effect, but not adverse
4. (Green) No effect

Categories of impacts defined as an *adverse effect; mitigated adverse effect; effect, but not adverse; and no effect* are comparable to those defined in *36 CFR § 800*, *Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation*, and the U.S. National Park Service's *National Register Bulletin: How to Apply the National Register Criteria for Evaluation* (*NPS 1995*).

[b] Per the National Historic Preservation Act, an historic property is defined as any district, archaeological site, building, structure, or object that is either listed or eligible for listing in the National Register of Historic Places (NRHP). Cultural resources present within an individual project's APE are not historic properties if they do not meet the eligibility requirements for listing in the NRHP. Sites of religious and/or cultural significance refer to areas of concern to Indian tribes and other consulting parties that, in consultation with the respective party or parties, may or may not be eligible for listing in the NRHP. This type of site may also be considered a traditional cultural property (TCP). Therefore, by definition, these significance criteria only apply to cultural resources that are historic properties, significant sites of religious and/or cultural significance, or TCPs. For the purposes of brevity, the term "historic property" is used here to refer to either historic properties, significant sites of religious and/or cultural significance, or TCPs.

ES4.11.1. Alaska

In Alaska, cultural resources can be found in coastal areas or inland environments, in relatively flat or easily accessible areas, or more remote locations, such as those that could be used for ceremonial purposes. There are currently 494 historic properties listed on the National Register of Historic Places (NRHP) in Alaska. FirstNet and/or their partners would work with the appropriate state agencies and interested Alaska Native tribes and organizations to determine the potential effect of the Preferred Alternative on any identified historic properties. Apart from such potential site-specific considerations, the overall impact rating in Alaska is anticipated to be *effect, but not adverse* at the programmatic level (see Table ES4-11).

ES4.11.2. Hawaii

In Hawaii, cultural resources can be found in coastal areas or inland environments, in relatively flat or easily accessible areas, or more remote locations, such as those that could be used for ceremonial purposes. There are currently 410 cultural resources listed on the NRHP in Hawaii, and the Hawaiian Register of Historic Places currently contains 890 historic properties. FirstNet and/or their partners would work with the appropriate state agencies and interested Native Hawaiian groups to determine the potential effect of the Preferred Alternative on any identified historic properties. Apart from such potential site-specific considerations, the overall impact rating in Hawaii is anticipated to be *effect, but not adverse* at the programmatic level (see Table ES4-11).

ES4.11.3. American Samoa

Known and unidentified cultural resources can occur throughout American Samoa, which currently has 32 historic properties listed on the NRHP. Portions of American Samoa with higher potential for the presence of cultural resources (including unidentified resources) include, but are not limited to, coastal areas where populated areas and infrastructure are prevalent, historic properties, near-shore shipwrecks, and military facilities and pillboxes. FirstNet and/or their partners would work with the appropriate territory agencies and interested Chamorro groups to determine the potential effect of the Preferred Alternative on any identified historic properties. Apart from such potential site-specific considerations, the overall impact rating in American Samoa is anticipated to be *effect, but not adverse* at the programmatic level (see Table ES4-11).

ES4.11.4. Guam

As with other territories, known and unidentified cultural resources can occur throughout Guam. There are currently 169 historic properties listed on the Guam Register of Historic Places and 146 historic properties listed on the NRHP in Guam; of these, 127 historic properties are listed on both. Portions of Guam with higher potential for the presence of cultural resources (including unidentified resources) include, but are not limited to, coastal areas where populated areas and infrastructure are prevalent, historic properties, near-shore shipwrecks, as well as relatively flat or easily accessible inland areas. FirstNet and/or their partners would work with the appropriate territory agencies and interested Chamorro groups to determine the potential effect of the Preferred Alternative on any identified historic properties. Apart from such potential site-specific considerations, the overall impact rating in Guam is anticipated to be *effect, but not adverse* at the programmatic level (see Table ES4-11).

ES4.11.5. Northern Mariana Islands

Known and unidentified cultural resources can occur throughout the Northern Mariana Islands; currently 40 historic properties are listed on the NRHP. Portions of the territory with higher potential for the presence of cultural resources (including unidentified resources) include, but are not limited to, coastal areas where populated areas and infrastructure are prevalent, historic properties, and near-shore shipwrecks. FirstNet and/or their partners would work with the appropriate territory agencies and interested native Northern Mariana Islander groups to determine the potential effect of the Preferred Alternative on identified historic properties. Apart from such potential site-specific considerations, the overall impact rating in the Northern Mariana Islands is anticipated to be *effect, but not adverse* at the programmatic level (see Table ES4-11).

ES4.11.6. Puerto Rico

Puerto Rico has known and unidentified cultural resources throughout the territory. There are currently 373 historic properties listed on the NRHP in Puerto Rico. Portions of Puerto Rico with higher potential for the presence of cultural resources (including unidentified resources) include, but are not limited to, coastal areas where populated areas and infrastructure are prevalent as well as flat or easily accessible inland areas. FirstNet and/or their partners would work with the appropriate territory agencies and interested groups to determine the potential effect of the Preferred Alternative on any identified historic properties. Apart from such potential site-specific considerations, the overall impact rating in Puerto Rico is anticipated to be *effect, but not adverse* at the programmatic level (see Table ES4-11).

ES4.11.7. U.S. Virgin Islands

As with other territories, the U.S. Virgin Islands has known and unidentified cultural resources throughout the territory, with 92 historic properties currently listed on the NRHP and various cultural resources listed on the U.S. Virgin Islands Register of Historic Places. Portions of the islands with higher potential for the presence of cultural resources (including unidentified resources) include, but are not limited to, coastal areas where populated areas and infrastructure are prevalent as well as flat or easily accessible inland areas. FirstNet and/or their partners would work with the appropriate territory agencies and interested groups to determine the potential effect of the Preferred Alternative on any identified historic properties. Apart from such potential site-specific considerations, the overall impact rating in the U.S. Virgin Islands is anticipated to be *effect, but not adverse* at the programmatic level (see Table ES4-11).

ES4.12. Air Quality

This section describes potential impacts to air quality at the programmatic level associated with deployment and operation of the Preferred Alternative, and discusses BMPs and mitigation measures that would avoid or minimize those potential impacts (see Table ES4-12). Operation of the Preferred Alternative would involve minimal potential impacts to air quality, generally limited to vehicle emissions associated with periodic inspection of structures, or operation of deployables during times of emergency. These cases notwithstanding, air quality potential impacts from the Preferred Alternative would be more likely during deployment.

Increased air emissions could result in adverse potential impacts to human health, wildlife, vegetation, and visibility. Emissions could result from stationary or mobile equipment that is powered by fossil fuels such as excavators, backhoes, front end loaders, graders, pavers, dump trucks, and other equipment required to support any clearance, drilling, and construction activities associated with network deployment. In addition, the use of power generators, first responder on-road vehicles, and aerial platforms associated with the use of deployable technologies could also increase air emissions, both from fossil fuel combustion and, in some cases, from stirring up dust on unpaved roads and construction areas.

