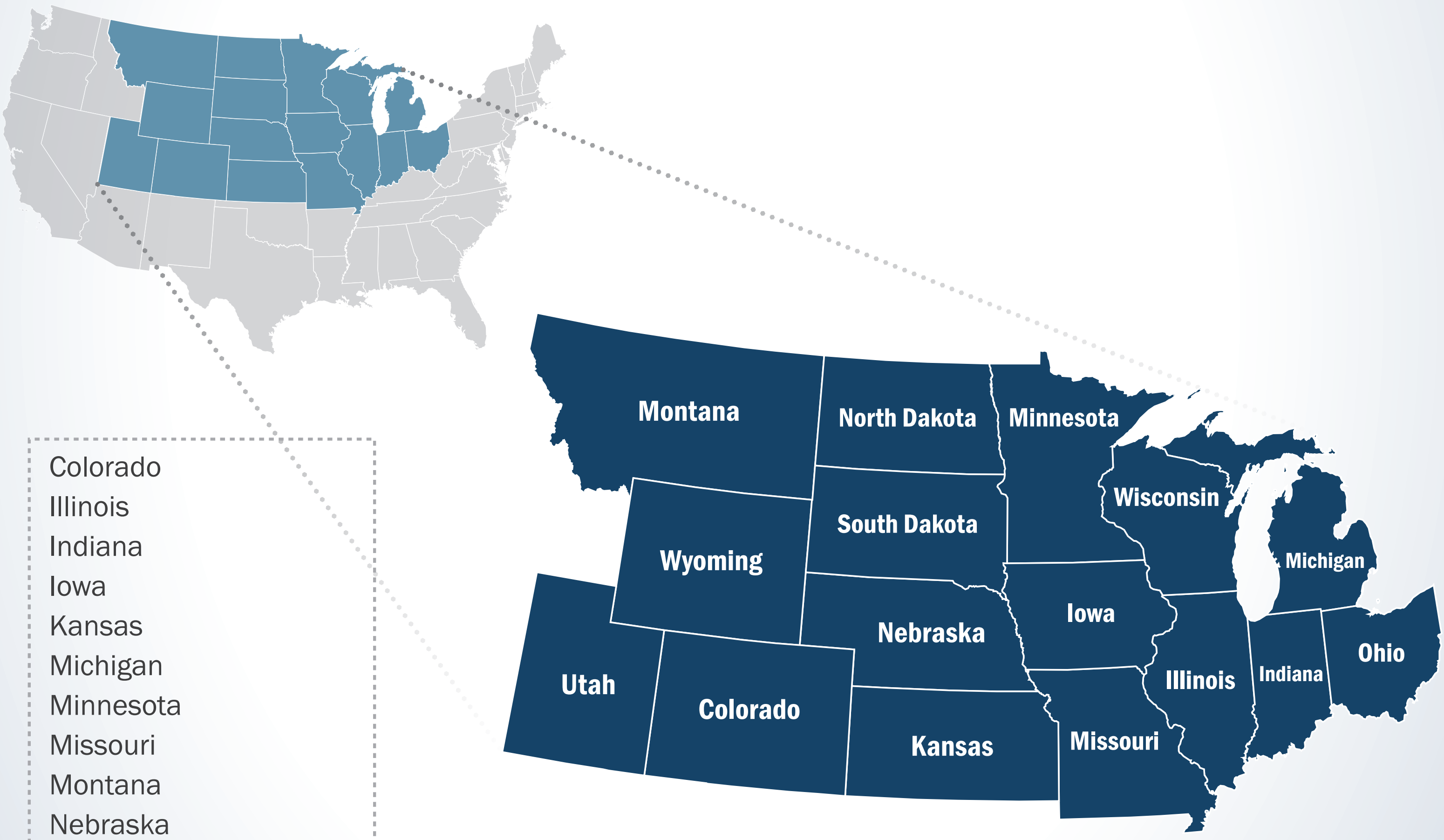
FirstNet®

Nationwide Public Safety Broadband Network

Draft Programmatic Environmental Impact Statement for the Central United States

VOLUME 13 - CHAPTER 15



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First Responder Network Authority

FirstNet®

Nationwide Public Safety Broadband Network

Draft Programmatic Environmental Impact Statement for the Central United States

VOLUME 13 - CHAPTER 15

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Cooperating Agencies

Federal Communications Commission
General Services Administration
U.S. Department of Agriculture—Rural Utilities Service
U.S. Department of Agriculture—U.S. Forest Service
U.S. Department of Agriculture—Natural Resource Conservation Service
U.S. Department of Defense—Department of the Air Force
U.S. Department of Energy
U.S. Department of Homeland Security

August 2016

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15.SOUTH DAKOTA

Through the examination of cultural artifacts, archaeologists have determined that human beings have occupied the South Dakota region for at least 12,500 years. South Dakota was populated for centuries by American Indian tribes with a rich cultural history.

The first European contact with American Indians in the state occurred during the 1700s (Institute of Maritime History, 2015). The United States (U.S.) acquired the area now referred to as South Dakota as part of the 1803 Louisiana Purchase. After being included in Louisiana Territory and then the Dakota Territory, South Dakota (and North Dakota) finally became states in 1889 (South Dakota Secretary of State, 2015). South Dakota is bordered by North Dakota to the north, Montana and Wyoming to the west, Minnesota and Iowa to the east, and Nebraska to the south. This chapter provides details about the existing environment of South Dakota as it relates to the Proposed Action.

General facts about South Dakota are provided below:

- **State Nickname**: The Mount Rushmore State
- **Area:** 75,811 square miles; **U.S. Rank**: 17 (U.S. Census Bureau, 2015z)
- **Capital:** Pierre
- **Counties:** 66 (U.S. Census Bureau, 2015x)
- **Estimated Population (2015):** 858,469 people; **U.S. Rank:** 46 (U.S. Census Bureau, 2015a)
- **Most Populated Cites:** Sioux Falls and Rapid City (U.S. Census Bureau, 2015x)
- **Main Rivers:** Cheyenne River, Missouri River, White River, James River, Big Sioux River, and Grande River
- **Bordering Waterbodies:** Missouri River, Big Sioux River, and Big Stone Lake
- **Mountain Ranges:** Black Hills and Prairie Hills
- **Highest Point:** Harney Peak (7,242 feet) (USGS, 2016a)

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15.1. AFFECTED ENVIRONMENT

15.1.1. Infrastructure

15.1.1.1. Definition of the Resource

This section provides information on key South Dakota infrastructure resources that could potentially be affected by FirstNet projects. Infrastructure consists of the systems and physical structures that enable a population in a specified area to function. Infrastructure in South Dakota includes a broad array of facilities such as utility systems, streets and highways, railroads, airports, buildings and structures, and other manmade facilities. Individuals, businesses, government entities, and virtually all relationships between these groups depend on infrastructure for their most basic needs, as well as for critical and advanced needs (e.g., emergency response, health care, and telecommunications).

Section 15.1.1.3 provides an overview of the traffic and transportation infrastructure in South Dakota, including road and rail networks and airport facilities. South Dakota public safety infrastructure could include any infrastructure utilized by a public safety entity[1] as defined in the Act, including infrastructure associated with police, fire, and emergency medical services (EMS). However, other organizations can qualify as public safety services as defined by Title VI of the Middle Class Tax Relief and Job Creation Act of 2012 (Public Law [Pub. L.] No. 112-96, Title VI Stat. 156 (codified at 47 United States Code [U.S.C.] 1401 et seq.) (the Act). Public safety services in South Dakota are presented in more detail in Section 15.1.1.4. Section 15.1.1.5 describes specific public safety communications infrastructure and commercial telecommunications infrastructure in South Dakota. An overview of utilities in South Dakota, such as power, water, and sewer, are presented in Section 15.1.1.6.

15.1.1.2. Specific Regulatory Considerations

Multiple South Dakota laws and regulations pertain to the state's public utility and transportation infrastructure and its public safety community. Table 15.1.1-1 identifies the relevant laws and regulations, the affected agencies, and their jurisdiction as derived from the state's applicable statutes and administrative rules referenced in column one. Appendix C, Environmental Laws and Regulations, identifies applicable federal laws and regulations.

Table 15.1.1-1: Relevant South Dakota Infrastructure Laws and Regulations

State Law/ Regulation	Regulatory Agency	Applicability
South Dakota Codified Laws (SDCL): Title 34 Public Health and Safety: South Dakota Administrative Rules (SDAR): Chapter 50:02 Public Safety, Emergency Management	South Dakota Department of Public Safety, Division of Emergency Management	Coordinates the state's emergency management functions.
SDCL: Public Utilities and Carriers: SDAR: Public Utilities Commission, Public Utilities	Public Utilities Commission	Regulates public utilities within the state.

[1] The term "public safety entity" means an entity that provides public safety services (7 U.S. Code [U.S.C.] § 1401(26)).

State Law/ Regulation	Regulatory Agency	Applicability
SDCL: Title 31 Highways and Bridges; Title 32 Motor Vehicles; Title 50 Aviation: Chapter 70 Transportation	South Dakota Department of Transportation	Oversees the transportation systems of the state.

Source: (South Dakota Legislature, 2015f) (South Dakota Legislature, 2015g)

15.1.1.3. Transportation

This section describes the traffic and transportation infrastructure in South Dakota, including specific information related to the road networks, airport facilities, and rail networks. The movement of vehicles is commonly referred to as traffic, as well as the circulation along roads. Roadways in the state can range from multilane road networks with asphalt surfaces, to unpaved gravel or private roads. The information regarding existing transportation systems in South Dakota are based on a review of maps, aerial photography, and federal and state data sources.

The South Dakota Department of Transportation (SDDOT) has jurisdiction over freeways and major roads, airports, and railroads; local counties have jurisdiction for smaller streets and roads. The mission of the SDDOT is "to efficiently provide a safe and effective public transportation system" (SDDOT, 2015b).

South Dakota has an extensive and complex transportation system across the entire state. The state's transportation network is consists of:

- 82,558 miles of public roads (FHWA, 2014) and 5,872 bridges (FHWA, 2015c);
- 1,851 miles of rail network (SDDOT, 2014a);
- 172 aviation facilities, including airstrips and heliports (FAA, 2015c); and
- No harbors or major ports (World Port Source, 2016).

Road Networks

As identified in Figure 15.1.1-1, the major urban centers of the state are Rapid City, Spearfish, Sioux Falls, and Vermillion. South Dakota has two major interstates connecting its major metropolitan areas to one another, as well as to other states. Travel to local towns is conducted mainly via state and county routes.

Table 15.1.1-2 lists the interstates and their start/end points in South Dakota. Per the national standard, even numbered interstates run from west to east with the lowest numbers beginning in the south; odd numbered interstates run from north to south with the lowest numbers beginning in the west (FHWA, 2015g).

Table 15.1.1-2: South Dakota Interstates

Interstate (I)	Southern or Western Terminus in SD	Northern or Eastern Terminus in SD
I-29	IA line in North Sioux City	ND line in Sisseton
I-90	WY line in North Lawrence	MN line near Valley Springs

In addition to the Interstate System, South Dakota has both National Scenic Byways and State Scenic Byways. National and State Scenic Byways are roads that are recognized for one or more archaeological, cultural, historic, natural, recreational, and scenic qualities. Figure 15.1.1-1 illustrates the major transportation networks, including roadways, in South Dakota. Section 15.1.8, Visual Resources, describes the National and State Scenic Byways found in South Dakota from an aesthetic perspective.

National Scenic Byways are roads with nationwide interest; the U.S. Department of Transportation's Federal Highway Administration (FHWA) designates and manages the byways. South Dakota has two National Scenic Byways (FHWA, 2015h):

- Native American Scenic Byway and
- Peter Norbeck Scenic Byway.

State Scenic Byways are roads with statewide interest; SDDOT designates and manages State Scenic Byways. Some State Scenic Byways may be designated on portions of National Scenic Byways. South Dakota has four State Scenic Byways that crisscross the entire state (Native American National and State Scenic Byway, Badlands Loop State Scenic Byway, Wildlife Loop State Scenic Byway, Spearfish Canyon State and National Forest Service Scenic Byway) (Travel South Dakota, 2015).[2]

Airports

Air service to the state is provided by Sioux Falls Regional Airport, also known as Joe Foss Field (FSD). FSD is operated by the Sioux Falls Regional Airport Authority (FSD, 2015). In fiscal year 2015, FSD served approximately 976,000 passengers, facilitated 10,344 aircraft departures, and moved 88 million pounds of cargo (BTS, 2015). Figure 15.1.1-1 illustrates the major transportation networks, including airports, in the state. Section 15.1.7, Airspace, provides detail on airports and airspace in South Dakota.

Rail Networks

South Dakota is connected to a vast rail network of freight rail; Amtrak does not run any lines through South Dakota (Amtrak, 2015). Figure 15.1.1-1 illustrates the major transportation networks, including rail lines, in South Dakota.

Eighty-three percent of the 1,851 miles of railroad track in South Dakota are owned and operated by privately owned freight rail companies (SDDOT, 2014a). BNSF Railway, a Class I railroad, owns about 900 miles of track in the state and the Rapid City, Pierre & Eastern Railroad, a Class II railroad, owns around 600 miles of track; combined, these two carriers own almost 80 percent of the entire rail network in South Dakota (SDDOT, 2014a). In 2011, 112 million tons of freight traveled through South Dakota via freight rail; that same year, 15 million tons of freight traveled out of the state, 3.6 million tons traveled to the state, and 0.7 million tons traveled within South Dakota (SDDOT, 2014a). "Railroads are the primary means of moving South Dakota agricultural exports, including ethanol, to U.S. and global markets. Trucks are generally not

[2] The total number of State Scenic Byways may not include those segments of National Scenic Byways that are also designated as State Scenic.

cost-effective for the long-haul transport of these heavy and bulky commodities, and barge service down the Missouri River is no longer a viable option…" (SDDOT, 2014a).

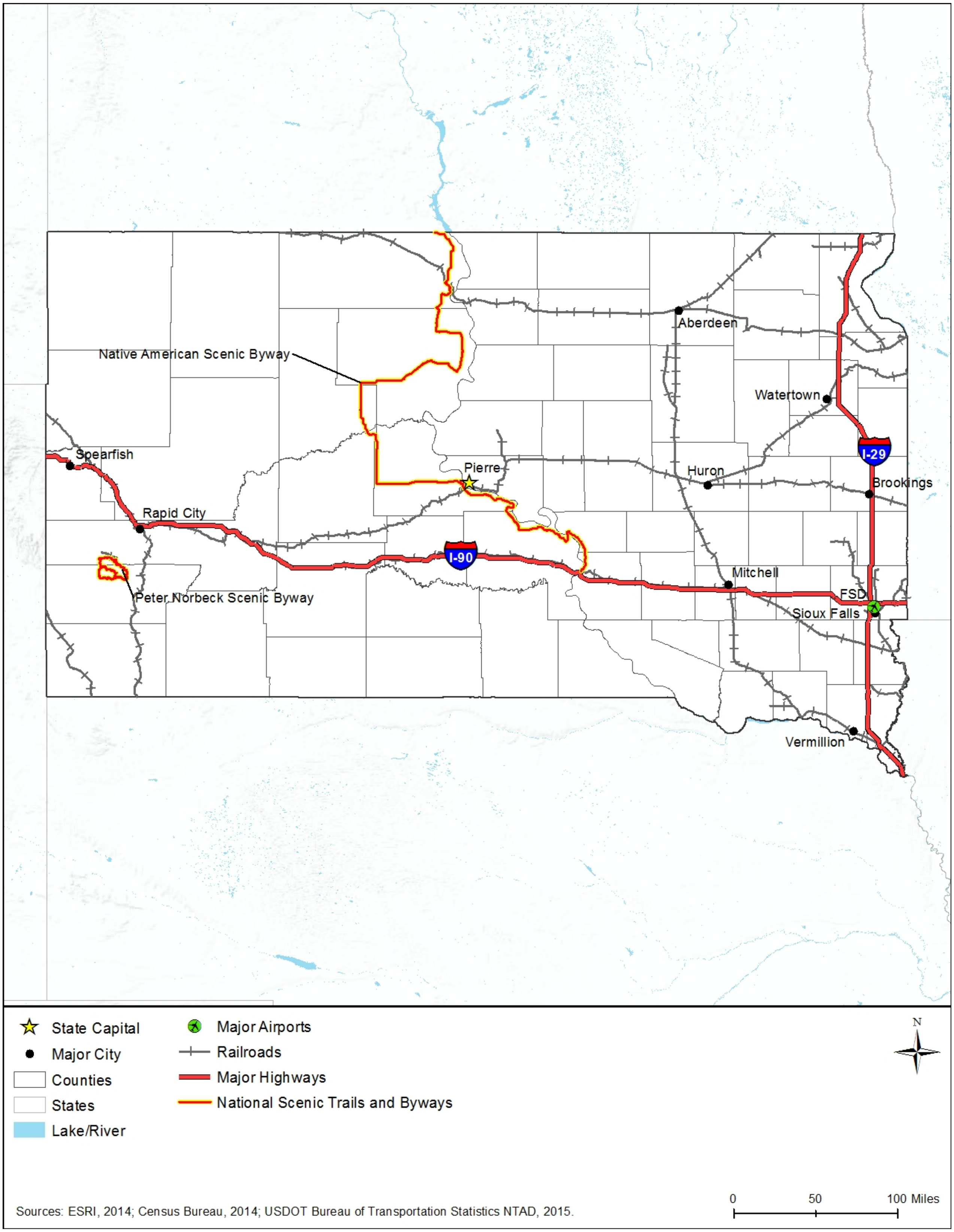

Figure 15.1.1-1: South Dakota Transportation Networks

Harbors and Ports

The state of South Dakota has no major harbors or ports.