Table ES4-12: Summary of Potential Impacts, Air Quality

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Increased air emissions	3	3	3	3	3	3	3	• Follow all applicable federal, state/territory, and local requirements for air quality control and obtain air pollution control permits for applicable emission sources. • Avoid constructing and operating emission sources in extreme or severe nonattainment areas and Class I Areas to the extent practicable. • Use engines certified to the lowest emission standards and engines that burn alternative fuels (e.g., natural gas, biofuels), and/or install emission control devices (when practicable) for equipment with internal combustion engines. • Use vehicles with hybrid or electric technology, when possible, to reduce or eliminate criteria pollutant emissions from fuel combustion. • Use renewable energy, as practicable or feasible, for backup power at buildout locations (cell tower sites, for example). • Control dust from construction or other land-disturbing activities by spraying water on roads/construction areas, limiting the area of uncovered soil to the minimum needed for each activity, siting staging areas to minimize fugitive dust, using a soil stabilizer (chemical dust suppressor), mulching areas or using a temporary gravel cover, limiting the number and speed of vehicles on the site, and covering trucks hauling dirt. • Post and enforce speed limits on dirt/gravel roads to reduce airborne fugitive dust. • Limit idling time of construction vehicle and equipment and conduct proper vehicle maintenance. • Minimize the time of operation of drones or aircraft below the mixing height (i.e., typically estimated at 3,000 feet aboveground level). • Use electric or alternate fueled ground support equipment for drones or other aircraft.

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Increased air emissions (continued)	3	3	3	3	3	3	3	• Ensure all activities are in compliance with general conformity requirements in nonattainment and maintenance areas. • Ensure all activities conform to the State or Territory Implementation Plan. • Follow all applicable federal, state/territory, and local air quality requirements, including standards for nuisance (where possible) and fossil fuel-powered generators. • Ensure all diesel engines are compliant with USEPA emission standards for the corresponding engine class. • Ensure all equipment is appropriately sized for the Proposed Action. • Consider using hydrogen-fueled generators where practicable to reduce nitrous oxides emissions. • Obtain permits, where required, to install and operate fossil fuel-powered generators. • Implement a dust control plan for construction activities and any travel over unpaved roads. • Use only ultra-low sulfur fuel (where commercially available) for both on-road and off-road diesel engines. • Ensure all fuel-burning equipment including, but not limited to, heavy construction equipment and power generators is maintained in accordance with manufacturer's specifications.

[a] Impact ratings are at the programmatic level, and colors are as follows:
1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact

Potential impacts from increased air emissions could occur in any location; however, they would be most significant in nonattainment areas (where air quality does not currently meet local standards), maintenance areas (where air quality has improved but historically did not meet local standards), and designated Class I Areas (areas of special national or cultural significance including certain national parks, wilderness areas, and national monuments).

These potential impacts would generally be *less than significant* because Preferred Alternative deployment would likely avoid, to the degree practicable, areas sensitive to decreased air quality, such as designated Class I Areas. It is anticipated that any air pollution increase due to deployment would likely be short-term with pre-existing air quality levels generally achieved after some months (typically less than a year).

ES4.12.1. Alaska

There are four Class I Areas in Alaska (Bering Sea Wilderness Area, Denali National Park, Simeonof Wilderness Area, and Tuxedni Wilderness Area). Fairbanks North Star Borough is designated as a moderate nonattainment area for particulate matter with a diameter of 2.5 micrometers or less ($PM_{2.5}$). Anchorage and Fairbanks are designated as maintenance areas for carbon monoxide, while Anchorage–Eagle River and Juneau–Mendenhall Valley are designated as maintenance areas for particulate matter with a diameter of 10 micrometers or less (PM_{10}). Effects on air quality in Alaska would be considered *less than significant* at the programmatic level (see Table ES4-12) because increases in air emissions from the Preferred Alternative are not expected to exceed applicable major source permitting thresholds and any air pollution increase would likely be short-term with pre-existing air quality levels generally achieved after some months (typically less than a year, and could be as short as a few hours or days for some activities such as pole construction).

ES4.12.2. Hawaii

There are no designated nonattainment or maintenance areas for any pollutants in Hawaii. There are two Class I Areas in the state: Haleakala National Park and Hawaii Volcanoes National Park. Effects on air quality in Hawaii would be considered *less than significant* at the programmatic level (see Table ES4-12) because increases in air emissions from the Preferred Alternative are not expected to exceed applicable major source permitting thresholds and any air pollution increase would likely be short-term with pre-existing air quality levels generally achieved after some months (typically less than a year, and could be as short as a few hours or days for some activities such as pole construction).

ES4.12.3. American Samoa

There are no designated nonattainment or maintenance areas or Class I Areas in American Samoa. Effects on air quality in American Samoa would be considered *less than significant* at the programmatic level (see Table ES4-12) because increases in air emissions from the Preferred Alternative are not expected to exceed applicable major source permitting thresholds and any air pollution increase would likely be short-term with pre-existing air quality levels generally achieved after some months (typically less than a year, and could be as short as a few hours or days for some activities such as pole construction).

ES4.12.4. Guam

There are no Class I Areas in Guam, although the areas near the Piti Power Plant and Tanguisson Power Plant are nonattainment areas for sulfur dioxide. Effects on air quality in Guam would be considered *less than significant* at the programmatic level (see Table ES4-12) because increases in air emissions from the Preferred Alternative are not expected to exceed applicable major source permitting thresholds and any air pollution increase would likely be short-term with pre-existing air quality levels generally achieved after some months (typically less than a year, and could be as short as a few hours or days for some activities such as pole construction).

ES4.12.5. Northern Mariana Islands

There are no designated nonattainment or maintenance areas or Class I Areas in the Northern Mariana Islands. Effects on air quality in the Northern Mariana Islands would be considered *less than significant* at the programmatic level (see Table ES4-12) because increases in air emissions from the Preferred Alternative are not expected to exceed applicable major source permitting thresholds and any air pollution increase would likely be short-term with pre-existing air quality levels generally achieved after some months (typically less than a year, and could be as short as a few hours or days for some activities such as pole construction).

ES4.12.6. Puerto Rico

There are no Class I Areas in Puerto Rico. Arecibo is designated as a nonattainment area for lead and Guaynabo County is designated as a maintenance area for PM_{10}. Effects on air quality in Puerto Rico would be considered *less than significant* at the programmatic level (see Table ES4-12) because increases in air emissions from the Preferred Alternative are not expected to exceed applicable major source permitting thresholds and any air pollution increase would likely be short-term with pre-existing air quality levels generally achieved after some

months (typically less than a year, and could be as short as a few hours or days for some activities such as pole construction).

ES4.12.7. U.S. Virgin Islands

There are no designated nonattainment or maintenance areas in the U.S. Virgin Islands. Virgin Islands National Park is a Class I Area. Effects on air quality in the U.S. Virgin Islands would be considered *less than significant* at the programmatic level (see Table ES4-12) because increases in air emissions from the Preferred Alternative are not expected to exceed applicable major source permitting thresholds and any air pollution increase would likely be short-term with pre-existing air quality levels generally achieved after some months (typically less than a year, and could be as short as a few hours or days for some activities such as pole construction).

ES4.13. Noise and Vibrations

This section describes potential impacts at the programmatic level to noise and vibration associated with deployment and operation of the Preferred Alternative, and discusses BMPs and mitigation measures that would avoid or minimize those potential impacts (see Table ES4-13). Operation of the Preferred Alternative would involve minimal potential noise and vibration impacts, with the notable exception being potential localized noise impacts from generators associated with operation of deployables. That case notwithstanding, potential noise and vibration impacts would be more likely during deployment.

Potential impacts to the community from increased noise and vibration levels could occur in wilderness areas or pristine environments (including wildlife refuges, historic sites, ecological preserve areas, etc.) where natural quiet is expected, rural and outer suburban areas with negligible traffic, general suburban areas with infrequent traffic, general suburban areas with medium density traffic, or suburban areas with some commerce or industry. These areas are most sensitive to increased noise levels because of their low to medium baseline average noise levels. Urban areas are less susceptible to increased noise levels because of their higher average ambient noise levels.

Increased noise levels could result in community annoyance by interfering with speech and other human-related activities. Noise emissions associated with movement of heavy equipment such as excavators, backhoes, trenchers, graders, pavers, rollers, dump trucks, cranes, etc., required to support any deployment activities needed for network deployment could potentially temporarily impact sensitive receptors, such as residences, hotels/motels/inns, hospitals, and recreational areas.

Table ES4-13: Summary of Potential Impacts, Noise and Vibrations

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Increased noise and vibration levels	3	3	3	3	3	3	3	• Use noise mufflers on heavy equipment to limit noise and vibration exposure on noise and vibration-sensitive receptors during construction and grading activities near populated areas and other noise sensitive receptors, including parks or other protected areas; limit the use of such equipment to operation during daytime hours only. • Avoid, as practicable, deployment in areas with highly sensitive receptors and construct facilities in alternate locations for those projects involving heavy equipment for deployment. • Follow all applicable federal, state/territory, county/borough, and local requirements for construction and operation noise and vibration control to avoid or minimize increased noise and vibration. • Follow all state/territory and federal guidelines for limiting aircraft noise and vibration on populated areas and over national parks. • Include mitigation measures during the design and implementation phases of the project for equipment that is expected to generate significant noise or vibration (e.g., use of noise barriers such as walls, shrubbery). • Ensure, as practicable, all heavy equipment, power generators, and boats are maintained in accordance with manufacturer's specifications. • Limit construction activities to daytime hours (7 a.m. to 7 p.m.) to the extent possible when increased noise levels are more tolerable and avoid construction on Sundays and legal holidays.

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Increased noise and vibration levels (continued)	3	3	3	3	3	3	3	• Implement BMPs and mitigation measures as directed by the local jurisdiction such as avoiding unnecessary revving of engines, switching off equipment when not in use, changing location of stationary construction equipment, minimizing drop height of materials, replacing conventional audible reversing alarms with more quiet alternative reversing warning systems, siting equipment away from noise sensitive areas (if practicable), notifying adjacent residents in advance of construction work, installing temporary acoustic barriers around stationary construction noise sources, and other controls as needed to reduce increased noise levels. • Do not permit underwater blasting and pile driving activities in any waterbody.

[a] Impact ratings are at the programmatic level, and colors are as follows:
1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact

These potential noise impacts would generally be *less than significant*, because Preferred Alternative deployment would likely avoid or minimize, to the degree practicable, areas sensitive to increased noise, such as designated wilderness areas and lands managed for recreation (such as national parks or national wildlife refuges) where noise is less common. In addition, it is anticipated that any noise increase due to deployment would likely be isolated within those locations and would be short-term with pre-existing noise levels generally achieved after some months (typically less than a year; could also be as short as a few hours for linear activities such as pole construction). Operation of the Preferred Alternative would involve minimal potential noise impacts, with the notable exception being potential localized noise impacts from generators associated with operation of deployables, and would be *less than significant* at the programmatic level. Similarly, vibration impacts are expected to be *less than significant* at the programmatic level in both deployment and operations since these potential impacts would generally be temporary and limited to areas near deployment locations.

ES4.13.1. Alaska

Over 50 percent of the wilderness areas in the U.S. are in Alaska, including several individual wilderness areas each covering more than one million acres. In addition, Alaska has millions of acres of other lands managed for recreation, wildlife, or other uses where an absence of artificial noise is likely to be expected. Because some Preferred Alternative infrastructure would be expected to be built near these areas, attendant potential noise impacts could occur within these areas, although such potential impacts would generally be temporary and limited to areas immediately near deployment locations. As described above, such potential impacts would generally be *less than significant* at the programmatic level (see Table ES4-13).

ES4.13.2. Hawaii

Noise-sensitive areas subject to Preferred Alternative potential impacts in Hawaii include wilderness and pristine natural environments such as Haleakala and Hawaii Volcanoes National Park, as well as rural and suburban areas. Because some Preferred Alternative infrastructure would be expected to be deployed near these areas, attendant potential noise impacts could occur within these areas, although such potential impacts would generally be temporary and limited to areas immediately near deployment locations. As described above, such potential impacts would generally be *less than significant* at the programmatic level (see Table ES4-13).

ES4.13.3. American Samoa

Although there are no wilderness areas in American Samoa, other noise-sensitive areas subject to Preferred Alternative potential impacts are present, including the National Park of American Samoa, which preserves and protects coral reefs, tropical rainforests, and Samoan culture. Because some Preferred Alternative infrastructure would be expected to be deployed near these areas, attendant potential noise impacts could occur within these areas, although such potential impacts would generally be temporary and limited to areas immediately near deployment locations. As described above, such potential impacts would generally be *less than significant* at the programmatic level (see Table ES4-13).

ES4.13.4. Guam

Although there are no wilderness areas in Guam, other noise-sensitive areas subject to Preferred Alternative potential impacts are present, including the Guam National Wildlife Refuge, along with rural and suburban areas. Because some Preferred Alternative infrastructure would be expected to be deployed near these areas, the attendant potential noise impacts could occur within these areas, although such potential impacts would generally be temporary and limited to areas immediately near deployment locations. As described above, such potential impacts would generally be *less than significant* at the programmatic level (see Table ES4-13).

ES4.13.5. Northern Mariana Islands

Noise-sensitive areas subject to Preferred Alternative potential impacts in the Northern Mariana Islands include national wildlife refuges and offshore marine sanctuaries. Because some Preferred Alternative infrastructure would be expected to be deployed near these areas, the attendant potential noise impacts could occur within these areas, although such potential impacts would generally be temporary and limited to areas immediately near deployment locations. As described above, such potential impacts would generally be *less than significant* at the programmatic level (see Table ES4-13).

ES4.13.6. Puerto Rico

Puerto Rico contains substantial areas subject to Preferred Alternative potential impacts that may be more sensitive to noise, such as El Yunque National Forest (including the El Toro Wilderness Area) and several national wildlife refuges, as well as rural and suburban areas. Because some Preferred Alternative infrastructure would be expected to be deployed near these areas, the attendant potential noise impacts could occur within these areas, although such potential impacts would generally be temporary and limited to areas immediately near

deployment locations. As described above, such potential impacts would generally be *less than significant* at the programmatic level (see Table ES4-13).