15.1.1.4. Public Safety Services

South Dakota public safety services generally consist of public safety infrastructure and first responder personnel aligned with the demographics of the state. Table 15.1.1-3 presents South Dakota's key demographics including estimated population; households; land area; population density; and number of counties, cities/towns, and municipal governments. More information about these demographics is presented in Section 15.1.9, Socioeconomics.

Table 15.1.1-3: Key South Dakota Indicators

South Dakota Indicators	
Estimated Population (2014)	853,175
Land Area (square miles) (2010)	75,811
Population Density (persons per sq. mile) (2010)	10.7
Municipal Governments (2013)	309

Sources: (U.S. Census Bureau, 2012b) (U.S. Census Bureau, 2013)

Table 15.1.1-4 presents South Dakota's public safety infrastructure, including fire and police stations. Table 15.1.1-5 identifies first responder personnel including dispatch, fire and rescue, law enforcement, and emergency medical personnel in the state.

Table 15.1.1-4: Public Safety Infrastructure in South Dakota by Type

Infrastructure Type	Number
Fire and Rescue Stations [a]	340
Law Enforcement Agencies [b]	155
Fire Departments [c]	293

[a] Data collected by the U.S. Fire Administration in 2015.

[b] Number of agencies from state and local law enforcement include: local police departments, sheriffs' offices, primary state law enforcement agencies, special jurisdictional agencies, and other miscellaneous agencies, collected by the U.S. Bureau of Justice Statistics in 2008.

[c] Data collected by the U.S. Fire Administration in 2015.

Sources: (U.S. Fire Administration, 2015) (U.S. Bureau of Justice Statistics, 2011)

Table 15.1.1-5: First Responder Personnel in South Dakota by Type

First Responder Personnel	Number
Police, Fire and Ambulance Dispatchers [a]	350
Fire and Rescue Personnel [b]	7,797
Law Enforcement Personnel [c]	2,669
Emergency Medical Technicians and Paramedics [d e]	860

[a] BLS Occupation Code: 43-5031.
[b] BLS Occupation Codes: 33-2011 (Firefighters), 33-2021 (Fire Inspectors and Investigators), 33-1021 (First-Line Supervisors of Fire Fighting and Prevention Workers), and 53-3011 (Ambulance Drivers and Attendants, Except Emergency Medical Technicians). Volunteer firefighters reported by the U.S. Fire Administration.
[c] Full-time employees from state and local law enforcement agencies which include: local police departments, sheriffs' offices, primary state law enforcement agencies, special jurisdictional agencies, and other miscellaneous agencies, collected by the U.S. Bureau of Justice Statistics in 2008.
[d] BLS Occupation Code: 29-2041.
[e] All BLS data collected in 2015.

Sources: (U.S. Fire Administration, 2015) (U.S. Bureau of Justice Statistics, 2011) (Bureau of Labor Statistics, 2015a)

15.1.1.5. Telecommunications Resources

Telecommunication resources in South Dakota can be divided into two primary categories: specific public safety communications infrastructure and commercial telecommunications infrastructure. There is no central repository of information for either category; therefore, the following information and data are combined from a variety of sources, as referenced.

In general, the deployment of telecommunications resources in South Dakota is widespread and similar to other states in the U.S. Communications throughout the state are based on a variety of publicly- and commercially-owned technologies, including coaxial cable (traditional copper cable), fiber optics, hybrid fiber optics / coaxial cable, microwave, wireless, and satellite systems providing voice, data, and video services.

Figure 15.1.1-2 presents a typical wireless configuration, including both a narrowband public safety land mobile radio network (traditional radio network) and a commercial broadband access network (wireless technology); backhaul (long-distance wired or wireless connections), core, and commercial networks including a long term evolution (LTE) evolved packet core (modern broadband cellular networks); and network applications (software) delivering voice, data, and video communications.

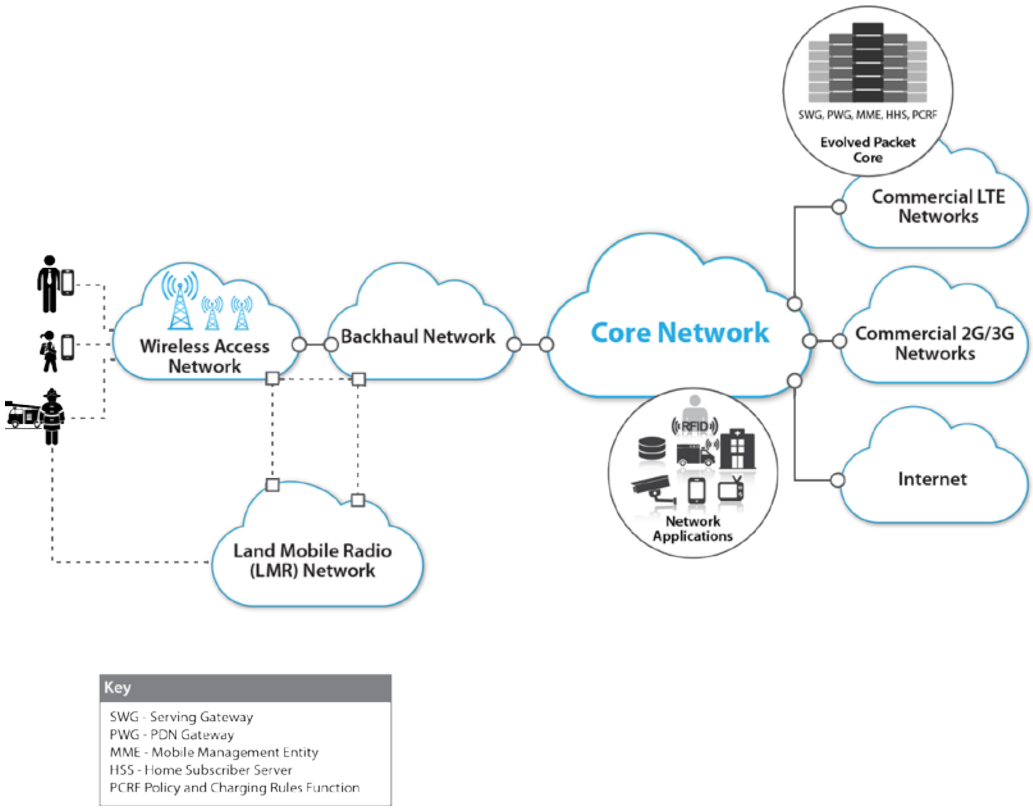

Figure 15.1.1-2: Wireless Network Configuration

Prepared by: Booz Allen Hamilton

Public Safety Communications

In order to protect and best serve the public interest, first responder and law enforcement communities must be able to communicate effectively. The evolution of the communications networks used by public safety stakeholders toward a broadband wireless technology, such as LTE (see Section 2.1.1), has the potential to provide users with better coverage, while offering additional capacity and enabling the use of new applications that would likely make their work safer and more efficient. Designing such a network presents several challenges due to the uniqueness of the deployment, the requirements, and the nationwide scale, which is national (NIST, 2015). Historically, there have been many challenges and impediments to timely and effective sharing of information. Chief among these factors impacting information sharing are: network coverage gaps, land mobile radio system infrastructure diversity, insufficient budgets, and diverse radio frequencies.

Communication interoperability has also been a persistent challenge, along with issues concerning spectrum availability, embedded infrastructure, and differing standards among stakeholders (NTFI, 2005). This has caused a fragmented approach to communications implementation across the U.S. and specifically in South Dakota. There are five key reasons why public safety agencies often cannot connect through existing communications (NTFI, 2005):

- Incompatible and aging communications equipment,
- Limited and fragmented funding,
- Limited and fragmented planning,
- A lack of coordination and cooperation, and
- Limited and fragmented radio spectrum.

To help enable the public safety community to incorporate disparate Land Mobile Radio (LMR) networks with a nationwide public safety LTE broadband network, the U.S. Department of Commerce Public Safety Communications Research Program (PSCR) – Boulder Laboratories, in 2015, prepared a locations-based services (LBS) research and development roadmap to examine the current state of location-based technologies, forecast the evolution of LBS capabilities and gaps, and identify potential research and development opportunities that would improve the public safety community's use of LBS within operational settings. This is the first of several technology roadmaps that PSCR plans to develop over the next few years (PSCR, 2015).

Like most states, South Dakota's public safety LMR network environment is facing transition as continues to upgrade from its legacy Very High Frequency (VHF)[3] analog statewide system to digital P25 technology; with an increasing number of county and local public safety departments adopting the system and investing in digital equipment and infrastructure. The digital P25 system in South Dakota, known as the South Dakota Statewide Radio System (SRS), covers 95 percent of South Dakota's 66 county geographic area on VHF (RadioReference.com, 2015a).

South Dakota's Bureau of Information & Telecommunications (BIT) is responsible for the SRS and provides a variety of services in support of the LMR system and its public safety users including ongoing operations, maintenance, and installation services as well as technical support for state dispatch services (BIT, 2015).

Statewide/Multi-County Public Safety Networks

The South Dakota SRS LMR system provides statewide coverage to public safety agencies, tribal entities, and state agencies over its digital P25 54 tower site[4] network (BIT, 2015). Figure 15.1.1-3 depicts the SRS LMR network tower site locations (South Dakota Public Safety Communications Council, 2009).

Public safety agencies and talkgroups currently using South Dakota's SRS include: State Highway Patrol, State Fire, State Medical/EMS, State Corrections, statewide interagency talkgroups, and coverage for the majority of South Dakota's county public safety users (RadioReference.com, 2015b).

[3] VHF band covers frequencies ranging from 30 MHz to 300 MHz. (NTIA, 2005)
[4] South Dakota's 54 tower site network is projected by South Dakota's BIT to expand to 96 sites when fully built out (BIT, 2015).

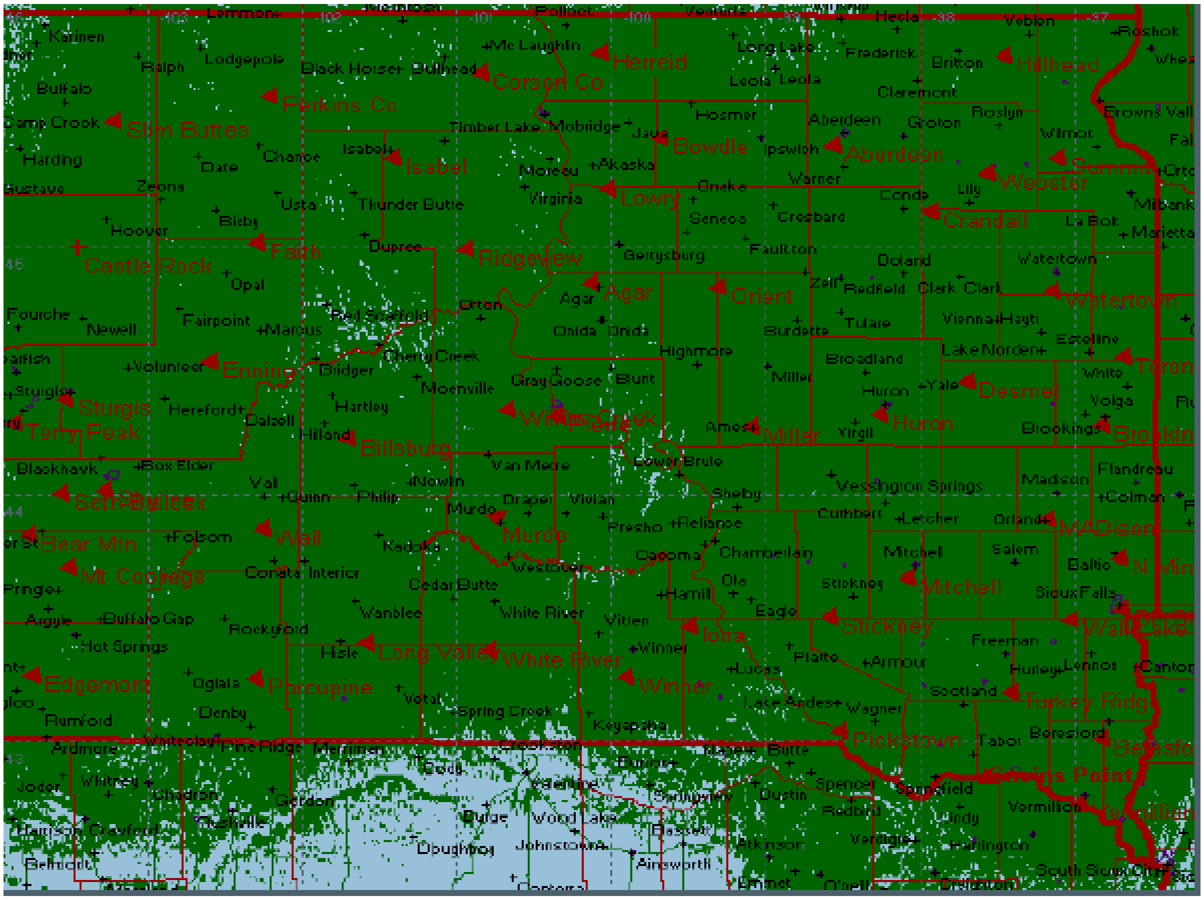

Figure 15.1.1-3: South Dakota SRS Tower Site Locations Map

County/City Public Safety Networks

In South Dakota public safety communications systems across the state have been dominated by analog VHF systems, with additional use of analog Ultra High Frequency (UHF)[5] systems. Even with the growing adoption of the SRS P25 system, many counties and cities continue to use legacy VHF and UHF analog systems, examples of this include Pennington county and Minnehaha county (RadioReference.com, 2015b). However, since the conversion of the state's SRS system to digital P25, an increasing number of county and local users have upgraded to the P25 standard, with a growing trend in South Dakota towards the adoption of digital P25 systems (RadioReference.com, 2015a).

There are currently two P25 systems providing service to South Dakota, as Table 15.1.1-6 indicates. The SRS system provides full geographic coverage in the state and the Siouxland Tri-State Area Radio (STARCOMM) Tri-State system covers Union County in South Dakota (as well as Woodbury County in Iowa and Dakota County in Nebraska with its network) (RadioReference.com, 2015c).

[5] UHF band covers frequencies ranging from 300 MHz to 3000 MHz. (NTIA, 2005)

Table 15.1.1-6: South Dakota Public Safety P25 Networks

South Dakota P25 Public Safety Systems	Frequency Band
South Dakota State Radio System (SRS)	VHF
Siouxland Tri-State Area Radio Communications (STARCOMM)	800 MHz

Source: (Project 25.org, 2015)

Operating on the Enhanced Digital Access System (EDACS), the RACOM LMR system covers 136 counties in the Midwestern states including coverage of two counties in South Dakota (Brooking and Deuel) (RadioReference.com, 2015d).

In Pennington county, the location of Rapid City, the majority of public safety emergency services is provided over the SRS digital P25 system; however, a number of departments and cities within the county continue to use UHF analog systems such as SWAT, the Detention Center, and Sheriff Operations (RadioReference.com, 2015e).

In Minnehaha County, the location of Sioux Falls, the SRS is available and widely used, with UHF continuing to be used by county EMS, hospital communications in Sioux Falls, and police operations in the city of Brandon (RadioReference.com, 2015f).

Public Safety Answering Points

According to the Federal Communication Commission (FCC) Master PSAP registry, there are 45 PSAPs in South Dakota serving South Dakota's 66 counties (FCC, 2015a).

Commercial Telecommunications Infrastructure

South Dakota's commercial telecommunications industry and infrastructure is robust with multiple service providers, offering products and services via the full spectrum of telecommunications technologies (FCC, 2014a) (FCC, 2014b). The following sub-sections present information on South Dakota's commercial telecommunications infrastructure, including information on the number of carriers and technologies deployed; geographic coverage; voice, Internet access, and wireless subscribers; and the quantity and location of telecommunications towers, fiber optic plant, and data centers.

Carriers, Coverage, and Subscribers

South Dakota's commercial telecommunications industry provides the full spectrum of telecommunications technologies and networks, including coaxial cable (traditional copper cable), fiber optics, hybrid fiber optics / coaxial cable, microwave, wireless, and satellite systems. Table 15.1.1-7 presents the number of providers of switched access[6] lines, Internet access,[7] and mobile wireless services including coverage.

[6] "A service connection between an end user and the local telephone company's switch; the basis of plain old telephone services (POTS)" (FCC, 2014b)
[7] Internet access includes Digital Subscriber Line (DSL), cable modem, fiber, satellite, and fixed wireless providers

Table 15.1.1-7: Telecommunications Access Providers and Coverage (2013)

Commercial Telecommunications Access Providers	Number of Service Providers	Coverage of Households
Switched access line [a]	96	97.5% of households
Internet access [b]	59	58% of households
Mobile wireless [c]	7	89% of population

[a] Switched access lines are a service connection between an end user and the local telephone company's switch (the basis of older telephone services); this number of service providers was reported by the FCC as of December 31, 2013 in Table 17 in "Local Telephone Competition: Status as of December 31, 2013" as the total of ILEC and non-ILEC providers (FCC, 2014b).
[b] Internet access providers are presented in Table 21 in "Internet Access Services: Status as of December 31, 2013" by technology provided; number of service providers is calculated by subtracting the reported Mobile Wireless number from the total reported number of providers (FCC, 2014a).
[c] Mobile wireless provider data is provided by the FCC in the sources identified. However, NTIA's National Broadband Map provides newer data, so FirstNet is using NTIA's GIS-based data from the National Broadband Map instead of the data reported by the FCC. The process for retrieving the National Broadband Map data is explained in detail in a subsequent footnote in Section 15.1.1.5, Last Mile Fiber Assets.