ES4.13.7. U.S. Virgin Islands

Noise-sensitive areas subject to Preferred Alternative potential impacts in the U.S. Virgin Islands include national wildlife refuges and offshore marine sanctuaries, as well as units of the National Park System and pristine natural areas. Because these sensitive areas are unavoidable in the U.S. Virgin Islands, some Preferred Alternative infrastructure would likely be deployed in or near these areas, although the attendant potential noise impacts would generally be temporary and limited to areas immediately near deployment locations. As described above, such potential impacts would generally be *less than significant* at the programmatic level (see Table ES4-13).

ES4.14. Climate Change

The analysis of climate change focuses on two primary factors: greenhouse gas (GHG) emissions from Preferred Alternative activities, used as a proxy for assessing the potential impact of the Preferred Alternative on climate change, and the effects of climate change on Preferred Alternative facilities (see Table ES4-14). GHG emissions, which would generally occur during deployment of the Preferred Alternative as well as during operation of deployables during emergency situations, would arise from combustion of fossil fuel in stationary or mobile equipment (such as construction equipment and deployables), clearing of vegetation, and use of generators and changes in land use during both deployment and operation. GHG emissions from various potential sources that could be associated with the deployment and operation of the Preferred Alternative are presented in the Climate Change portions of each state/territory's Environmental Consequences section.

Table ES4-14: Summary of Potential Impacts, Climate Change

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Contribution to climate change through GHG emissions (deployment and operations)	3							• Ensure that equipment used is the most energy efficient, or use state-of-the-art equipment to increase energy efficiency. • Use more fuel-efficient diesel-power generation units or low-emission units such as gasoline- or hydrogen-fueled power generators. • Ensure that construction vehicles are running only when required for construction and reduce or limit unnecessary idling. • Ensure all operators and drivers have received adequate training to efficiently use equipment. • Conduct regular maintenance and inspection on equipment to ensure that it is running at the maximum energy efficiency. • Use renewable energy, as practicable or feasible, for backup power at buildout locations (cell tower sites, for example); • Minimize disturbed land area and soil disturbance by co-locating where it is feasible. • Revegetate disturbed land areas after construction where it is feasible. • Use access roads previously used during deployment activities for maintenance and operational activities.

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Effect of climate change on Preferred Alternative (operations)[c]	**1-2**	**1-2**	**1-2**	**1-2**	**1-2**	**1-2**	**1-2**	• Ensure design of aboveground structures and equipment has included allowances for maximum temperature and precipitation changes. • Continuously monitor and reinforce structures build on permafrost. • Assess sea-level rise prior to installation of infrastructure near coastal areas. • To allow for extreme weather events and flooding, monitor risk-prone areas and reinforce structures or relocate structures such as deployables outside of high-risk areas as needed. • Work jointly with public authorities in the implementation of monitoring plans and action plans related to potential impacts that could affect the Proposed Action.

[a] Impact ratings are at the programmatic level, and colors are as follows:
1. (Red) Potentially significant
1-2. (White) Range of Potentially significant to Less than significant with BMPs and mitigation measures incorporated.
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact

[b] Given this Environmental Impact Statement is programmatic and does not include any site-specific locations or deployment technology, the potential impact of the Preferred Alternative on climate change is not rated at the programmatic level.

[c] Climate change effects on the various deployment activities would likely be minimal and are expected to have *no impacts*.

Given that this Final Programmatic Environmental Impact Statement presents a programmatic assessment and the numbers and locations of specific types of deployment technologies are not available, it is impossible to determine the actual total GHG emissions associated with deployment or operation activities. However, although specific sites are geographically widespread across the non-contiguous region, any one site would be limited in extent and the quantity of GHG emissions would be relatively minor, as explained in the analysis. There is no information to indicate that GHG emissions would be significant relative to other alternative scenarios.[12] As such, the potential impact of the Preferred Alternative on climate change is considered to be *less than significant* at the programmatic level.

Climate changes due to increasing global GHG emissions from all sources, which would generally affect operation of the Preferred Alternative, are projected to produce a range of effects, including changes in temperature, precipitation, and sea level as well as changes in frequency and intensity of weather events when compared to historical trends. These climate effects could exacerbate the potential impacts on environmental resources during operation of the Preferred Alternative:

- Projections indicate increasing average annual temperatures through the end of the century. These increases could lead to potential impacts associated with heat stress and wildfire risk particularly for aboveground infrastructure.
- Climate change could lead to increased or decreased precipitation in different parts of the world. Increased precipitation could lead to flooding, erosion, and similar effects, while decreased precipitation could lead to soil compaction. All of these effects could potentially impact the stability of aboveground infrastructure, such as towers, antennas, POPs, huts, poles, and microwave dishes.
- Projections indicate that the global mean sea level would rise through the end of the century. Sea-level rise increases the likelihood for coastal flooding and erosion, which could pose significant potential impacts to infrastructure near or on the coast.

[12] According to the CEQ Final Guidance, "When considering GHG emissions and their significance, agencies should use appropriate tools and methodologies for quantifying GHG emissions and comparing GHG quantities across alternative scenarios...The rule of reason and the concept of proportionality caution against providing an in-depth analysis of emissions regardless of the insignificance of the quantity of GHG emissions that would be caused by the proposed agency action." (*Council of Environmental Quality 2016*)

Based on the analysis of the operational activities described above, climate change effects on the Preferred Alternative would be *potentially significant* to *less than significant with BMPs and mitigation measures incorporated* at the programmatic level because climate change effects such as changes in temperature, precipitation, and sea-level rise during operations could potentially impact the infrastructure of the Preferred Alternative. Mitigation measures could minimize or reduce the severity or magnitude of a potential impact resulting from the Preferred Alternative, while adaptive measures refer to anticipating adverse effects of climate change and taking appropriate action to prevent and minimize the damage climate change effects could cause.

ES4.14.1. Alaska

As discussed above, the potential impact of the Preferred Alternative on climate change through the contribution of GHG emissions is determined to be *less than significant* at the programmatic level. GHG emissions from various potential sources that could be associated with the deployment and operation of the Preferred Alternative are presented in Section 3.2.14, Climate Change. Potential climate change impacts on the Preferred Alternative were also evaluated. In a high-emission scenario, temperature in Alaska is expected to increase by 8.3 degrees Fahrenheit (°F) by the end of the century, while precipitation in Alaska is projected to increase 25 percent. These climate changes could lead to thawing of permafrost, which would likely lead to potential impacts on infrastructure, particularly foundations and structures including buildings and roads (*Markon et al. 2012)*. Climate change could produce other concerns for Preferred Alternative facilities in Alaska, particularly for facilities in coastal areas, such as increased frequency of flood events, sea level rise, and increased potential for fires (*Markon et al. 2012*). Accordingly, the magnitude of potential climate change impacts on the Preferred Alternative in Alaska would generally range between *potentially significant* and *less than significant with BMPs and mitigation measures incorporated* at the programmatic level (see Table ES4-14).