Sources: (FCC, 2014a) (FCC, 2014b) (NTIA, 2014)

Table 15.1.1-8 shows the wireless providers in South Dakota along with their geographic coverage. The following three maps: Figure 15.1.1-4 to Figure 15.1.1-6 show: the combined coverage for the top two providers; Northern Wireless Communications and Sioux Valley Energy's coverage; and the coverage of all other providers with less than 5 percent coverage area, respectively.

Table 15.1.1-8: Wireless Telecommunications Coverage by Providers in South Dakota

Wireless Telecommunications Providers	Coverage
AT&T Mobility LLC	98.91%
Verizon Wireless	90.83%
Northern Wireless Communications	6.71%
Sioux Valley Energy	5.99%
Other[a]	18.93%

Source: (NTIA, 2014)

[a] Other: Provider with less than 5% coverage area. Providers include: Santel Communications Cooperative; MNWireless, LLC; Sprint; Dryad Communications; Celerity Networks; Echelon Internet Services; KeyOn Communications Inc.; RC Technologies, Inc.; SpeedConnect; Wescomm Wireless; Data Truck LLC; Consolidated Telecom; NVC; Fibercomm L.C.; Interlakes Wireless.

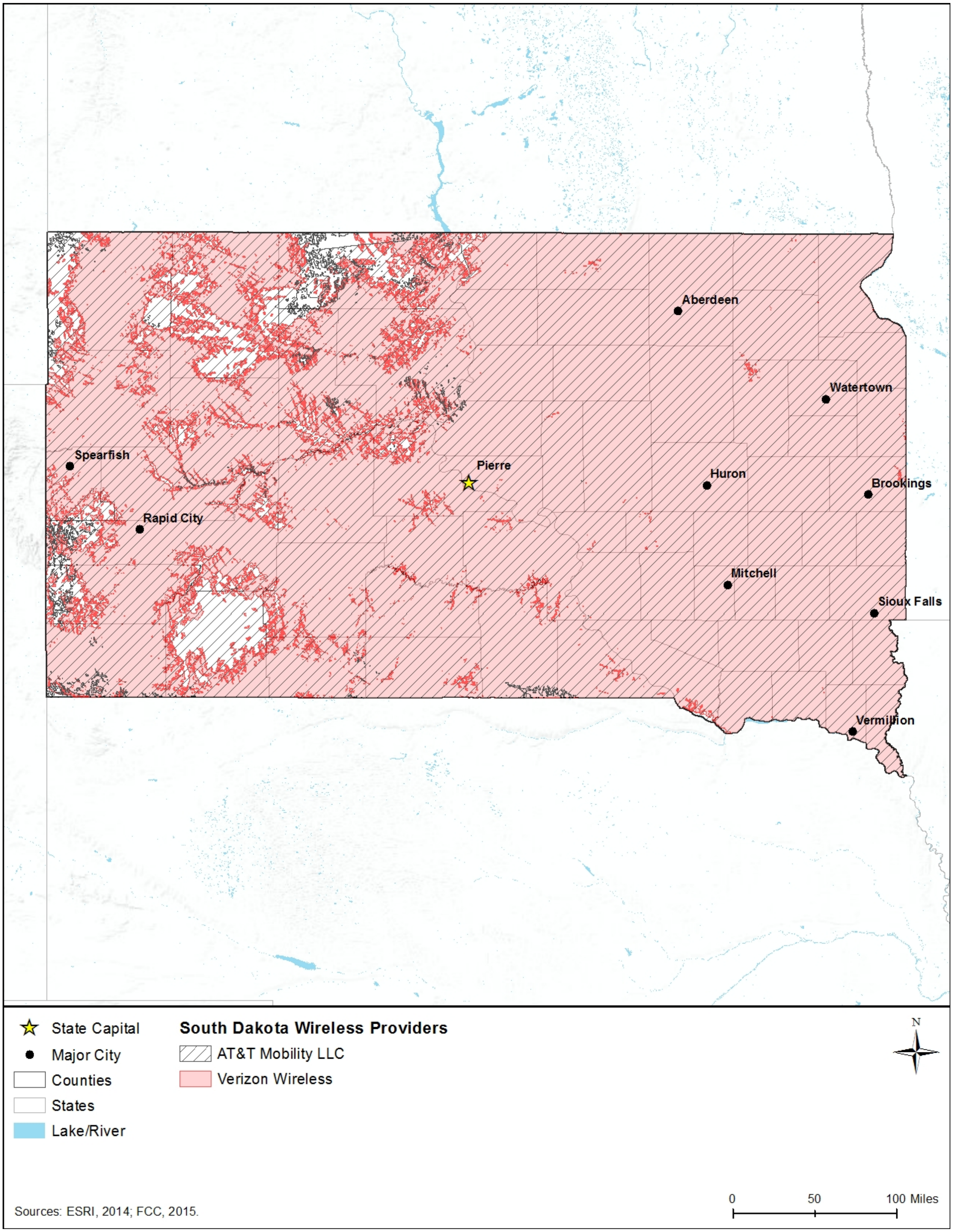

Figure 15.1.1-4: Top Wireless Providers Availability in South Dakota

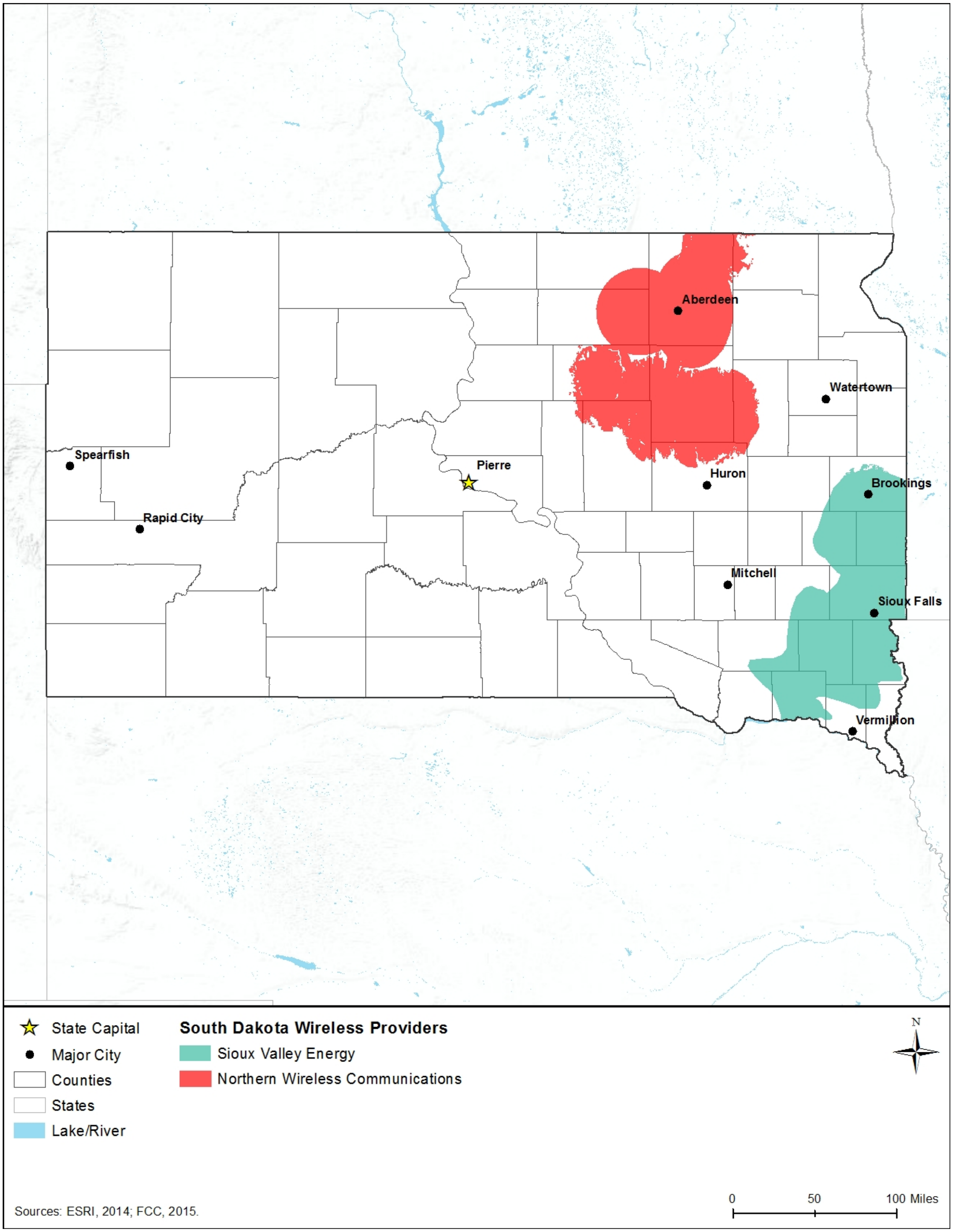

Figure 15.1.1-5: Sioux Valley Energy and Northern Wireless Communications Wireless Availability in South Dakota

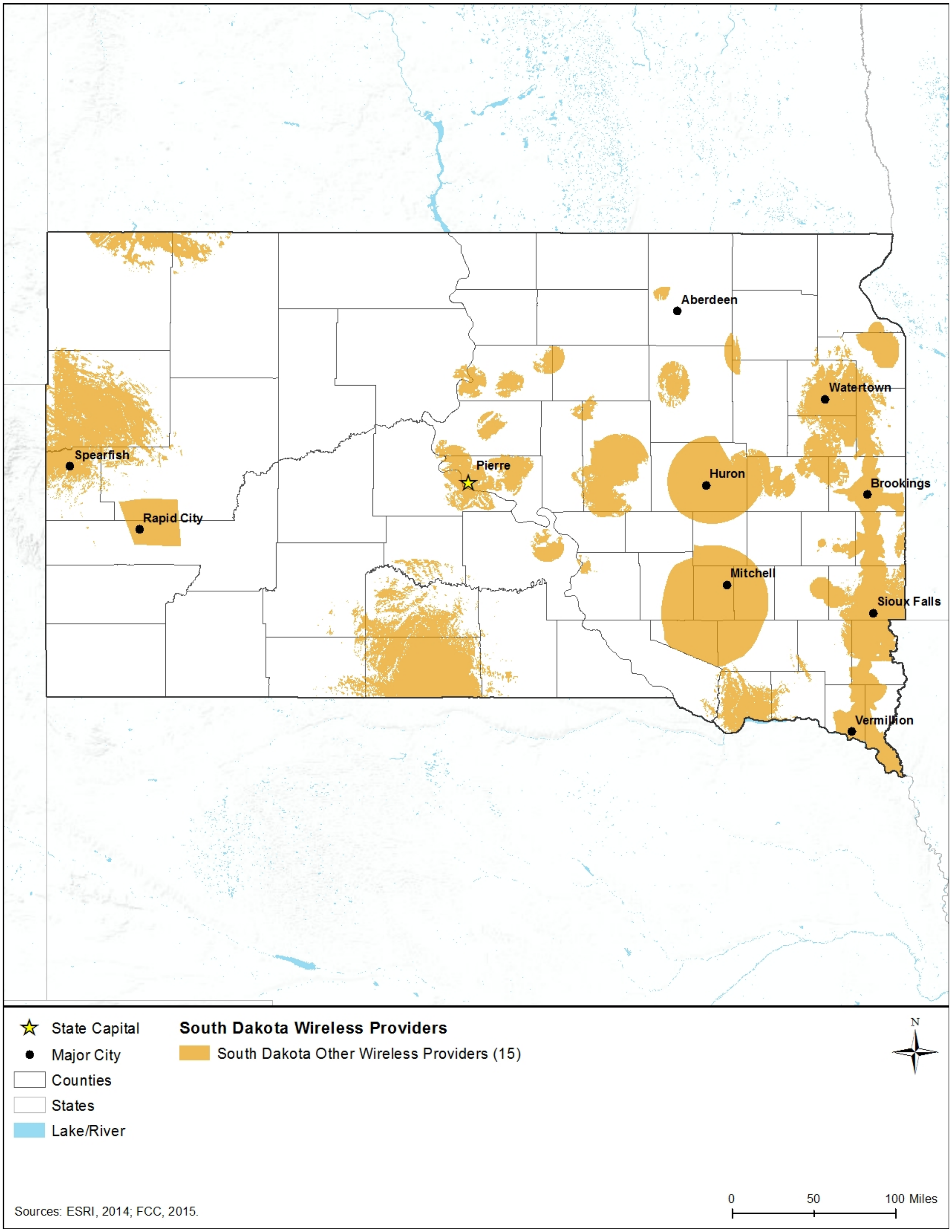

Figure 15.1.1-6: Other Providers Wireless Availability in South Dakota

Towers

There are many types of domestic towers employed today by the telecommunications industry, government agencies, and other owners. Towers are designed and used for a variety of purposes, and the height, location, and supporting structures and equipment are all designed, constructed, and operated according to the technical specifications of the spectrum used, the type of equipment mounted on the tower, geographic terrain, need for line-of-sight transmissions to other towers, radio frequency needs, and other technical specifications. There are three general categories of stand-alone towers: monopole, lattice, and guyed. Typically, monopole towers are the smallest, followed by lattice towers at a moderate height, and guyed towers at taller heights (with the guyed wires providing tension support for the taller heights) (CSC, 2007). In general, taller towers can provide communications coverage over larger geographic areas, but require more land for the actual tower site, whereas shorter towers provide less geographic coverage and require less land for the tower site (USFS, 2009). Figure 15.1.1-7 presents representative examples of each of these categories or types of towers.

Monopole
100 – 200 feet
Source: *http://laps.noaa.gov/birk/laps_intranet/site_photos/Monarch/tower.jpg*

Lattice
200 – 400 feet
Source: Personal Picture

Guyed
200 – 2,000 feet
Source: *http://www.esrl.noaa.gov/gmd/ccgg/insitu/*

Figure 15.1.1-7: Types of Towers

Telecommunications tower infrastructure proliferates throughout South Dakota, although tower infrastructure is concentrated in the higher and more densely populated areas of South Dakota: Sioux Falls, Rapid City, Aberdeen, Brookings, and Watertown. Owners of towers and some types of antennas are required to register those infrastructure assets with the Federal Communications Commission (FCC) (FCC 2016).[8] Table 15.1.1-9 presents the number of

[8] An antenna structure must be registered with the FCC if the antenna structure is taller than 200 feet above ground level (AGL) or may interfere with the flight path of a nearby airport (FCC 2016).

towers (including broadcast towers) registered with the FCC in South Dakota, and Figure 15.1.1-8 presents the location of those structures, as of July 2015.

Table 15.1.1-9: Number of Commercial Towers in South Dakota by Type

Constructed[a] Towers[b]		**Constructed Monopole Towers**	
100ft and over	147	100ft and over	0
75ft – 100ft	207	75ft – 100ft	1
50ft – 75ft	113	50ft – 75ft	1
25ft – 50ft	60	25ft – 50ft	13
25ft and below	17	25ft and below	2
Subtotal	**544**	**Subtotal**	**17**
Constructed Guyed Towers		**Buildings with Constructed Towers**	
100ft and over	41	100ft and over	1
75ft – 100ft	33	75ft – 100ft	0
50ft – 75ft	9	50ft – 75ft	0
25ft – 50ft	3	25ft – 50ft	0
25ft and below	1	25ft and below	1
Subtotal	**87**	**Subtotal**	**2**
Constructed Lattice Towers		**Multiple Constructed Structures[c]**	
100ft and over	4	100ft and over	0
75ft – 100ft	23	75ft – 100ft	0
50ft – 75ft	8	50ft – 75ft	0
25ft – 50ft	11	25ft – 50ft	0
25ft and below	5	25ft and below	0
Subtotal	**51**	**Subtotal**	**0**
Constructed Tanks[d]			
Tanks	3		
Subtotal	**3**		
Total All Tower Structures		**704**	

Source: (FCC, 2015b)

[a] Planned construction or modification has been completed. Results will return only those antenna structures that the FCC has been notified are physically built or planned modifications/alterations to a structure have been completed (FCC, 2013).

[b] Free standing or guyed structure used for communication purposes (FCC, 2013).

[c] Multiple constructed structures per antenna registration (FCC, 2013).

[d] Any type of tank – water, gas, etc. with a constructed antenna (FCC, 2013).

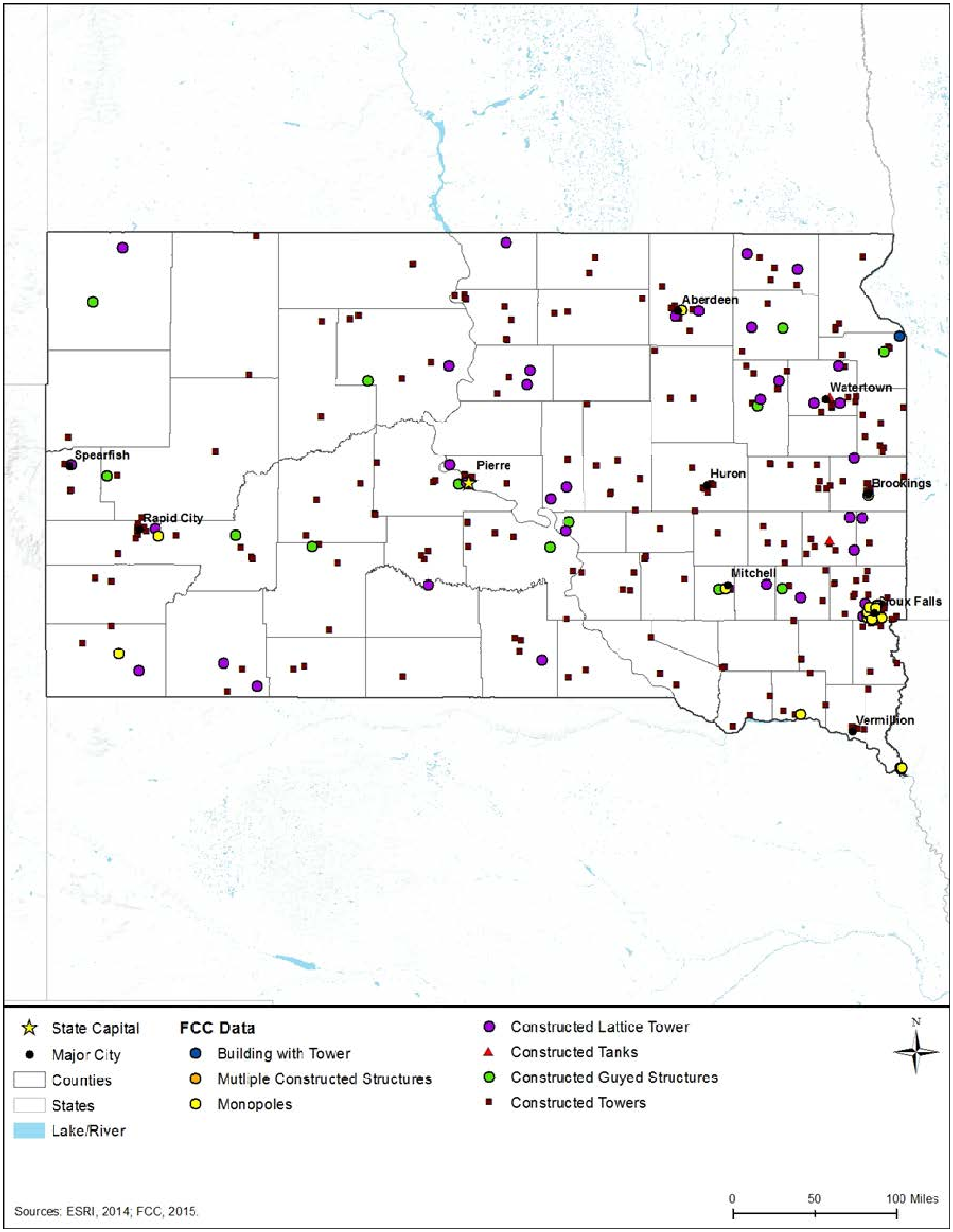

Figure 15.1.1-8: FCC Tower Structure Locations in South Dakota

Fiber Optic Plant (Cables)

iber optic plant, or cables, can be buried directly in the ground; pulled, blown, or floated into ducts, conduits, or innerduct (flexible plastic protective sleeves or tubes); placed under water; or installed aerially between poles, typically on utility rights-of-way. A fiber optic network includes an access network consisting of a central office, distribution and feeder plant (cables of various sizes directly leaving a central office and splitting to connect users to the network), and a user location, as shown in Figure 15.1.1-9. The network also may include a middle mile component (shorter distance cables linking the core network between central offices or network nodes across a region) and a long haul network component (longer distance cables linking central offices across regions) (FCC, 2000).

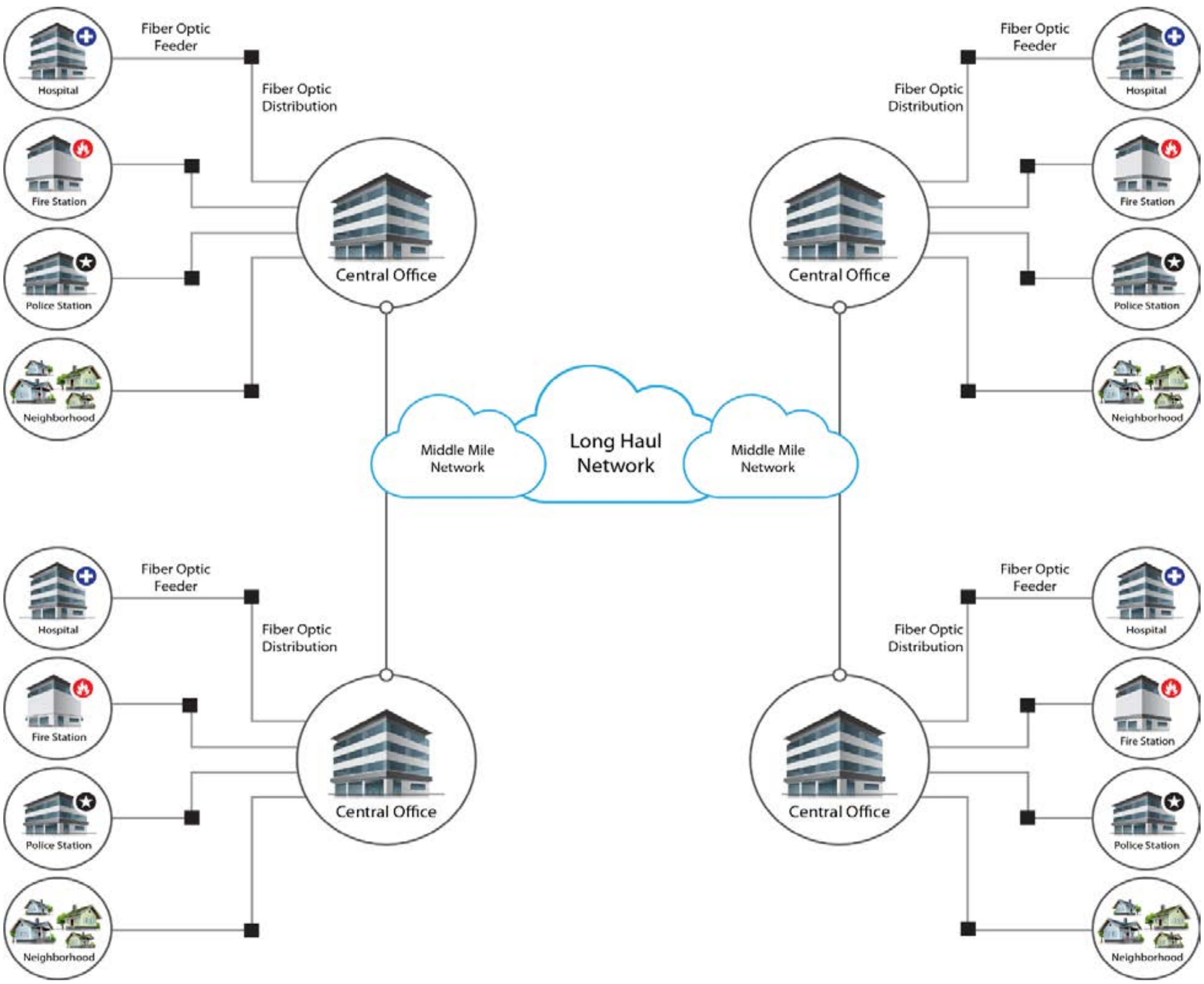

Figure 15.1.1-9: Typical Fiber Optic Network in South Dakota

Source: (ITU-T, 2012)

Prepared by: Booz Allen Hamilton

Last Mile Fiber Assets

In South Dakota, fiber access networks are concentrated in the highest population centers as shown in the figures below. In South Dakota, there are 33 fiber providers that offer service in the state, as listed in Table 15.1.1-10.

Figure 15.1.1-10 shows coverage for Golden West Telecommunications and Venture Communications Coop., and Figure 15.1.1-11 shows coverage for other providers with less than 5 percent coverage area, respectively.[9]

Table 15.1.1-10: Fiber Provider Coverage

Fiber Provider	Coverage
Golden West Telecommunications	11.26%
Venture Communications Coop.	5.23%
Other[a]	22.64%

Source: (NTIA, 2014)

[a] Other: Provider with less than 5% coverage area. Providers include: Interstate Telecommunications Cooperative, Inc.; Santel Communications Cooperative; James Valley Telecommunications; Midstate Communications; Valley Telecommunications; CenturyLink; West River Cooperative Telephone Company; SDN Communications; WOW! Internet, Cable, and Phone; Fort Randall Telephone Company; TrioTel Communications, Inc.; Midcontinent Communications; Splitrock; Alliance Communications; RC Communications; Cheyenne River Sioux Tribe Telephone Authority; Kennebec Telephone Company Inc.; Roberts County Telephone Coop. Assn; Consolidated Telecom; Mediacom LLC; Zayo Group LLC; Long Lines; NVC; Frontier Citizens Communications of Minnesota; Three River Telco; Mitchell Telecom; Swiftel Communications; Cable One; Beresford Municipal Telephone; City of Faith Telephone Company; Fibercomm L.C.

[9] The broadband map utilized data collected as part of the broadband American Recovery and Reinvestment Act initiative. The data was retrieved from the FCC National Broadband Map website (www.broadbandmap.gov/data-download). Each state's broadband data was downloaded accordingly. The data pertaining to broadband data/coverage for census blocks, streets, addresses, and wireless were used. Census blocks, roads, and addresses were merged into one file and dissolved by similar business and provider names. Square miles were calculated for each provider. The maps show all providers over 5% on separate maps; providers with areas under 5% were merged and mapped as "[State Name] Other Fiber Providers". All Wireless providers were mapped as well; those with areas under 5% were merged and mapped as "[State Name] Other Wireless Providers". Providers under 5% were denoted in their respective tables.

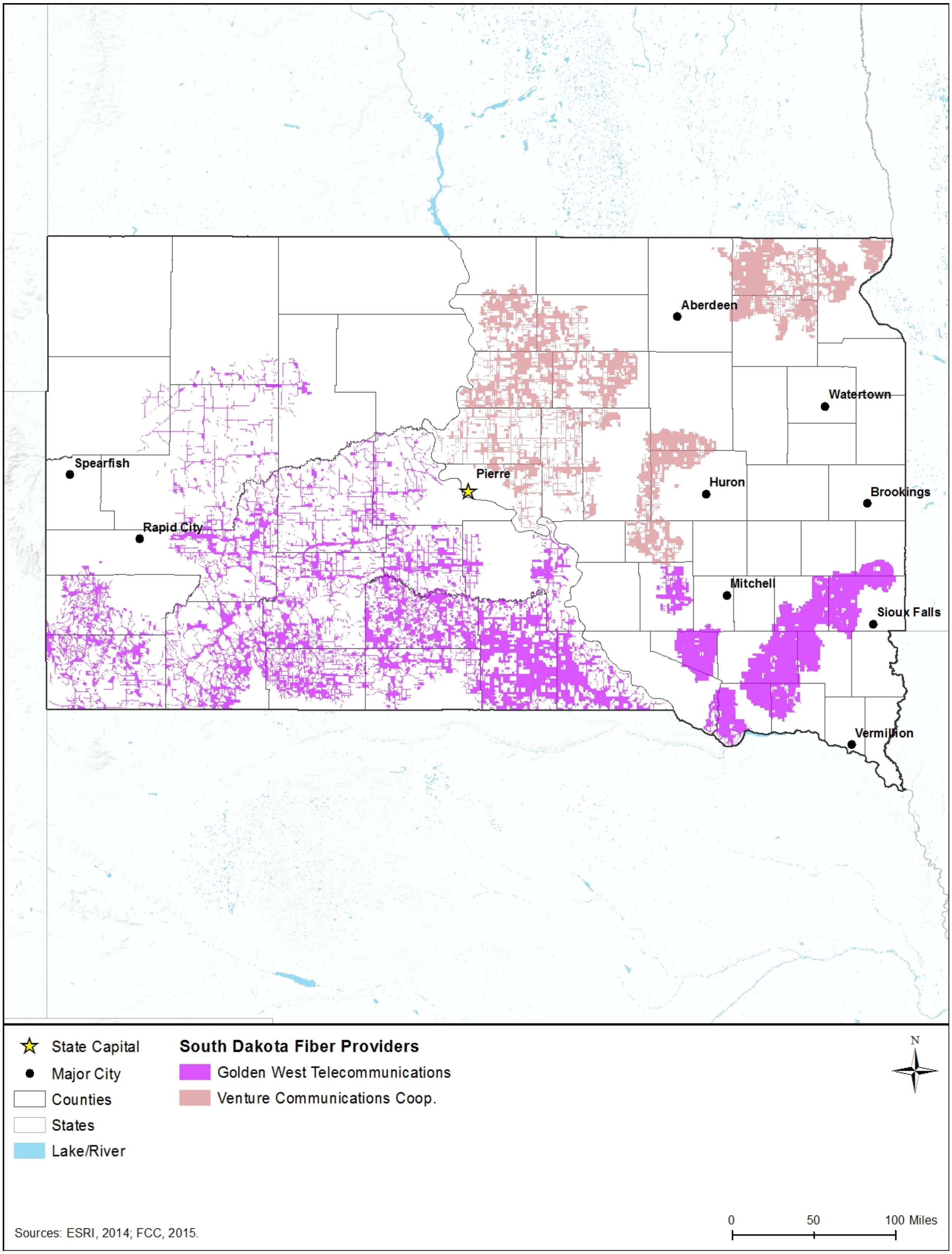

Figure 15.1.1-10: Fiber Availability in South Dakota for Golden West Telecommunications and Venture Communication Coop.

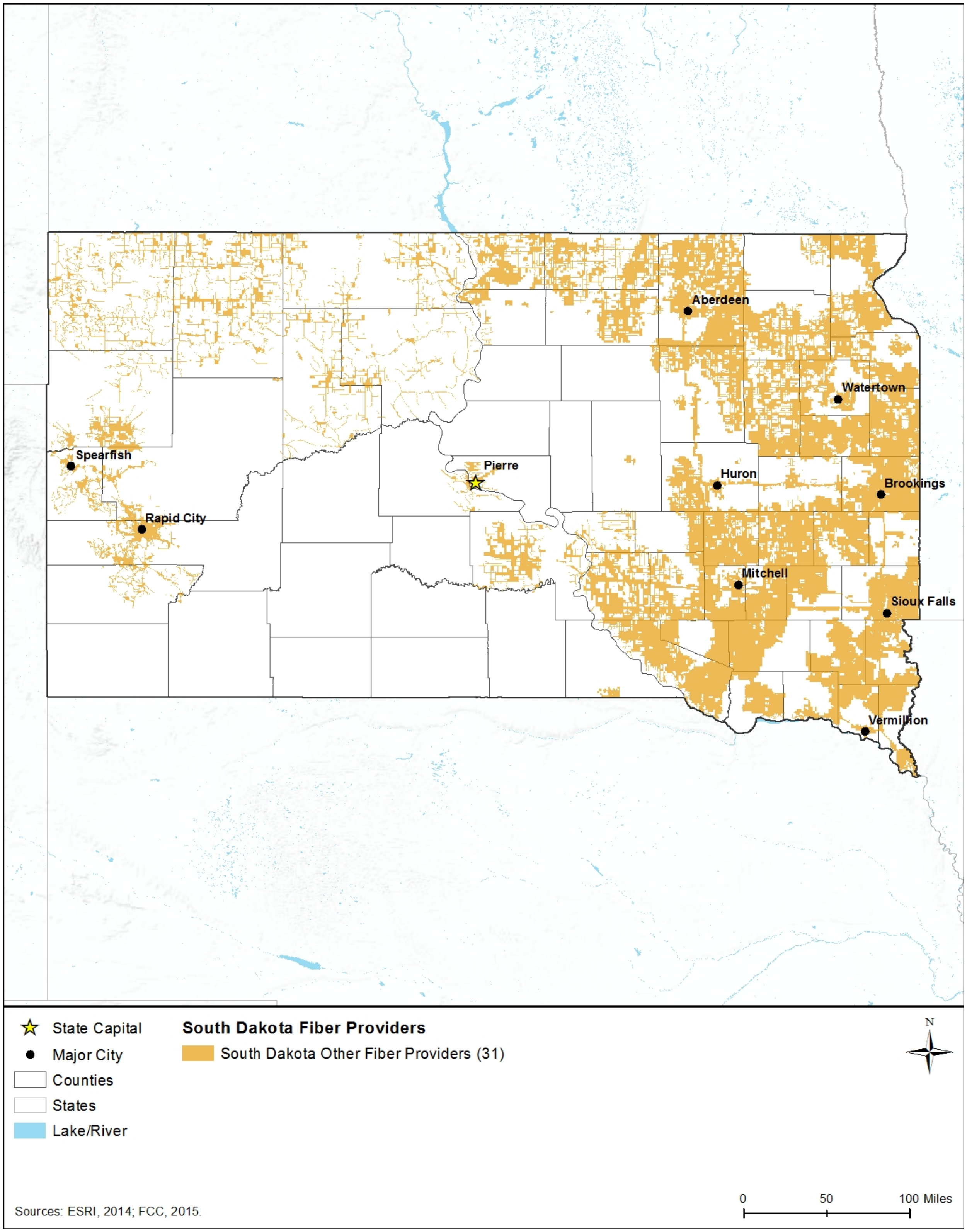

Figure 15.1.1-11: Other Providers Fiber Availability in South Dakota

Data Centers

Data centers (also known as network access points, collocation facilities, hosting centers, carrier hotels, and Internet exchanges) are large telecommunications facilities that house routers, switches, servers, storage, and other telecommunications equipment. These data centers facilitate efficient network connectivity among, and between telecommunications carriers and between carriers and their largest customers. These facilities also provide racks and cages for equipment, power and cooling, cabling, physical security, and 24x7 monitoring (CIO Council, 2015; GAO, 2013). Ownership of data centers may be public or private; comprehensive information regarding data centers may not be publicly available as some are related to secure facilities.