ES4.14.2. Hawaii

As discussed above, the potential impact of the Preferred Alternative on climate change through the contribution of GHG emissions is determined to be *less than significant* at this programmatic level. GHG emissions from various potential sources that could be associated with the deployment and operation of the Preferred Alternative are presented in Section 3.2.14, Climate Change. Potential climate change impacts on the Preferred Alternative were also evaluated. In a high-emission scenario, temperature in Hawaii is expected to increase by 5°F by the end of the century. Precipitation will vary greatly in northern and southern

Hawaii; increases in precipitation are projected in southern Hawaii while decreases in precipitation are projected in northern Hawaii. Sea-level rise would increase the vulnerability of Preferred Alternative coastal structures, although potential impacts would vary with location. Increasing mean sea levels would likely increase the frequency of extreme events (*Keener et al. 2012*). Accordingly, the magnitude of potential climate change impacts on the Preferred Alternative in Hawaii would generally range between *potentially significant* and *less than significant with BMPs and mitigation measures incorporated* at the programmatic level (see Table ES4-14).

ES4.14.3. American Samoa

As discussed above, the potential impact of the Preferred Alternative on climate change through the contribution of GHG emissions is determined to be *less than significant* at this programmatic level. GHG emissions from various potential sources that could be associated with the deployment and operation of the Preferred Alternative are presented in Section 3.2.14, Climate Change. Potential climate change impacts on the Preferred Alternative were also evaluated. In a high-emission scenario, temperature in the Central South Pacific region, which includes American Samoa, is expected to increase by 4.8°F, and the intensity and frequency of extreme heat will also increase through the end of the century. Precipitation is also projected to increase along the equator through the end of the century (*Keener et al. 2012*). El Niño-like events could be expected more frequently in the tropical Pacific (*Keener et al. 2013*). Increasing mean sea levels would likely increase the frequency of extreme events (*Keener et al. 2012*). Drier conditions, related to increased heat, could increase soil contraction, potentially impacting foundations of infrastructure. These changes, along with sea-level rise, could increase the risk to Preferred Alternative structures and facilities, particularly those in coastal areas. Accordingly, the magnitude of potential climate change impacts on the Preferred Alternative in American Samoa would generally range between *potentially significant* and *less than significant with BMPs and mitigation measures incorporated* at the programmatic level (see Table ES4-14).

ES4.14.4. Guam

As discussed above, the potential impact of the Preferred Alternative on climate change through the contribution of GHG emissions is determined to be *less than significant* at this programmatic level. GHG emissions from various potential sources that could be associated with the deployment and operation of the Preferred Alternative are presented in Section 3.2.14, Climate Change. Potential climate change impacts on the Preferred Alternative were also evaluated. In a

high-emission scenario, temperature in the Western North Pacific region, which includes Guam, is expected to increase by 5.1°F, and the intensity and frequency of extreme heat will also increase through the end of the century. Precipitation is also projected to increase along the equator through the end of the century (*Keener et al. 2012*). El Niño-like events could be expected more frequently in the tropical Pacific (*Keener et al. 2013*). Increasing mean sea levels would likely increase the frequency of extreme events (*Keener et al. 2012*). Drier conditions, related to increased heat, could increase soil contraction, potentially impacting foundations of infrastructure. These changes, along with sea-level rise, could increase the risk to Preferred Alternative structures and facilities, particularly those in coastal areas. Accordingly, the magnitude of potential climate change impacts on the Preferred Alternative in Guam would generally range between *potentially significant* and *less than significant with BMPs and mitigation measures incorporated* at the programmatic level (see Table ES4-14).

ES4.14.5. Northern Mariana Islands

As discussed above, the potential impact of the Preferred Alternative on climate change through the contribution of GHG emissions is determined to be *less than significant* at this programmatic level. GHG emissions from various potential sources that could be associated with the deployment and operation of the Preferred Alternative are presented in Section 3.2.14, Climate Change. Potential climate change impacts on the Preferred Alternative were also evaluated. In a high-emission scenario, temperature in the Western North Pacific region, which includes the Northern Mariana Islands, is expected to increase by 5.1°F, and the intensity and frequency of extreme heat will also increase through the end of the century. Precipitation is also projected to increase along the equator through the end of the century (*Keener et al. 2012*). El Niño-like events could be expected more frequently in the tropical Pacific (*Keener et al. 2013*). Increasing mean sea levels would likely increase the frequency of extreme events such as flooding (*Keener et al. 2012*). Drier conditions, related to increased heat, could increase soil contraction, potentially impacting foundations of infrastructure. These changes, along with sea-level rise, could increase the risk to Preferred Alternative structures and facilities, particularly those in coastal areas. Accordingly, the magnitude of potential climate change impacts on the Preferred Alternative in the Northern Mariana Islands would generally range between *potentially significant* and *less than significant with BMPs and mitigation measures incorporated* at the programmatic level (see Table ES4-14).

ES4.14.6. Puerto Rico

As discussed above, the potential impact of the Preferred Alternative on climate change through the contribution of GHG emissions is determined to be *less than significant* at this programmatic level. GHG emissions from various potential sources that could be associated with the deployment and operation of the Preferred Alternative are presented in Section 3.2.14, Climate Change. Potential climate change impacts on the Preferred Alternative were also evaluated. In a high-emission scenario, temperature in the Caribbean (including Puerto Rico) is expected to increase by 6.1°F (*Centella et al. 2008*), while precipitation is projected to decrease by the end of the century (*Ingram et al. 2013*). Furthermore, drought frequency is expected to increase (*Ingram et al. 2013*). As a result of these changes, damage to Preferred Alternative infrastructure, particularly in coastal areas, could occur from storm surges or sea-level rise. Drought conditions could increase soil contraction, affecting Preferred Alternative facility foundations. Accordingly, the magnitude of potential climate change impacts on the Preferred Alternative in Puerto Rico would generally range between *potentially significant* and *less than significant with BMPs and mitigation measures incorporated* at the programmatic level (see Table ES4-14).

ES4.14.7. U.S. Virgin Islands

As discussed above, the potential impact of the Preferred Alternative on climate change through the contribution of GHG emissions is determined to be *less than significant* at this programmatic level. GHG emissions from various potential sources that could be associated with the deployment and operation of the Preferred Alternative are presented in Section 3.2.14, Climate Change. Potential climate change impacts on the Preferred Alternative were also evaluated. In a high-emission scenario, temperature in the Caribbean (including the U.S. Virgin Islands) is expected to increase by 6.1°F (*Centella et al. 2008*), while precipitation is projected to decrease by the end of the century (*Ingram et al. 2013*). Furthermore, drought frequency is expected to increase (*Ingram et al. 2013).* As a result of these changes, damage to Preferred Alternative infrastructure, particularly in coastal areas, could occur from storm surges or sea-level rise. Drought conditions could increase soil contraction, affecting Preferred Alternative facility foundations. Accordingly, the magnitude of potential climate change impacts on the Preferred Alternative in U.S. Virgin Islands would generally range between *potentially significant* and *less than significant with BMPs and mitigation measures incorporated* at the programmatic level (see Table ES4-14).

ES4.15. Human Health and Safety

Health effects from human exposure to environmental contaminants can range from experiences of physical irritation/nuisance to acute illness to chronic disease outcomes, depending on the type of contaminant and level of exposure. Potential human health impacts of the Preferred Alternative generally include (see Table ES4-15):

- Existing environmental contaminants in soil or water. Preferred Alternative deployment activities could pose a health risk to workers and communities if deployment causes or facilitates direct contact with contaminated soil (i.e., soil that is already contaminated, or that becomes contaminated as a result of Preferred Alternative activities) or surface water runoff containing soil chemicals from the construction site.
- Potential pollutants in surface water from spills (i.e., spills associated with Preferred Alternative activities).
- Air emissions from stationary and mobile sources that are powered by fossil fuels. Particularly sensitive populations include those with chronic respiratory diseases, acute respiratory infections, chronic heart disease, and/or diabetes.
- Workplace and construction site accidents and injuries, including injuries to FirstNet workers as well as community members.
- Road traffic accidents and injuries, including accidents involving FirstNet workers as well as members of the community.
- Potential noise-related health impacts, including at Preferred Alternative deployment sites, as well as at nearby residences and businesses.
- Communicable diseases. Of particular concern are insect-borne diseases such as dengue and chikungunya, which could affect FirstNet workers exposed to the elements.

These potential impacts would generally be *less than significant* at the programmatic level due to the relatively small amount of hazardous materials (such as vehicle fuels), air emissions, and noise associated with Preferred Alternative deployment and operation, safety procedures required by federal and state/territory law, and limited potential for increased risk of communicable disease. Operation of the Preferred Alternative would involve minimal potential impacts to human health, except for new air emissions and potential road traffic accidents associated with operation of deployables during emergencies. Although still minimal, potential impacts would instead be more likely during deployment.

Table ES4-15: Summary of Potential Impacts, Human Health and Safety

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Potential exposure to hazardous materials	3	3	3	3	3	3	3	• Follow all applicable federal, state/territory, and local requirements for hazardous materials and health and safety management. • Utilize trained and licensed heavy equipment operators, when available or required. • Develop a site-specific Health and Safety Plan that identifies all potential physical and chemical hazards present at the site, including historic contamination. • Develop and utilize Standard Operating Procedures for site preparation activities and include descriptions of work practice controls and administrative controls. • Ensure workers wear proper safety equipment as appropriate to the potential hazards present, such as high visibility safety vests, hard hats, steel-toe boots, gloves, eye protection, and hearing protection. • Provide daily safety meetings to review activities, potential hazards, and safety objectives. • Avoid site preparation work in areas with high vehicle traffic volume, such as road ROWs. • Avoid site preparation work in areas known to contain environmental contamination. • Incorporate all BMPs and mitigation measures listed in Infrastructure, Soils, Water Resources, and Air Quality and Noise as appropriate. • Prepare an SPCC Plan to prevent, contain, and report accidental spills. • Conduct air and noise monitoring to ensure levels stay within health-protective levels for communities and workers and, as required, that workers are trained and comply with personal protective equipment requirements as established by Occupational Safety and Health Administration (OSHA).

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Accidents and injuries	3	3	3	3	3	3	3	• Search for the location of known contaminated sites prior to site selection in the area where the Preferred Alternative site is being considered, for new or existing infrastructure projects. • Ensure that appropriate measures are taken in compliance with applicable regulations if construction occurs in an area where there is the potential for legacy soil contamination, to protect workers and the public from unacceptable levels of exposure to contaminants as a result of deployment activities. • Establish an emergency response plan (including emergency preparedness and response activities, resources, and responsibilities) to attend to specific emergencies (e.g., accidental spills) that could arise during deployment.
Exposure to noise	3	3	3	3	3	3	3	• Ensure that reporting requirements are followed in the event that Emergency Planning and Community Right-to-Know Act reporting thresholds are reached for the shipping, handling or storage of gasoline or diesel used for equipment and generators. • Establish a grievance mechanism or other stakeholder engagement tool that is accessible and culturally appropriate for use by the community to express concerns regarding the Preferred Alternative. • Implement community education and public awareness, as needed, about the Preferred Alternative's traffic, routes used, road signage, and safety which are particularly critical in high-risk areas. • Use signage to clearly mark construction sites, and establish boundaries and barricades to keep people out of dangerous areas. • Make sure an incident investigation procedure is in place that can be specifically used for any near misses or incidents involving workers and community members. • Ensure all workers are appropriately trained in wildlife identification and hazard management to minimize the likelihood of wildlife attacks.

Potential Impact	Impact Rating[a]							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Communicable disease	3	3	3	3	3	3	3	• Ensure all workers are appropriately trained in weather hazard management and equipped with all necessary personal protective equipment. • Inform community members of dates and times of construction activities that are likely to generate noise at levels above 55 A-weighted decibels at the residences or workplaces of those individuals. • Monitor land clearing and construction sites for areas of standing water, including ditches and holes in the ground, as well open receptacles (e.g., empty barrels) and fill or eliminate these hazards to prevent mosquito breeding. • Given that no filariasis-, chikungunya-, or dengue-specific OSHA recommendations are available, follow OSHA-recommended Workplace Precautions against West Nile Virus, another mosquito-borne illness for which, like chikungunya and dengue, the only preventative measure is avoidance of bites by infected mosquitoes. • Ensure that the appropriate medication is available for treatment of any filariasis infections that may arise in the workforce for projects located in areas where filariasis is known to occur.

[a] Impact ratings are at the programmatic level, and colors are as follows:
1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact

In addition to these potential human health and safety impacts, interest has been expressed regarding the potential for human exposure to RF and the corresponding potential for adverse health effects. Regulatory limits for human exposure to RF emissions have been established by the FCC under federal law. Over the years, the FCC has revised its standards and guidelines for protecting both workers and the general public—including limits for Maximum Permissible Exposure for transmitters covering the 700 megahertz (MHz) range and localized absorption limits for mobile devices—and these have been upheld by the federal courts. FirstNet is a licensee of the FCC, and FirstNet's operations in the 700 MHz range are governed by these exposure limits.

There is some evidence of adverse health effects at levels below the current standards in a number of scientific studies; however, these studies are subject to a variety of uncertainties inherent in the epidemiological process. The preponderance of the evidence to date does not definitively demonstrate that there are adverse health effects caused by RF emissions, and there is still no single, plausible biological mechanism to indicate adverse effects. Scientific investigations into RF emissions and the possible effects of exposure on humans are inconclusive. These studies do not indicate any clearly reproducible trend and, consequently, there is insufficient and inconclusive data to make a definitive determination of effect of RF emissions on humans. Further discussion of RF emissions and their potential effects on humans is presented in Section 2.4, Radio Frequency Emissions.

ES4.15.1. Alaska

Alaska has six active Superfund sites that have ongoing cleanup action to address soil and groundwater contamination. The state has identified four specific highway segments that have a higher than average incidence of fatal and major injury crashes (Seward, Parks, Knik/Goose Bay and Sterling Highways). Some Preferred Alternative infrastructure could be deployed in or near some of these areas with the human health risks. As described above, such potential impacts would generally be *less than significant* at the programmatic level (see Table ES4-15), assuming the adherence to Occupational Safety and Health Administration (OSHA) workplace health and safety standards.