15.1.1.6. Utilities

Utilities are the essential systems that support daily operations in a community and cover a broad array of public services, such as electricity, water, wastewater, and solid waste. Section 15.1.4, Water Resources, describes the potable water sources in the state.

Electricity

South Dakota's electric utilities are regulated by the South Dakota Public Utilities Commission (PUC), which regulates both the quality of service that utilities provide and the rates that are charged to customers. They also help to mediate disputes between electric providers and their customers. This regulation extends mainly to investor-owned companies and to a lesser extent, electric cooperatives, and municipal utilities (PUC, 2015a). Six investor-owned companies fall under the PUC's jurisdiction: Black Hills Power, MidAmerican Energy, Montana-Dakota Utilities Co., NorthWestern Energy, Otter Tail Power Co. and Xcel Energy (PUC, 2015b). There are also 37 municipal electricity providers and 32 electric cooperatives that supply electricity in the state (PUC, 2015c) (PUC, 2015d). The PUC also advocates for smart energy "policy at the state and federal levels and works hard to educate consumers about ways to save energy and money" (PUC, 2015a).

Approximately half of the state's electricity was produced by hydroelectric facilities in 2014, creating 5,498,214 megawatt hours[10] of electricity of the total 10,995,240 megawatt hours generated (EIA 2015a) . Wind power contributed 2,336,293 megawatt hours (approximately 21 percent) of electricity, while coal fueled facilities produced 2,689,216 megawatt hours (approximately 24 percent) (EIA, 2015b). Electric generation facilities powered by natural gas and petroleum liquids both produced minimal amounts of power. South Dakota is well suited to the use of renewable energy facilities; in fact, "The National Renewable Energy Laboratory estimates that 88% of South Dakota's land area is suitable for wind resource development" (EIA, 2015e). A large portion (40 percent) of the electricity consumed in the state goes to the

[10] One megawatthour is defined as one thousand kilowatt-hours or 1 million watt-hours'; where one watthour is "the electrical energy unit of measure equal to one watt of power supplied to, or taken from, an electric circuit steadily for one hour." (EIA, 2016)

industrial sector. South Dakota's transportation sector uses 24.4 percent, while the residential and commercial sectors use just 18.8 percent and 16.7 percent respectively (EIA, 2015e).

Water

The South Dakota Department of Environment and Natural Resources (SD DENR) manage the quality of South Dakota's drinking water. The federal Safe Drinking Water Act (SDWA) drives the main body of the regulation provided by SD DENR. The U.S. Environmental Protection Agency (USEPA) gave primary enforcement of the SDWA in South Dakota to the SD DENR in 1983. The regulations set forth by the SDWA relate to the operation of public drinking water systems (PWS) (SD DENR, 2015g). PWSs are defined as any "water system that serves 15 connections or 25 people per day for 60 days per year" (SD DENR, 2015i). These PWSs are broken into three groups: community water systems, non-transient non-community water systems and transient non-community water systems. As defined by the USEPA, community systems have at least fifteen service connections and serve at least 25 year round residents. Non-transient non-community water systems "regularly serves at least 25 of the same persons at such place a work places, offices, daycares, and schools for at least six months a year." Transient non-community water systems serve non-residential populations, such as campgrounds or rest stops (SD DENR, 2015i). "These systems do not have to test or treat their water for contaminants which pose long-term health risks because fewer than 25 people drink the water over a long period. They still must test their water for microbes and several chemicals" (SD DENR, 2015f). As of 2013, there were 644 public water systems in the state: 458 community systems, 162 transient non-community systems, and 24 non-transient non-community systems. Most South Dakota residents get their water from groundwater (SD DENR, 2015i).

Community water systems are required by the SWDA to provide annual reports to their consumers called Consumer Confidence Reports (CCR). These annual CCRs include information on the body of water used as a source for the water system, provide information on any contaminants that may be found in the water, the water's susceptibility to contamination, and the system's compliance with federal, state, and local water quality regulations. The reports ensure that consumers are aware of the quality of their water (SD DENR, 2015b). Water systems operators must be licensed by the SD DENR in order to protect public health. This regulation applies to "all community and non-transient non-community systems" which "must have a certified water treatment and distribution operator." "All transient water systems using surface water, using disinfection equipment, or that serve more than 500 people per day must have a certified operator" (SD DENR, 2015m).

Wastewater

South Dakota's wastewater is managed through the granting of permits allowing wastewater discharge and the licensing of wastewater facility operators. The National Pollutant Discharge Elimination System (NPDES) Program was formed as a part of the federal Clean Water Act of 1972. The programs main purpose is to "control the amount of pollution that can enter waters of the U.S. and protect the beneficial uses of all streams and lakes." The DENR has had authority to grant NPDES permits since 1993, though the state refers to them as Surface Water Discharge permits (SD DENR, 2015l). These permits are required by any facility wishing to discharge pollutants from a point source, including municipal or industrial wastewater treatment plants. Permits include specifications limits on the pollutants that can be discharged into a given body of water (SD DENR, 2015g). The federal Clean Water Act requires that states define Total Maximum Daily Loads (TMDL) for their bodies of water, outlining "the sum allowable load of a pollutant from all contributing point and nonpoint sources, that a waterbody can receive and still meet the applicable water quality standards" (SD DENR, 2015h).

The operators of wastewater treatment facilities must also be licensed through the DENR. The DENR operates an Operator Certification Program to ensure that South Dakota's water resources are well protected (SD DENR, 2015m). Currently, "any wastewater treatment facility or wastewater collection facility that serves 500 or more people must employ a certified operator." Certification by the SD DENR requires an operator to pass an exam, as well as meet educational and experience-based requirements (SD DENR, 2015m).

Solid Waste

The management of South Dakota's solid waste is the responsibility of the SD DENR. In the pursuit of solid waste management, the SD DENR's Solid Waste Section regulates the storage, treatment, and disposal of solid wastes. They issue permits for disposal facilities and conduct inspections to ensure compliance (SD DENR, 2015i). The permitting process for solid waste management facilities is mandated by both USEPA regulations and state based legal requirements (SD DENR, 2015h). Among the regulated facilities are fifteen regional landfills that accept municipal waste and seventeen dedicated to the disposal of construction debris. There are also two dedicated kiln dust landfills to handle lime and cement dust. These, along with a number of yard waste, waste tire, medical waste sites, and transfer stations comprise the permitted solid waste management facilities in the state (SD DENR, 2015k). A 2011 state recycling report noted that about 579,951 tons of municipal waste was sent to municipal landfills that year, and the state was also able to recycle approximately 131,427 tons of municipal waste. "The State of South Dakota in 2011 achieved an estimated municipal solid waste (MSW) recycling rate of 18.5 percent." This number rose to 21 percent when scrap metal and wood commodities in the calculations. As of 2011, "The [SD] DENR Waste Management Program estimates that approximately 56 percent of the population in South Dakota has reasonable access to an MSW recycling program." This was estimated to be due to the low density of population centers in the state, which make the centralization of recycling programs difficult (SD DENR, 2015l).

15.1.2. Soils

15.1.2.1. Definition of the Resource

The Soil Science Society of America defines soil as:

i. "The unconsolidated mineral or organic material on the immediate surface of the Earth that serves as a natural medium for the growth of land plants." (NRCS, 2015b) *ii.* "The unconsolidated mineral or organic matter on the surface of the Earth that has been subjected to and shows effects of genetic and environmental factors of: climate (including water and temperature effects), and macro- and microorganisms, conditioned by relief, acting on parent material over a period of time. A product-soil differs from the material from which it is derived in many physical, chemical, biological, and morphological properties and characteristics." (NRCS, 2015b)

Five primary factors account for soil development patterns. A combination of the following variables contributes to the soil type in a particular area (University of Minnesota, 2001):

- *Parent Material*: The original geologic source material from the soil formed affects soil aspects, including color, texture, and ability to hold water.
- *Climate*: Chemical changes in parent material occur slowly in low temperatures. However, hot temperatures evaporate moisture, which also facilitates chemical reactions within soils. The highest degree of reaction within soils occurs in temperate, moist climates.
- *Topography*: Steeper slopes produce increased runoff, and, therefore, downslope movement of soils. Slope orientation also dictates the microclimate to which soils are exposed, because different slope faces receive more sunlight than others.
- *Biology*: The presence/absence of vegetation in soils affects the quantity of organic content of the soil.
- *Time*: Soil properties are dependent on the period over which other processes act on them.

15.1.2.2. Specific Regulatory Considerations

The Proposed Action must meet the requirements of the National Environmental Policy Act (NEPA) and other applicable laws and regulations. A list of applicable state laws and regulations is included in Table 15.1.2-1 below.

Table 15.1.2-1: Relevant South Dakota Soil Statutes and Regulations

State Law / Regulation	Regulatory Agency	Applicability
South Dakota Water Pollution Control Act and the Administrative Rules of South Dakota (ARSD) Chapters 74:52:01 through 74:52:11	SD DENR	Sediment and erosion controls are required as part of the SD DENR General Permit for Construction Activities, required for any construction activity that disturbs one or more acres. (SD DENR, 2010)

15.1.2.3. Environmental Setting

South Dakota is composed of three Land Resource Region (LRR),[11] as defined by the National Resources Conservation Service (NRCS) (NRCS, 2006):

- Central Feed Grains and Livestock Region,

[11] Land Resource Region: "A geographical area made up of an aggregation of Major Land Resource Areas (MLRA) with similar characteristics" (NRCS, 2006).

- Northern Great Plains Spring Wheat Region, and
- Western Great Plains Range and Irrigated Region.

Within and among South Dakota's three LRRs are 18 Major Land Resource Areas (MLRA),[12] which are characterized by patterns of soils, climate, water resources, land uses, and type of farming. The locations and characteristics of South Dakota's MLRAs are presented in Figure 15.1.2-1 and Table 15.1.2-2.

Soil characteristics are an important consideration for FirstNet insomuch as soil properties could influence the suitability of sites for network deployment. Soil characteristics can differ over relatively short distances, reflecting differences in parent material, elevation and position on the landscape, biota[13] such as bacteria, fungi, biological crusts, vegetation, animals, and climatic variables such as precipitation and temperature. For example, expansive soils[14] with wet and dry seasons alternately swell and shrink, which presents integrity risks to structural foundations (Rogers, Olshansky, & Rogers, 2004). Soils can also be affected by a variety of surface uses that loosen topsoil and damage or remove vegetation or other groundcover, which may result in accelerated erosion, compaction, and rutting[15] (discussed further in the subsections below).

[12] Major Land Resource Area: "A geographic area, usually several thousand acres in extent, that is characterized by a particular pattern of soils, climate, water resources, land uses, and type of farming" (NRCS, 2006).
[13] The flora and fauna of a region.
[14] Expansive soils are characterized by "the presence of swelling clay minerals" that absorb water molecules when wet and expand in size or shrink when dry leaving "voids in the soil" (Rogers, Olshansky, & Rogers, 2004).
[15] Rutting is indentations in soil from operating equipment in moist conditions or soils with lower bearing strength (USFS, 2009a).

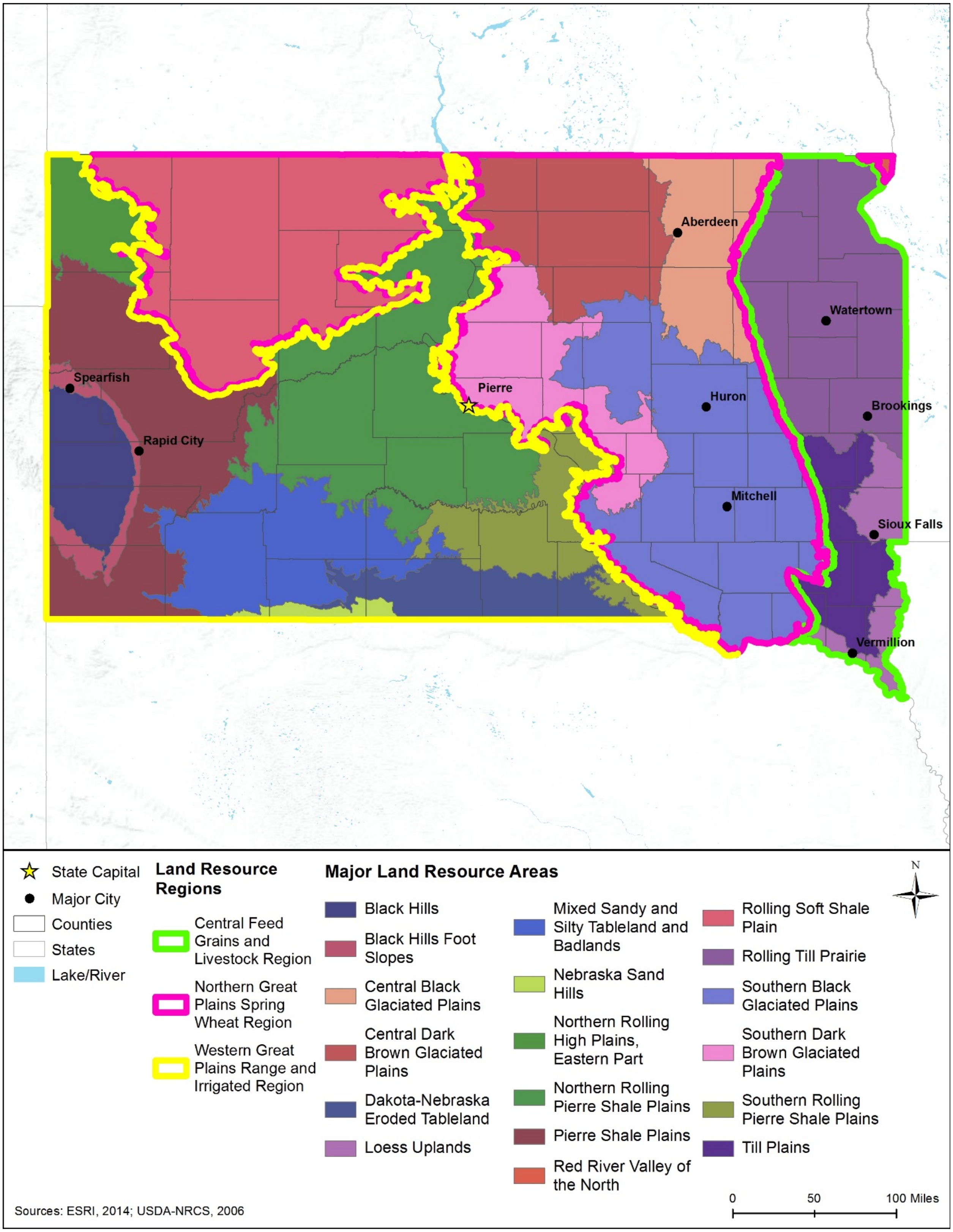

Figure 15.1.2-1: Locations of Major Land Resource Areas in South Dakota

Table 15.1.2-2: Characteristics of Major Land Resource Areas in South Dakota

MLRA Name	Region of State	Soil Characteristics
Black Hills	Southwestern South Dakota	Alfisols[a] and Mollisols[b] are the dominant soil orders. These clayey or loamy soils[c] are typically well drained and range from shallow to very deep.
Black Hills Foot Slopes	Southwestern South Dakota	Alfisols, Entisols,[d] and Mollisols are the dominant soil orders. These loamy soils are typically well drained and range from shallow to very deep.
Central Black Glaciated Plains	Northeastern South Dakota	Mollisols is the dominant soil order. These clayey or loamy[c] soils typically range from poorly drained to well drained, and are very deep.
Central Dark Brown Glaciated Plains	Northern South Dakota	Mollisols is the dominant soil order. These loamy or clayey soils typically range from poorly drained to well drained, and are very deep.
Dakota-Nebraska Eroded Tableland	Southern South Dakota	Entisols and Mollisols are the dominant soil orders. These sandy or loamy soils are typically well drained to excessively drained, and are very deep.
Loess Uplands	Southeastern South Dakota	Mollisols is the dominant soil order. These clayey or loamy soils are moderately well drained to somewhat excessively drained and range from very deep to shallow.
Mixed Sandy and Silty Tableland and Badlands	Southwestern South Dakota	Entisols, Inceptisols,[e] and Mollisols are the dominant soil orders. These sandy or loamy soils are typically well drained or somewhat excessively drained, and range from shallow to very deep.
Nebraska Sand Hills	Southern South Dakota	Entisols and Mollisols are the dominant soil orders. These sandy and very deep soils typically range from somewhat poorly drained to excessively drained.
Northern Rolling High Plains, Eastern Part	Northwestern South Dakota	Alfisols, Entisols, Inceptisols, and Mollisols are the dominant soil orders. These clayey or loamy soils are typically well drained and range from shallow to very deep.
Northern Rolling Pierre Shale Plains	Central South Dakota	Entisols, Inceptisols, Mollisols, and Vertisols[f] are the dominant soil orders. These clayey soils range from shallow to very deep, and are typically well drained.
Pierre Shale Plains	Western South Dakota	Alfisols, Entisols, Inceptisols, and Vertisols are the dominant soil orders. These clayey soils are typically well drained and range from shallow to very deep.
Red River Valley of the North	Northeastern South Dakota	Mollisols and Vertisols are the dominant soil orders. These soils are clayey or loamy, and are very deep. They are somewhat poorly drained to very poorly drained.
Rolling Soft Shale Plain	Northwestern South Dakota	Entisols and Mollisols are the dominant soil orders. These soils are clayey or loamy and range from shallow to very deep. They are typically moderately well drained to somewhat excessively drained.
Rolling Till Prairie	Northeastern South Dakota	Mollisols is the dominant soil order. These loamy soils range from very poorly drained to well drained, and are very deep.
Southern Black Glaciated Plains	Southeastern South Dakota	Mollisols is the dominant soil order. These loamy or clayey soils are typically well drained to poorly drained, and are very deep.

MLRA Name	Region of State	Soil Characteristics
Southern Dark Brown Glaciated Plains	Central South Dakota	Inceptisols and Mollisols are the dominant soil orders. These very deep soils are clayey or loamy, and moderately well drained to well drained.
Southern Rolling Pierre Shale Plains	Southern South Dakota	Entisols, Inceptisols, Mollisols, and Vertisols are the dominant soil orders. These clayey or loamy soils are typically well drained and range from shallow to very deep.
Till Plains	Eastern South Dakota	Mollisols is the dominant soil order. These very deep and loamy or clayey soils range from poorly drained to well drained.

Source: (NRCS, 2006)

[a] Alfisols: "Soils found in semiarid to moist areas that are formed from weathering processes that leach clay minerals and other constituents out of the surface layer and into the subsoil. They are productive for most crop, are primarily formed under forest or mixed vegetative cover, and make up nearly 10 percent of the world's ice-free land surface." (NRCS, 2015d)

[b] Mollisols: "Soils that have a dark colored surface horizon relatively high in content of organic matter. They are base rich throughout and quite fertile. Mollisols form under grass in climates that have a moderate to pronounced seasonal moisture deficit." (NRCS, 2015d)

[c] Loamy Soil: "[A soil] that combines [sand, silt, and clay] in relatively equal amounts." (Purdue University Consumer Horticulture, 2006)

[d] Entisols: "Soils that show little to no pedogenic horizon development. They occur in areas of recently deposited parent materials or in dunes, steep slopes, or flood plains where erosion or deposition rates are faster than rate of soil development. They make up nearly 16 percent of the world's ice-free land surface." (NRCS, 2015d)

[e] Inceptisols: "Soils found in semiarid to humid environments that exhibit only moderate degrees of soil weathering and development. They have a wide range of characteristics, can occur in a wide variety of climates, and make up nearly 17 percent of the world's ice-free land surface." (NRCS, 2015d)

[f] Vertisols: "Vertisols have a high content of expanding clay minerals. They undergo pronounced changes in volume with changes in moisture, and have cracks that open and close periodically, and that show evidence of soil movement. Vertisols transmit water very slowly, have undergone little leaching, and tend to be high in natural fertility. They make up about 2 percent of the world's ice-free land surface." (NRCS, 2015d)

15.1.2.4. Soil Suborders

Soil suborders are part of the soil taxonomy (a system of classification used to make and interpret soil surveys). Soil orders are the highest level in the taxonomy;[16] there are 12 soil orders in the world and they are characterized by both observed and inferred[17] properties, such as texture, color, temperature, and moisture regime. Soil suborders are the next level down, and are differentiated within an order by soil moisture and temperature regimes, as well as dominant physical and chemical properties (NRCS, 2015e). The STATSGO2[18] soil database identifies 17 different soil suborders in South Dakota (NRCS, 2015a). Figure 15.1.2-2 depicts the distribution of the soil suborders, and Table 15.1.2-3 provides a summary of the major physical-chemical characteristics of the various soil suborders found.

[16] Taxonomy: "A formal representation of relationships between items in a hierarchical structure" (USEPA, 2013b).
[17] "Soil properties inferred from the combined data of soil science and other disciplines (e.g., soil temperature and moisture regimes inferred from soil science and meteorology)." (NRCS, 2015g)
[18] STATSGO2 is the Digital General Soil Map of the United States that shows general soil association units across the landscape of the nation. Developed by the National Cooperative Soil Survey, STATSGO2 supersedes the State Soil Geographic (STATSGO2) dataset.

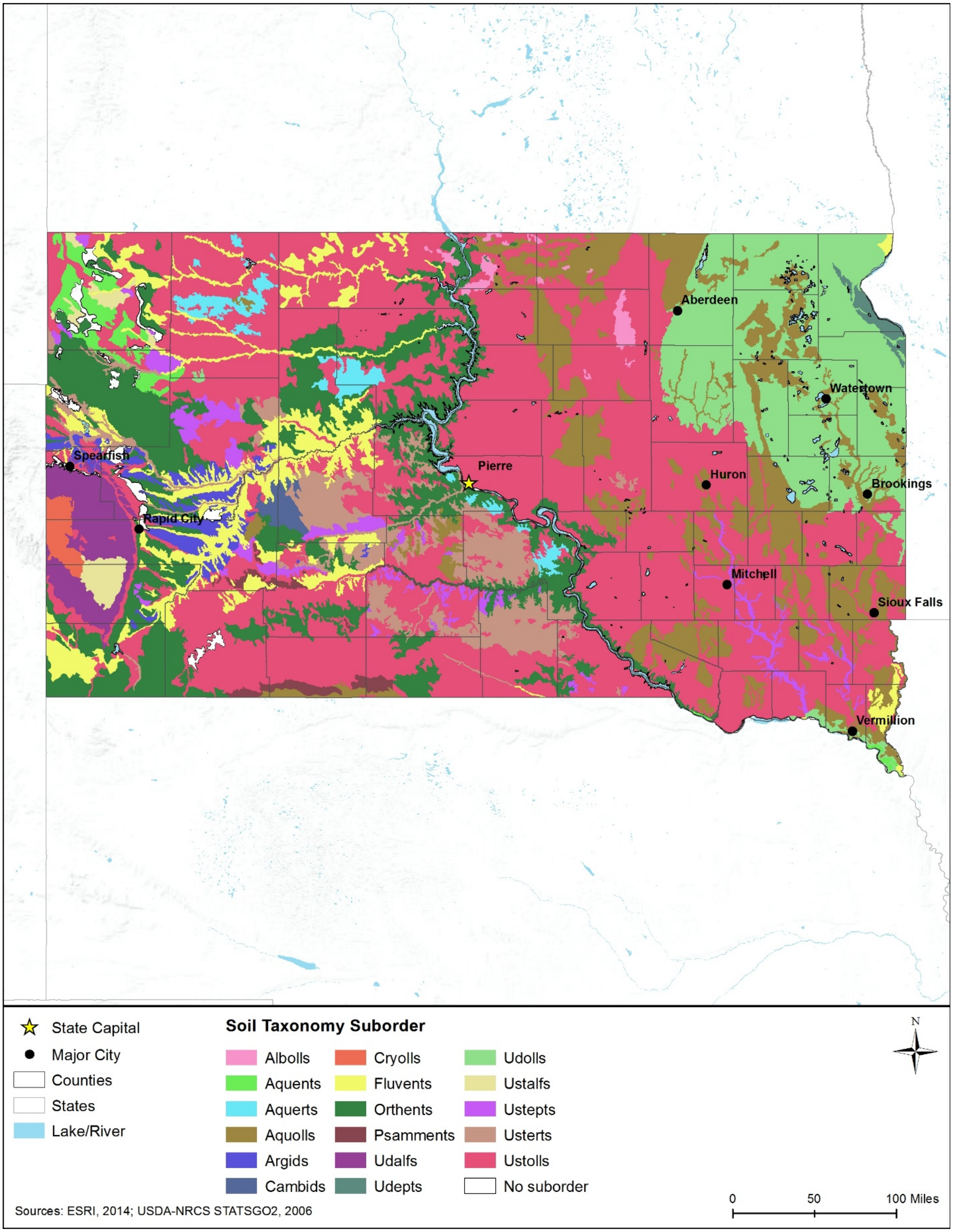

Figure 15.1.2-2: South Dakota Soil Taxonomy Suborders

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Table 15.1.2-3: Major Characteristics of Soil Suborders[a] Found in South Dakota, as depicted in Figure 15.1.2-2

Soil Order	Soil Suborder	Ecological Site Description	Soil Texture	Slope (%)	Drainage Class	Hydric Soil[b]	Hydrologic Group	Runoff Potential	Permeability[c]	Erosion Potential	Compaction and Rutting Potential	Limitation for Construction
Mollisols	Albolls	Albolls have a fluctuating groundwater table, with gentle slopes. They supported grasses and shrubs, and are typically used as cropland.	Silt loam	0-1	Poorly drained	Yes	C, D	Medium, High	Low, Very Low	Medium to High, depending on slope	High, due to hydric soil and poor drainage conditions	Erosion and Compaction
Entisols	Aquents	Widely distributed, with some forming in sandy deposits, and most forming in recent sediments. Aquents support vegetation that tolerates either permanent or periodic wetness, and are mostly used for pasture, cropland, forest, or wildlife habitat.	Loam, Silty clay	0-2	Very poorly drained to poorly drained	Yes	D	High	Very Low	High	High, due to hydric soil and poor drainage conditions	Erosion and Compaction
Vertisols	Aquerts	Aquerts are wet soils, with prolonged moisture at or near the soil surface. Their natural vegetation includes savanna, grass, and forest. They are used as forest, rangeland, and cropland, although drainage for cropland can be difficult due to poor drainage.	Clay, Loam	0-1	Poorly drained	Yes	D	High	Very Low	High	High, due to hydric soil and poor drainage conditions	Erosion and Compaction
Mollisols	Aquolls	Aquolls support grass, sedge, and forb vegetation, as well as some forest vegetation. However, most have been artificially drained and utilized as cropland.	Clay, Clay loam, Fine sandy loam, Loam, Silt loam, Silty clay, Silty clay loam, Very fine sandy loam	0-4	Very poorly drained to moderately well drained	No, Yes	B, C, D	Medium, High	Moderate, Low, Very Low	Medium to High, depending on slope	High, due to hydric soil and poor drainage conditions	Erosion and Compaction
Aridisols	Argids	Argids are found in the western U.S.. They are primarily used as wildlife habitat or rangeland, although some can also be used as cropland, if irrigated.	Loam, Silty clay loam	0-20	Well drained	No	C, D	Medium, High	Low, Very Low	Medium to High, depending on slope	Low	Erosion
Aridisols	Cambids	Cambids are found in the western U.S., with little soil development. They are primarily used as wildlife habitat or rangeland, although some can also be used as cropland, if irrigated.	Silty clay	6-15	Well drained	No	C	Medium	Low	Medium	Low	Erosion
Mollisols	Cryolls	Cryolls are generally freely drained, cold weather soils. They are primarily used as rangeland, along with some forest and pasture. Forest, grass, or grass/shrub vegetation is supported with these soils.	Extremely cobbly silty clay loam	0-10	Well drained	No	B	Medium	Moderate	Medium	Low	Erosion
Entisols	Fluvents	Fluvents are mostly freely drained soils that form in recently deposited sediments on floodplains, fans, and deltas along rivers and small streams. Unless protected by dams or levees, these soils frequently flood. Fluvents are normally utilized as rangeland, forest, pasture, or wildlife habitat, with some also used for cropland.	Clay, Fine sand, Fine sandy loam, Loam, Silt loam, Silty clay loam, Stratified fine sandy loam to clay, Stratified fine sandy loam to loam, Stratified loamy sand to sandy loam, Very gravelly loamy sand	0-25	Somewhat poorly drained to excessively drained	No	A, B, C, D	Low, Medium, High	High, Moderate, Low, Very Low	Low to High, depending on slope	Low	Erosion
Entisols	Orthents	Orthents are commonly found on recent erosional surfaces and are used primarily as rangeland, pasture, or wildlife habitat.	Channery clay, Clay, Loam, Loamy very fine sand, Silty clay, Silty clay loam, Weathered bedrock	0-60	Well drained	No	B, C, D	Medium, High	Moderate, Low, Very Low	Medium to High, depending on slope	Low	Erosion

Soil Order	Soil Suborder	Ecological Site Description	Soil Texture	Slope (%)	Drainage Class	Hydric Soil[b]	Hydrologic Group	Runoff Potential	Permeability[c]	Erosion Potential	Compaction and Rutting Potential	Limitation for Construction
Entisols	Psamments	Psamments are sandy in all layers. In some arid and semi-arid climates, they are among the most productive rangeland soils, and are primarily used as rangeland, pasture, or wildlife habitat. Those Psamments that are nearly bare are subject to wind erosion and drifting, and do provide good support for wheeled vehicles.	Fine sand, Loamy fine sand, Sand, Weathered bedrock	0-24	Somewhat excessively drained to excessively drained	No, Yes	A	Low	High	Low	High, due to hydric soil and poor drainage conditions	Compaction
Alfisols	Udalfs	Udalfs have an udic (humid or subhumid climate) moisture regime, and are believed to have supported forest vegetation at some time during development.	Channery loam, Extremely gravelly clay loam, Sandy loam	6-60	Well drained	No	B	Medium	Moderate	Medium	Low	Erosion
Inceptisols	Udepts	Udepts have an udic or perudic (saturated with water long enough to cause oxygen depletion) moisture regime, and are mainly freely drained. Most of these soils currently support or formerly supported forest vegetation, with mostly coniferous forest in the northwest and mixed or hardwood forest in the east. Some also support shrub or grass vegetation, and in addition to being used as forest, some have been cleared and are used as cropland or pasture.	Stratified sandy loam to silt loam	12-20	Well drained	No	B	Medium	Moderate	Medium	Low	Erosion
Mollisols	Udolls	Udolls are found in humid climates. They are more or less freely drained, and have historically supported tall grass prairie. They are used as pasture or rangeland, and as cropland in areas with little slope.	Clay, Clay loam, Fine sand, Fine sandy loam, Gravelly sand, Loam, Loamy sand, Sandy clay loam, Sandy loam, Silt loam, Silty clay, Silty clay loam, Stratified sandy loam to silty clay loam	0-40	Moderately well drained to somewhat excessively drained	No	A, B, C, D	Low, Medium, High	High, Moderate, Low, Very Low	Low to High, depending on slope	Low	Erosion
Alfisols	Ustalfs	Ustalfs are primarily used for grazing or cropland, and they also support savanna and grassland vegetation. They are found in areas with a marked dry season.	Extremely gravelly loam, Loam, Loamy fine sand	0-40	Moderately well drained to well drained	No	B, D	Medium, High	Moderate, Very Low	Medium to High, depending on slope	Low	Erosion
Inceptisols	Ustepts	Ustepts are freely drained soils, typically used as pasture or cropland, although some support forest, rangeland, and wildlife habitat.	Channery silty clay, Clay loam, Loamy fine sand, Silt loam, Silty clay, Weathered bedrock	0-40	Well drained	No	B, D	Medium, High	Moderate, Very Low	Medium to High, depending on slope	Low	Erosion
Vertisols	Usterts	Usterts are soils with low permeability, and receive low rainfall amounts. They support grasses and forbs, and are mostly used for rangeland or cropland. However, but due to their low permeability, they typically need to be artificially drained if irrigated, to prevent standing water and a buildup of salinity.	Clay, Silty clay, Unweathered bedrock, Weathered bedrock	0-15	Well drained	No	D	High	Very Low	High	Low	Erosion

Soil Order	Soil Suborder	Ecological Site Description	Soil Texture	Slope (%)	Drainage Class	Hydric Soil[b]	Hydrologic Group	Runoff Potential	Permeability[c]	Erosion Potential	Compaction and Rutting Potential	Limitation for Construction
Mollisols	Ustolls	Ustolls typically supported grass and forest vegetation, and are now primarily used as cropland or rangeland. They are generally freely drained, and found in subhumid to semiarid climates. Areas with drought are common, and blowing soil can be an issue.	Clay, Clay loam, Fine sand, Fine sandy loam, Loam, Loamy coarse sand, Loamy fine sand, Loamy sand, Sandy clay loam, Sandy loam, Silt loam, Silty clay, Silty clay loam, Stratified fine sandy loam to silty clay loam, Stratified loamy fine sand to silty clay loam, Stratified sand to gravelly sand, Stratified silt loam to silty clay loam, Stratified very fine sand to silt loam, Very fine sandy loam, Very gravelly sand, Weathered bedrock	0-40	Somewhat poorly drained to excessively drained	No	A, B, C, D	Low, Medium, High	High, Moderate, Low, Very Low	Low to High, depending on slope	Low	Erosion

Sources: (NRCS, 2015a) (NRCS, 1999)

[a] Soil suborders constitute a broad range of soil types. Within each suborder, the range of soil types may have a range of properties across the state, which result in multiple values being displayed in the table for that suborder.

[b] Hydric Soil: "A soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (NRCS, 2015c). Soil suborders constitute a broad range of soil types. Within each soil suborder, some specific soil types are hydric while others are not.

[c] Based on Runoff Potential, described in Section 15.1.2.5.