ES4.15.2. Hawaii

Hawaii has three active Superfund sites that have ongoing cleanup action around soil and groundwater contamination. In Hawaii, human cases of the mosquito-borne diseases chikungunya and dengue have been reported in recent years. While all reported chikungunya cases and most reported dengue cases have been

imported (*USGS 2015b*), the mosquito vectors that transmit the virus are present in the state and therefore local transmission is possible (*Remanda 2015*). Some Preferred Alternative infrastructure would be expected to be deployed in or near these areas with these human health risks. As described above, such potential impacts would generally be *less than significant* at the programmatic level (see Table ES4-15), assuming the adherence to OSHA workplace health and safety standards.

ES4.15.3. American Samoa

American Samoa has no active Superfund sites. The rate of diabetes prevalence in American Samoa is almost six times higher than the national average (*CDC 2013; WHO 2011*). Diabetics may be more sensitive to air pollution than other individuals. In American Samoa, the mosquito- and tick-borne disease filariasis and the mosquito-borne diseases chikungunya and dengue are endemic and are a major public health concern. Some Preferred Alternative infrastructure would be expected to be deployed in these areas with these human health risks. As described above, such potential impacts would generally be *less than significant* at the programmatic level (see Table ES4-15), assuming the adherence to OSHA workplace health and safety standards.

ES4.15.4. Guam

Guam has 12 active Superfund sites that have ongoing cleanup action around soil and groundwater contamination. In Guam, the mosquito-borne dengue is an ongoing public health concern. Some Preferred Alternative infrastructure would be expected to be deployed in or near some of these areas with these human health risks. As described above, such potential impacts would generally be *less than significant* at the programmatic level (see Table ES4-15), assuming the adherence to OSHA workplace health and safety standards.

ES4.15.5. Northern Mariana Islands

The Northern Mariana Islands has no active Superfund sites and is ranked 55 out of 56 states or territories for toxic release volume (*USEPA 2015; 2014*). In the Northern Mariana Islands, the mosquito-borne disease dengue is endemic, although there have been no reported cases in recent years. Some Preferred Alternative infrastructure would be expected to be deployed in these areas with these human health risks. As described above, such potential impacts would generally be *less than significant* at the programmatic level (see Table ES4-15), assuming the adherence to OSHA workplace health and safety standards.

ES4.15.6. Puerto Rico

Puerto Rico is a relatively heavily industrialized area, ranking 27 out of 56 states/territories in the USEPA's 2013 Toxic Release Inventory, and the territory has 33 active Superfund sites that have ongoing cleanup action around soil and groundwater contamination. In Puerto Rico, human cases of the mosquito-borne diseases chikungunya and dengue have been reported in recent years, including a notable dengue outbreak in 2010. Some Preferred Alternative infrastructure would be expected to be deployed in or near some of these areas with these human health risks. As described above, such potential impacts would generally be *less than significant* at the programmatic level (see Table ES4-15), assuming the adherence to OSHA workplace health and safety standards.

ES4.15.7. U.S. Virgin Islands

The U.S. Virgin Islands has four active Superfund sites that have ongoing cleanup action around soil and groundwater contamination. In the U.S. Virgin Islands, the mosquito-borne diseases chikungunya and dengue have been identified by public health officials as infectious diseases of concern. Some Preferred Alternative infrastructure would be expected to be built in or near some of these areas with these human health risks. As described above, such potential impacts would generally be *less than significant* at the programmatic level (see Table ES4-15), assuming the adherence to OSHA workplace health and safety standards.

ES4.16. Cumulative Effects

NEPA regulations (*40 CFR §§ 1500-1508*) require the assessment of the Preferred Alternative to address potential cumulative impacts: the potential incremental impact of the Proposed Action in combination with other past, present, and reasonably foreseeable future actions. The scope of the cumulative effects analysis involves both the geographic extent of the effects and the timeframe in which the effects could be expected to occur, as well as a description of what resources could potentially be cumulatively affected.

The design, deployment, and operation of the Proposed Action would occur throughout the non-contiguous region of the U.S., and specific project sites have not yet been identified. Furthermore, there is currently a wide range of technologies that FirstNet may use to implement and deploy the Proposed Action. Therefore, this Final PEIS addresses potential cumulative impacts qualitatively.

The geographic extent of the Proposed Action as considered for the cumulative impact analysis includes the area under the jurisdiction of the Proposed Action, specifically the non-contiguous region that is the subject of this Final PEIS. The timeframe considered for this analysis is 50 years. There are few other past,

present, and reasonably foreseeable future projects planned for the non-contiguous region that are or would be similar to the Preferred Alternative with common potential impacts that could have additive effects. As described in Chapters 3 through 10 of this Final PEIS, the effects of the Proposed Action would not result in significant potential impacts at the programmatic level, either alone or when combined with other ongoing or planned telecommunications infrastructure development or operations, to the extent such projects were foreseeable at the time of the preparation of this Final PEIS.

ES5. POTENTIAL IMPACTS OF OTHER ALTERNATIVES

ES5.1. DEPLOYABLE TECHNOLOGIES ALTERNATIVE

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and no new construction associated with wired or wireless projects discussed above under the Preferred Alternative. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration.

Table ES5-1 summarizes the impact ratings for the Deployable Technologies Alternative at the programmatic level. The ratings for each type of potential impact reflect the overall rating for that potential impact across all seven states and territories evaluated in this Final PEIS. In cases where the states and territories had different values, the value selected for Table ES5-1 reflects the more potentially impactful category. Please see the discussion of the Deployable Technologies Alternative in Chapter 12, Comparison of Alternatives, and in each Environmental Consequences section in this Final PEIS for a more detailed discussion. BMPs and mitigation measures for the Deployable Technologies Alternative would generally be the same as those described for the Deployable Technologies option within the Preferred Alternative.

ES5.1.1. Potential Deployment Impacts

Deployment of deployable technologies would generally involve the purchase, initial testing, staffing, and mobilization of deployables. These activities would generally result in potential impacts similar to those described throughout Section ES4, Potential Impacts of the Preferred Alternative (such as additional air emissions and noise from testing). These potential impacts would range from

no impact to *less than significant with BMPs and mitigation measures incorporated* at the programmatic level, although most deployment potential impacts would be *less than significant* at the programmatic level (including potential socioeconomic impacts, which would be beneficial due to equipment purchase and staffing).

ES5.1.2. Potential Operation Impacts

Operation of deployable technologies would likely involve the mobilization and stationing of deployables at various pre-determined locations in (or above, in the case of deployable aerial communications architecture) each state or territory, for periods of time lasting up to approximately two years.

As shown in Table ES5-1, these potential impacts would range from *no impact* to *less than significant with BMPs and mitigation measures incorporated* at the programmatic level. The exact value of operational potential impacts would depend on the type and length of time of deployable technology used.