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15.1.2.5. Runoff Potential

The NRCS uses four Hydrologic Soil Groups (A, B, C, and D) that are based on a soil's runoff potential.[19] Group A generally has the smaller runoff potential, whereas Group D generally has the greatest (Purdue University, 2015). Table 15.1.2-3 (above) provides a summary of the runoff potential for each soil suborder in South Dakota.

Group A. Sand, loamy sand or sandy loam soils. This group of soils has "low runoff potential and high infiltration rates[20] even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sands or gravels and have a high rate of water transmission" (Purdue University, 2015). Fluvents, Psamments, Udolls, and Ustolls fall into this category in South Dakota.

Group B. Silt loam or loam soils. This group of soils has a "moderate infiltration rate when thoroughly wetted and consists chiefly or moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures" (Purdue University, 2015). This group has medium runoff potential. Aquolls, Cryolls, Fluvents, Orthents, Udalfs, Udepts, Udolls, Ustalfs, Ustepts, and Ustolls fall into this category in South Dakota.

Group C. Sandy clay loam soils. This group of soils has "low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine structure" (Purdue University, 2015). This group has medium runoff potential. Albolls, Aquolls, Argids, Cambids, Fluvents, Orthents, Udolls, and Ustolls fall into this category in South Dakota.

Group D. Clay loam, silty clay loam, sandy clay, silty clay, or clay soils. This group of soils "has the highest runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface and shallow soils over nearly impervious material" (Purdue University, 2015). Albolls, Aquents, Aquerts, Aquolls, Argids, Fluvents, Orthents, Udolls, Ustalfs, Ustepts, Usterts, and Ustolls fall into this category in South Dakota.

15.1.2.6. Soil Erosion

"Soil erosion involves the breakdown, detachment, transport, and redistribution of soil particles by forces of water, wind, or gravity" (NRCS, 2015f). Water-induced erosion can transport soil into streams, rivers, and lakes, degrading water quality and aquatic habitat. When topsoil is eroded, organic material is depleted, creating loss of nutrients available for plant growth. Soil particles displaced by wind can cause human health problems and reduced visibility, creating a

[19] Classifying soils is highly generalized and it is challenging to differentiate orders as soil properties can change with distance or physical properties. The soil suborders are at a high level, therefore soil groups may be found in multiple hydrologic groups within a state, as composition, topography, etc. varies in different areas.
[20] Infiltration Rate: "The rate at which a soil under specified conditions absorbs falling rain, melting snow, or surface water expressed in depth of water per unit time." (FEMA, 2010)

public safety hazard (NRCS, 1996a). Table 15.1.2-3 provides a summary of the erosion potential for each soil suborder in South Dakota. Soils with medium to high erosion potential in South Dakota include those in the Albolls, Aquents, Aquerts, Aquolls, Argids, Cambids, Cryolls, Fluvents, Orthents, Udalfs, Udepts, Udolls, Ustalfs, Ustepts, Usterts, and Ustolls suborders, which are found throughout most of the state (Figure 15.1.2-2).

15.1.2.7. Soil Compaction and Rutting

Soil compaction and rutting occurs when soil layers are compressed by machinery or animals, which decreases both open spaces in the soil, as well as water infiltration rates (NRCS, 1996b). Moist soils with high soil water content are most susceptible to compaction and rutting, as they lack the strength to resist deformation caused by pressure. When rutting occurs, channels form and result in downslope erosion (USFWS, 2009). Other characteristics that factor into compaction and rutting risk include soil composition (i.e., low organic soil is at increased risk of compaction), amount of pressure exerted on the soil, and repeatability (i.e., the number of times the pressure is exerted on the soil). Machinery and vehicles that have axle loads greater than ten tons can cause soil compaction of greater than 12 inches depth (NRCS, 1996b), (NRCS, 2003).

Loam, sandy loam, and sandy clay loam soils are most susceptible to compaction and rutting; silt, silty clay, silt loam, silty clay loam, and clay soils are more resistant to compaction and rutting (NRCS, 1996b). Table 15.1.2-3 provides a summary of the compaction and rutting potential for each soil suborder in South Dakota. Soils with the highest potential for compaction and rutting in South Dakota include those in the Albolls, Aquents, Aquerts, Aquolls, and Psamments suborders, which are found throughout the state (Figure 15.1.2-2).

15.1.3. Geology

15.1.3.1. Definition of the Resource

The U.S. Geological Survey (USGS) is the primary government organization responsible for the nation's geological resources. USGS defines geology as an interdisciplinary science with a focus on the following aspects of earth sciences: geologic hazards and disasters, climate variability and change, energy and mineral resources, ecosystem and human health, and ground-water availability. Several of these elements are discussed in other sections of this Programmatic Environmental Impact Study (PEIS), including Water Resources (Section 15.1.4), Human Health and Safety (Section 15.1.15), and Climate Change (Section 15.1.14).

This section covers the six aspects of geology most relevant to the Proposed Action and Alternatives:

- Section 15.1.3.3, Environmental Setting: Physiographic Regions and Provinces[21, 22]
- Section 15.1.3.4, Surface Geology

[21] Physiographic regions: Areas of the United States that share commonalities based on topography, geography, and geology (Fenneman, 1916).
[22] Physiographic provinces: Subsets within physiographic regions (Fenneman, 1916).

- Section 15.1.3.5, Bedrock Geology[23]
- Section 15.1.3.6, Paleontological Resources[24]
- Section 15.1.3.7, Fossil Fuel and Mineral Resources
- Section 15.1.3.8, Geologic Hazards[25]

15.1.3.2. Specific Regulatory Considerations

The Proposed Action must meet the requirements of NEPA and other applicable laws and regulations. A list of applicable state laws and regulations is included in Table 15.1.3-1.

Table 15.1.3-1: Relevant South Dakota Geology Laws and Regulations

State Law / Regulation	Regulatory Agency	Applicability
South Dakota Building Codes	Local Agencies	Check county, city, and other local agencies for seismic guidelines in building codes (City of Rapid City, 2015) (City of Sioux Falls, South Dakota, 2015).

15.1.3.3. Environmental Setting: Physiographic Regions and Provinces

The concept of physiographic regions was created in 1916 by geologist Nevin Fenneman as a way to describe areas of the U.S. based on common landforms (i.e., not climate or vegetation). Physiographic regions are areas of distinctive topography, geography, and geology. Important physiographic differences between adjacent areas are generally due to differences in the nature or structure of the underlying rocks. There are eight distinct physiographic regions in the continental U.S.: 1) Atlantic Plain, 2) Appalachian Highlands, 3) Interior Plains, 4) Interior Highlands, 5) Laurentian Upland, 6) Rocky Mountain System, 7) Intermontane Plateaus, and 8) Pacific Mountain System. Regions are further sub-divided into physiographic provinces based on differences observed on a local scale (Fenneman, 1916).

South Dakota has one major physiographic region: Interior Plains (Central Lowland and Great Plains Provinces). The locations of these regions are shown in Figure 15.1.3-1 and their general characteristics summarized in the following subsections.

[23] Bedrock: Solid rock beneath the soil and superficial rock (USGS, 2015d).
[24] Paleontology: "Study of life in past geologic time based on fossil plants and animals" (USGS, 2015e).
[25] Geologic Hazards: Any geological or hydrological process that poses a threat to people and/or their property, which includes but is not limited to volcanic eruptions, earthquakes, landslides, sinkholes, mudflows, flooding, and shoreline movements (NPS, 2013).

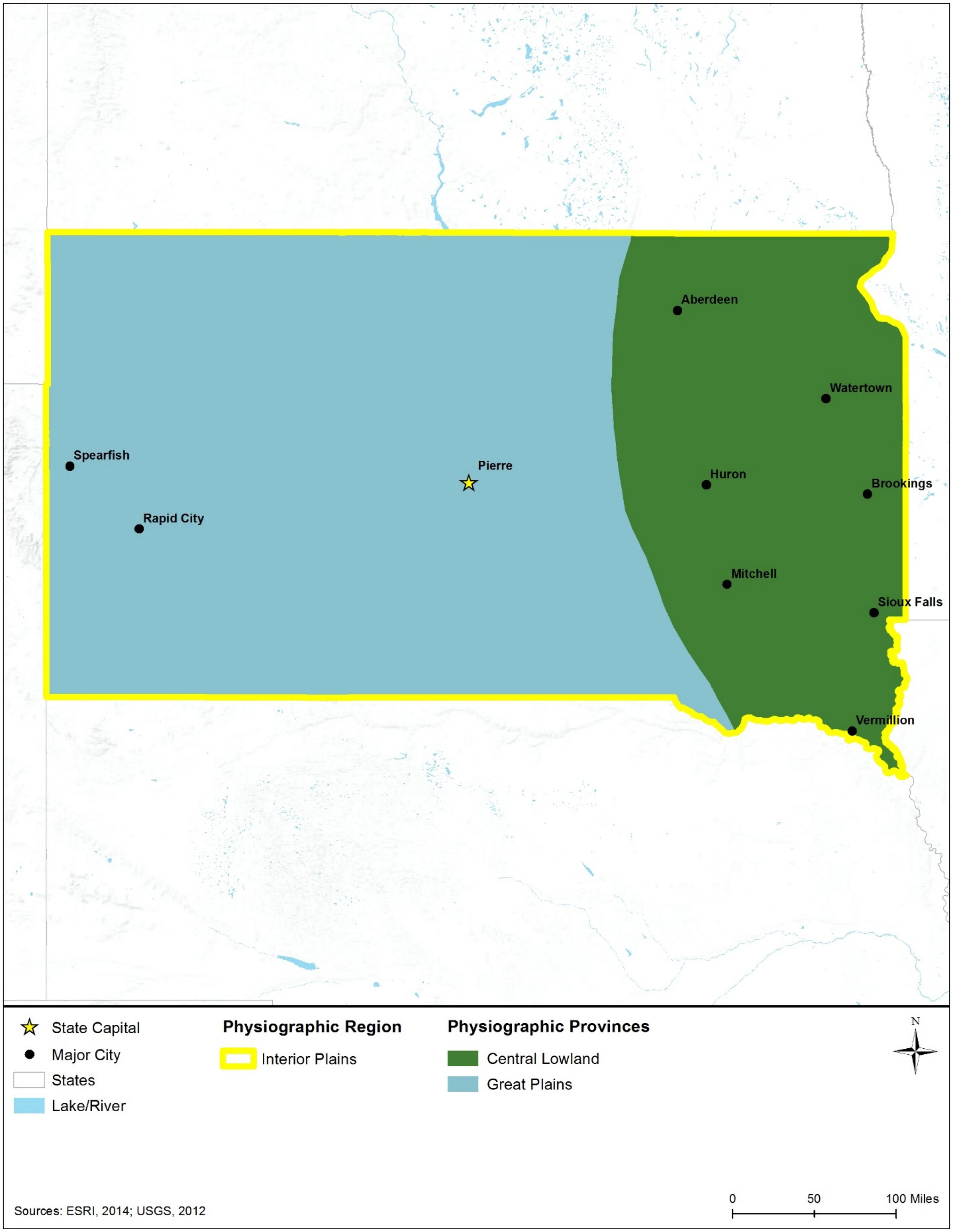


Figure 15.1.3-1: Physiographic Regions and Provinces of South Dakota

Interior Plains Region

The Interior Plains Region extends across much of the interior of the U.S., roughly between the western edge of the Appalachian Highlands (near states including Ohio, Tennessee, and Alabama), and the eastern edge of the Rocky Mountain System (including states such as Montana, Wyoming, and Colorado) (Fenneman, 1916). Metamorphic[26] and igneous[27] rocks dating to the Precambrian Era (older than 542 million years ago (MYA)) underlie the entire region.[28] There is minimal topographic relief throughout the region, except for the Black Hills of South Dakota. During the Mesozoic Era, much of the Interior Plains were covered by the oceans, resulting in the formation of sedimentary rocks,[29] which lie on top of the Precambrian basement rocks. Erosion from the Rocky Mountains to the west and the Ozark/Ouachita Mountains to the east, also contributed to the formation of sandstone,[30] mudstone,[31] and clay (USGS, 2014a).

As reported above, the Interior Plains Region within South Dakota is composed of two physiographic provinces: the Central Lowland and Great Plains (USGS, 2003b).

<u>Central Lowland Province</u> – As the largest physiographic province in the U.S., the Central Lowland Province includes more than 580,000 square miles and encompasses the eastern portion of the Interior Plains Region. Much of the region is flat lying and is at about 2,000 feet above sea level (ASL) (NPS, 2014). Within South Dakota, the Central Lowland includes the eastern portion of the state, east of the Missouri River. Within northeastern South Dakota, "the Minnesota River-Red River Lowlands are a broad, flat valley where the north-south continental divide runs between Big Stone Lake and Lake Traverse. Lake Traverse waters flow north eventually draining into Hudson Bay, while Big Stone Lake drains south. Just to the west, the Coteau des Prairies rise sharply about 900 feet above the River Lowlands. The Coteau is the most conspicuous landform in eastern South Dakota. This highland plateau is drained by the Big Sioux River and contains many glacial lakes." (South Dakota State Historical Society, 2015)

<u>Great Plains Province</u> – The Great Plains Province includes more than 450,000 square miles and encompasses the western portion of the Interior Plains Region. The Great Plains, which are the second largest physiographic province in the U.S., are noted for their flat topography that is interrupted by the occasional hill or lowland (USGS, 2003b) (NPS, 2014). Within South Dakota, the Great Plains includes much of the western portion of the state, west of the Missouri River. "The Northern Plateaus area near Slim Buttes in northwestern South Dakota features a landscape of isolated, eroded buttes. The central section of west river country is covered by the rolling

[26] Metamorphic Rock: "A rock that has undergone chemical or structural changes produced by increase in heat or pressure, or by replacement of elements by hot, chemically active fluids." (USGS, 2015f)
[27] Igneous Rock: "Rocks that solidified from molten or partly molten material, such as magma." (USGS, 2005)
[28] For consistency, this PEIS uses the University of California Berkeley Geologic Time Scale for all of the FirstNet PEIS state documents. Time scales differ among universities and researchers; FirstNet utilized a consistent time scale throughout, which may differ slightly from other sources. (University of California Museum of Paleontology, 2011)
[29] Sedimentary Rock: "Rocks that formed from pre-existing rocks or pieces of once-living organisms. They form from deposits that accumulate on the Earth's surface. Sedimentary rocks often have distinctive layering or bedding." (USGS, 2014c)
[30] Sandstone: "Sedimentary rock made mostly of sand-sized grains." (USGS, 2015f)
[31] Mudstone: "A very fine-grained sedimentary rock formed from mud." (USGS, 2015f)

Pierre Hills." South Dakota's Black Hills constitute a major interruption to the otherwise flat topography of the Great Plains Province throughout the state. "The Black Hills are a mountainous region about 125 miles long and 60 miles wide… Elevations in the Hills range from 3,700 to 7,200 feet [ASL]." At 7,242 feet ASL, Harney Peak is the highest point within the Black Hills. (South Dakota State Historical Society, 2015)

15.1.3.4. Surface Geology

Surficial geology is characterized by materials such as till,[32] sand and gravel, or clays that overlie bedrock. The surface terrain, which can include bedrock outcrops, provides information on the rock compositions and structural characteristics of the underlying geology. Because surface materials are exposed, they are subject to physical and chemical changes due to weathering from precipitation (rain and snow), wind and other weather events, and human-caused interference. Depending on the structural characteristics and chemical compositions of the surface materials, heavy precipitation can cause slope failures,[33] subsidence,[34] and erosion (Thompson, 2015).

The surface geology of much of eastern South Dakota was influenced by periodic glaciation events between 1.5 MYA and 10,000 years ago. Glaciers impacted areas as far west as the Missouri River within South Dakota. Glacial till, which generally ranges between 40 and 700 feet thick, covers much of eastern South Dakota. "Landforms left behind by the glaciers are still evident in eastern South Dakota. Moraines[35] are long ridges that form rugged upland areas. Kettles[36] are low-lying wetlands or sloughs. Some larger kettles formed pothole lakes such as Lake Poinsett" (South Dakota State Historical Society, 2015). The James River Valley in northeastern South Dakota is a relic surficial feature from the Pleistocene glaciation (SD DENR, 2015). Western South Dakota was largely unaffected by the Pleistocene glaciation. Surface materials in this area of the state consist of eroded materials from the underlying geologic units and alluvial deposits (Figure 15.1.3-2). Figure 15.1.3-2 depicts the main surficial composition of South Dakota.