Table ES5-1: Summary of Potential Impacts, Deployment and Operation of the Deployable Technologies Alternative

Resource Area/Type of Effect	Potential Impact[a]	
	Deployment	Operations
Infrastructure		
Transportation system capacity and safety	3	3
Strain on capacity of local health, public safety, and emergency response services	3	3
Modifies existing public safety response telecommunication practices, physical infrastructure, or level of service in a manner that directly affects public safety communication capabilities and response times	3	3
Effects on commercial telecommunication systems, communications, or level of service	3	3
Effects on utilities, including electric power transmission facilities and water and sewer facilities	3	3
Soils		
Soil erosion	3	3
Topsoil mixing	3	3
Soil compaction and rutting	3	3
Geology		
Potential Impacts of the Project		
Surface geology, bedrock, topography, physiography, and geomorphology	3	3
Mineral and fossil fuel resource potential impacts	3	3
Paleontological resources potential impacts	3	3
Potential Impacts to the Project		
Seismic hazard	3	3
Volcanic activity	3	3
Landslide	3	3
Land subsidence	3	3

Resource Area/Type of Effect	Potential Impact[a]	
	Deployment	Operations
Water Resources		
Water quality (groundwater and surface water): sedimentation, pollutants, water temperature	3	3
Floodplain degradation	3	4
Drainage pattern alteration	3	4
Flow alteration	4	4
Changes in groundwater or aquifer characteristics	3	4
Wetlands		
Direct wetland loss (fill or conversion to non-wetland), other direct and indirect effects	3	3
Biological Resources		
Vegetation		
Vegetation and habitat loss, alteration, or fragmentation	3	3
Invasive species effects	3	3
Wildlife		
Amphibians and reptiles	3	3
Terrestrial mammals	3	3
Marine mammals	3	3
Birds	3	2
Bats	3	2
Terrestrial invertebrates	3	3
Fisheries		
Direct injury/mortality	3	3
Vegetation and habitat/loss	3	3
Indirect injury/mortality	3	3
Migration effects	3	3
Reproductive effects	3	3
Effects of invasive species	3	3
Threatened and Endangered Species and Species of Conservation Concern[b]		
Marine mammals	2	2
Terrestrial mammals	2	2
Birds	2	2
Reptiles	2	2
Fish	2	2
Invertebrates	2	2
Plants	2	2
Land Use, Airspace, and Recreation		
Direct land use change (site of FirstNet facility installation or deployable base)	4	3
Indirect land use change (site of FirstNet facility installation or deployable base)	4	3
Use of airspace (at and near site of FirstNet facility installation or deployable base)	3	3
Loss of access to public or private recreation land	4	3
Loss of enjoyment of public or private recreation land (due to visual, noise, or other potential impacts that make recreational activity less desirable)	4	3
Visual Resources		
Adverse change in aesthetic character	3	3
Nighttime lighting (overall)	3	3
Nighttime lighting (isolated rural areas)	3	3

Resource Area/Type of Effect	Potential Impact[a]	
	Deployment	Operations
Socioeconomics		
Potential impacts to real estate	4	3
Potential economic benefits or adverse impacts related to changes in tax revenues, wages, or direct spending (could be beneficial or adverse)	3	3
Employment	3	3
Increased pressure on existing public services	4	4
Diminished social cohesion/disruption related to influx	4	4
Reduced opportunities for subsistence practices	4	3
Environmental Justice		
Effects associated with other resource areas (e.g., cultural resources) that have environmental justice implications due to the affected parties (as defined by *EO 12898*)	3	3
Cultural Resources[c]		
Direct effects to historic properties[d]	3	3
Indirect effects on historic properties (i.e., visual, noise, vibration, atmospheric)	3	3
Loss of access to historic properties	3	3
Air Quality		
Increased air emissions	3	3
Noise		
Increased noise and vibration levels	3	3
Climate Change		
Contribution to climate change through GHG emissions	3	3
Effect of climate change on potential Proposed Action-related impacts	4	4
Human Health and Safety		
Potential exposure to hazardous materials	3	4
Accidents and injuries	3	3
Exposure to noise	3	3
Communicable disease	3	3

[a] Impact ratings and colors are as follows:
1. (Red) Potentially significant
1-2. (White) Range of Potentially significant to less than significant with BMPs and mitigations measures incorporated
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact

[b] Note that the impact ratings used in the Threatened and Endangered Species and Species of Conservation Concern are a distinct set of impact categories, based on those in the *Endangered Species Consultation Handbook* (*USFWS and NMFS 1998*), in order to facilitate impact evaluation under Section 7 of the Endangered Species Act. These impact categories used in Table ES4-6 are as follows:
1. (Red) May affect, likely to adversely affect
2. (Orange) May affect, but is not likely to adversely affect
4. (Green) No effect

[c] Impact ratings for the evaluation of cultural resources are as follows:
1. (Red) Adverse effect
2. (Orange) Mitigated adverse effect
3. (Yellow) Effect, but not adverse
4. (Green) No effect

[d] Categories of impacts defined as an *adverse effect; mitigated adverse effect; effect, but not adverse; and no effect* are comparable to those defined in *36 CFR § 800*, *Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation*, and the U.S. National Park Service's *National Register Bulletin: How to Apply the National Register Criteria for Evaluation* (*NPS 1995*).

ES5.2. No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated deployment or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be *no impacts* because there would be no deployment or operation of the Proposed Action. Conditions would therefore be the same as those described in the Affected Environment sections of this Final PEIS.

ES5.3. Comparison of Alternatives

Potential impacts associated with the two Proposed Action alternatives are generally similar. Both alternatives have potential impacts whose significance ranges from *no impacts* to *potentially significant with BMPs and mitigations measures incorporated* at the programmatic level. For many resources, impact ratings are identical, although some differences exist for some resource areas. For example, the Preferred Alternative would have somewhat greater potential impacts than the Deployable Technologies Alternative to floodplains, birds and bats, land use, nighttime lighting, and real estate values. Conversely, the Deployable Technologies Alternative would have somewhat greater potential impacts than the Preferred Alternative to air resources. The purpose and need of the NPSBN would not be met under the No Action Alternative.

ES6. FINAL PEIS CONTENTS

This Final PEIS includes descriptions of the affected environment, potential impacts, and BMPs and mitigation measures for the Proposed Action and its alternatives in each of the seven states and territories that make up the non-contiguous region. The structure and contents of this document have been developed in accordance with NEPA requirements. The main organization of this document is as follows:

- Chapter 1: Introduction
- Chapter 2: Description of the Proposed Action and Alternatives
- Chapters 3 through 9: Each chapter focuses on one of the non-contiguous region states or territories and contains an analysis of that state's or territory's affected environment (including descriptions of the portions of the environment that could be affected by the Proposed Action), environmental consequences (including descriptions of the potential environmental, social, historic, and cultural impacts of the Proposed Action), and references

- Chapter 10: Cumulative Effects
- Chapter 11: BMPs and Mitigation Measures
- Chapter 12: Comparison of Alternatives
- Chapter 13: Other Required Analyses
- Chapter 14: Draft PEIS Public Comments
- Chapter 15: List of Preparers and Contributors
- Chapter 16: Distribution List
- Chapter 17: Index
- Chapter 18: Glossary
- Appendices

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