[32] Till: "An unsorted and unstratified accumulation of glacial sediment, deposited directly by glacier ice. Till is a heterogeneous mixture of different sized material deposited by moving ice (lodgement till) or by the melting in-place of stagnant ice (ablation till). After deposition, some tills are reworked by water" (USGS, 2013b).
[33] Slope failure, also referred to as mass wasting, is the downslope movement of rock debris and soil in response to gravitational stresses.
[34] Subsidence: "Gradual settling or sudden sinking of the Earth's surface owing to subsurface movement of earth materials" (USGS, 2000).
[35] Moraine: "A hill-like pile of rock rubble located on or deposited by a glacier. An end moraine forms at the terminus of a glacier. A terminal moraine is an end moraine at the farthest advance of the glacier. A lateral moraine forms along the sides of a glacier." (USGS, 2015f)
[36] Kettle: "A depression that forms in an outwash plain or other glacial deposit by the melting of an in-situ block of glacier ice that was separated from the retreating glacier-margin and subsequently buried by glacier sedimentation. As the buried ice melts, the depression enlarges." (USGS, 2013b)

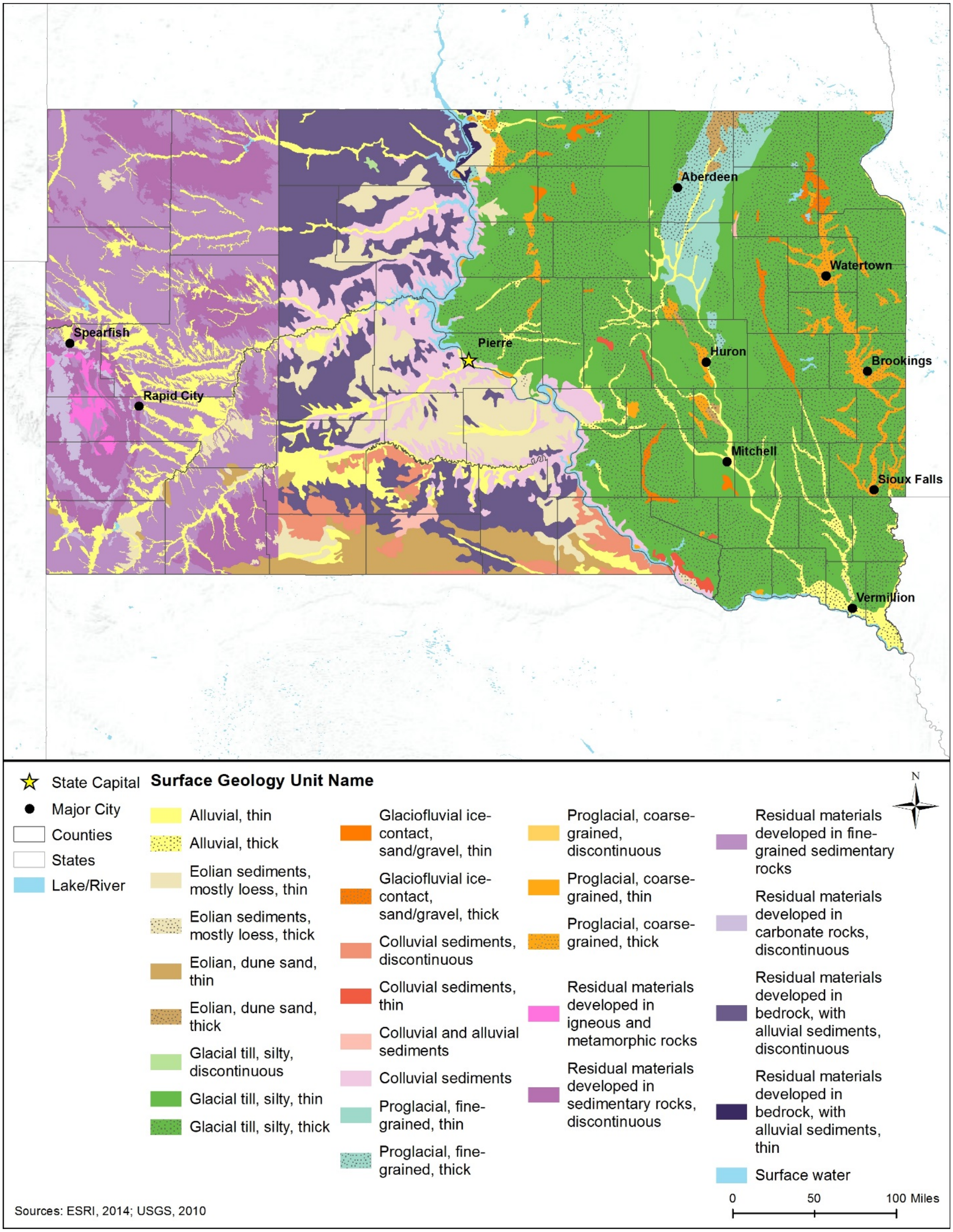


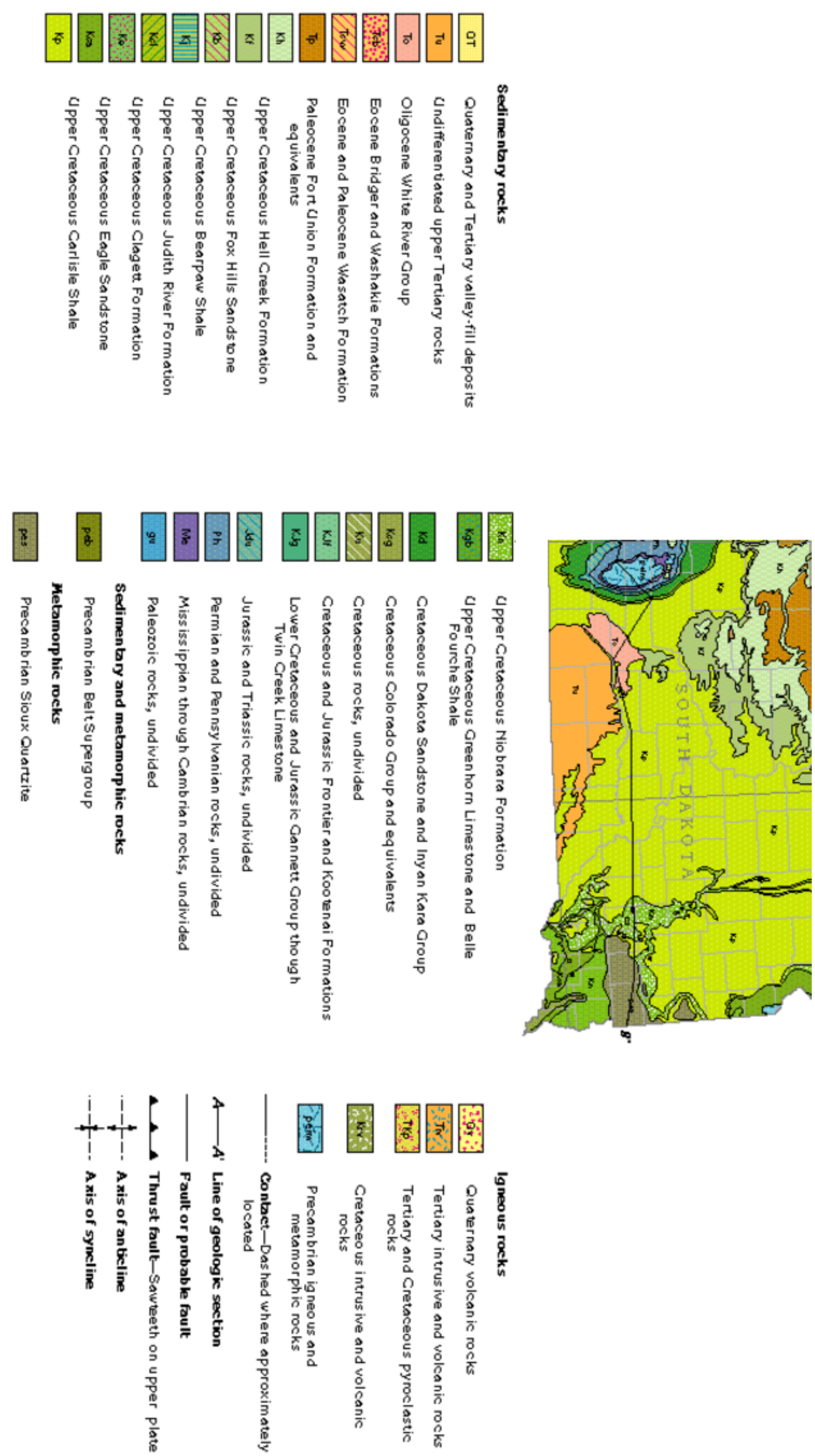
Figure 15.1.3-2: Generalized Surface Geology for South Dakota

15.1.3.5. Bedrock Geology

Bedrock geology analysis, and "the study of distribution, position, shape, and internal structure of rocks" (USGS, 2015a) reveals important information about a region's surface and subsurface characteristics (i.e., three-dimensional geometry), including dip (slope of the formation),[37] rock composition, and regional tectonism.[38] These structural aspects of bedrock geology are often indicative of regional stability, as it relates to geologic hazards such as landslides, subsidence, earthquakes, and erosion (New Hampshire Department of Environmental Services, 2014).

Much of eastern South Dakota is underlain by Cretaceous (151 to 66 MYA) shale[39] and sandstone units, although they are generally buried beneath glacial deposits. In southern South Dakota, Tertiary (66 to 2.6 MYA) sedimentary rocks "consist mostly of semi consolidated to unconsolidated deposits of clay and sand, with some gravel" (USGS, 1996). Portions of southwestern South Dakota are often referred to as the Badlands – "regions with little rainfall and high erosion… The state's most famous badlands are the White River Badlands in southwestern South Dakota. They are 100 miles long and 3 [to] 5 miles wide… The badlands were formed by debris from erosion as the Rocky Mountains and Black Hills rose" (South Dakota State Historical Society, 2015). "The sedimentary rock layers of Badlands National Park were deposited during the late Cretaceous Period (67 to 75 [MYA]) throughout the Late Eocene (34 to 37 [MYA]) and Oligocene Epochs (26 to 34 [MYA])… The Badlands erode at the rapid rate of about one inch per year. Evidence suggests that they will erode completely away in another 500,000 year" (NPS, 2015b). Figure 15.1.3-3 shows the general bedrock geology for South Dakota.

[37] Dip: "A measure of the angle between the flat horizon and the slope of a sedimentary layer, fault plane, metamorphic foliation, or other geologic structure" (NPS, 2000).
[38] Tectonism: "Structure forces affecting the deformation, uplift, and movement of the earth's crust." (USGS, 2015f)
[39] Shale: "Sedimentary rock derived from mud. Commonly finely laminated (bedded). Particles in shale are commonly clay minerals mixed with tiny grains of quartz eroded from pre-existing rocks." (USGS, 2015f)



Source: (USGS, 1996)

Figure 15.1.3-3: Generalized Bedrock Geology for South Dakota

15.1.3.6. Paleontological Resources

South Dakota State Fossil *Triceratops*

Source: (SD DENR, 2015s)

A shallow sea covered South Dakota during the Ordovician (488 to 444 MYA) and Carboniferous (359 to 299 MYA) Periods, leaving behind fossils from cephalopods,[40] brachiopods,[41] and corals. By the Permian Period (299 to 251 MYA), sea levels dropped in South Dakota. Permian fish fossils have been recorded in western South Dakota. By the Jurassic Period (200 to 146 MYA), a marine sea again covered the state, leaving behind fossils from ammonites,[42] crinoids,[43] clams, and starfish. As seas retreated in the late Jurassic Period, sedimentary rocks formed, which contain plant and dinosaur fossils, as well as the giant sauropod *Camarasaurus.* By the Cretaceous (146 to 66 MYA) Period, a large sea covered the state, resulting in the preservation of marine invertebrates and reptiles, aquatic birds, dinosaurs, small mammals, and terrestrial birds (Paleontology Portal, 2015). The *Triceratops*, South Dakota's State Fossil, lived during the Mesozoic Era (Bjork & Tallman, 2015). Fossils from Cenozoic (66 MYA to present) mammals and tortoises have been recorded in the southwestern part of the state. During the Quaternary Period (2.6 MYA to present), glaciers advanced and retreated across eastern South Dakota, with fossils of horses, mastodons, mammoths, and bison recorded from this time (Paleontology Portal, 2015).

15.1.3.7. Fossil Fuel and Mineral Resources

Oil and Gas

In 2014, South Dakota produced nearly 1.8M barrels of oil, which accounted for less than 1 percent of total nationwide production. During August 2015, South Dakota ranked 25th nationwide among oil producing states. Most of South Dakota's current oil production is occurring in Harding County in the northwestern corner of the state (EIA, 2014a). The Red River Formation is the state's most productive geologic unit for oil (SD DENR, 2012).

In 2014, South Dakota produced 15,307 million cubic feet of natural gas, which accounted for 0.1 percent of the total nationwide production. Among natural gas producing states, South Dakota ranked 23rd nationwide in total gas production. The majority of South Dakota's natural gas comes from the Pierre Shale. (EIA, 2014a)

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[40] Cephalopods: “Any mollusk of the class Cephalopoda, which includes squids, octopus, and ammonites. They are characterized by the tentacles attached to their heads.” (Smithsonian Institution, 2016)

[41] Brachiopods: “Any member of a phylum of marine invertebrate animals called Brachiopoda. Brachiopods are sessile, bivalved organisms, but are more closely related to the colonial Bryozoa than the bivalved mollusks. Brachiopod diversity peaked in the Paleozoic, but some species survive.” (Smithsonian Institution, 2016)

[42] Ammonites: “Any member of an extinct suborder of cephalopod mollusks (Ammonoidea) with chambered, spiral shells that thrived in the Mesozoic and Paleozoic oceans.” (Smithsonian Institution, 2016)

[43] Crinoids: “The common name for any echinoderm of the class Crinoidea, including sea lilies, feather stars, etc. Crinoids are common fossils in the Paleozoic and persist to the present. Many species have stalks and radiating arms and feed on particles in the water column.” (Smithsonian Institution, 2016)

Minerals

In 2015, South Dakota's total nonfuel mineral production value was $293M, which ranked 41st nationwide (in terms of dollar value). This level of production accounted for less than 0.4 percent of total nationwide production. As of 2015, South Dakota's leading nonfuel mineral commodities were gold, portland cement, crushed stone, construction sand and gravel, and lime (USGS, 2016). In 2011, South Dakota ranked first nationwide in production of dimension stone.[44] Other minerals produced in the state are bentonite, common clay and shale, dimension stone, feldspar, gemstones, gypsum, mica, silver, and iron ore (USGS, 2015b).

15.1.3.8. Geologic Hazards

The three major geologic hazards of concern in South Dakota are earthquakes, landslides, and subsidence. Volcanoes were considered but not analyzed further for South Dakota because they do not occur in South Dakota and therefore do not present a hazard to the state (USGS, 2015c). A discussion of each geologic hazard is included below.

Earthquakes

While the potential for damaging earthquakes in South Dakota is minimal, South Dakota regularly experiences minor to moderate earthquakes, particularly in the southern portion of the state. Between 1973 and March 2012, there were 30 earthquakes of a magnitude 2.5 (on the Richter scale) or greater in South Dakota (USGS, 2014b). Earthquakes are the result of large masses of rock moving against each other along fractures called faults. Earthquakes occur when landmasses on opposite sides of a fault suddenly slip past each other; the grinding motion of each landmass sends out shock waves. The vibrations travel through the Earth and, if they are strong enough, they can damage manmade structures on the surface. Earthquakes can produce secondary flooding impacts resulting from dam failure (USGS, 2012).

Significant South Dakota Earthquake – 1911

The largest recorded earthquake in South Dakota during the last 150 years occurred near the town of Huron in the eastern portion of the state. The earthquake measured 4.5 on the Richter scale and was felt over an area of 100,000 square kilometers. (USGS, 2016a) (USGS, 2016b)

The shaking due to earthquakes can be significant many miles from its point of origin depending on the type of earthquake and the type of rock and soils beneath a given location. Crustal earthquakes, the most common, typically occur at depths of 6 to 12 miles; these earthquakes typically do not reach magnitudes higher than 6.0 on the Richter scale.[45] Subduction zone earthquakes occur where Earth's tectonic plates collide. "When tectonic plates collide, one plate slides beneath the other, where it is reabsorbed into the mantle of the earth" (Oregon Department of Geology, 2015). Subduction zones are found off the coast of Washington, Oregon, and

[44] Dimension Stone: "Natural rock material quarried for the purpose of obtaining blocks or slabs that meet specifications as to size (width, length, and thickness) and shape." (USGS, 2016c)
[45] The Richter scale is a numerical scale for expressing the magnitude of an earthquake on the basis of seismograph oscillations. The more destructive earthquakes typically have magnitudes between about 5.5 and 8.9; the scale is logarithmic and a difference of one represents an approximate thirtyfold difference in magnitude (USGS, 2014d).

Alaska (USGS, 2014). Convergence boundaries between two tectonic plates can result in earthquakes with magnitudes that exceed 8.0 on the Richter scale (Oregon Department of Geology, 2015). South Dakota is far from any convergence boundaries.

Figure 15.1.3-4 depicts the seismic risk throughout South Dakota; the box surrounding the range of colors shows the seismic hazards in the state. The map indicates levels of horizontal shaking (measured in Peak Ground Acceleration) that have a 2 percent chance of being exceeded in a 50-year period. Units on the map are measured in terms of acceleration due to gravity (percent g). Most pre-1965 buildings are likely to experience damage with exceedances of 10 percent g. Post-1985 buildings (in California) have experienced only minor damage with shaking of 60 percent g. (USGS, 2010)

"South Dakota is somewhat more seismically active than other areas in the Northern Great Plains, although the earthquake magnitudes have been relatively minor to date. At least two mechanisms may be important in generation of the earthquakes. These include initiation of movement along preexisting fractures due to crustal plate movements or movements due to glacial rebound" (South Dakota Office of Emergency Management, 2014). Earthquakes in South Dakota occur most often along the eastern side of the Black Hills, in the southwestern corner of the state. USGS estimates that there is a 10 percent risk that South Dakota will experience a magnitude 5.1 or greater, earthquake, in any one 50-year period. (South Dakota Office of Emergency Management, 2014)

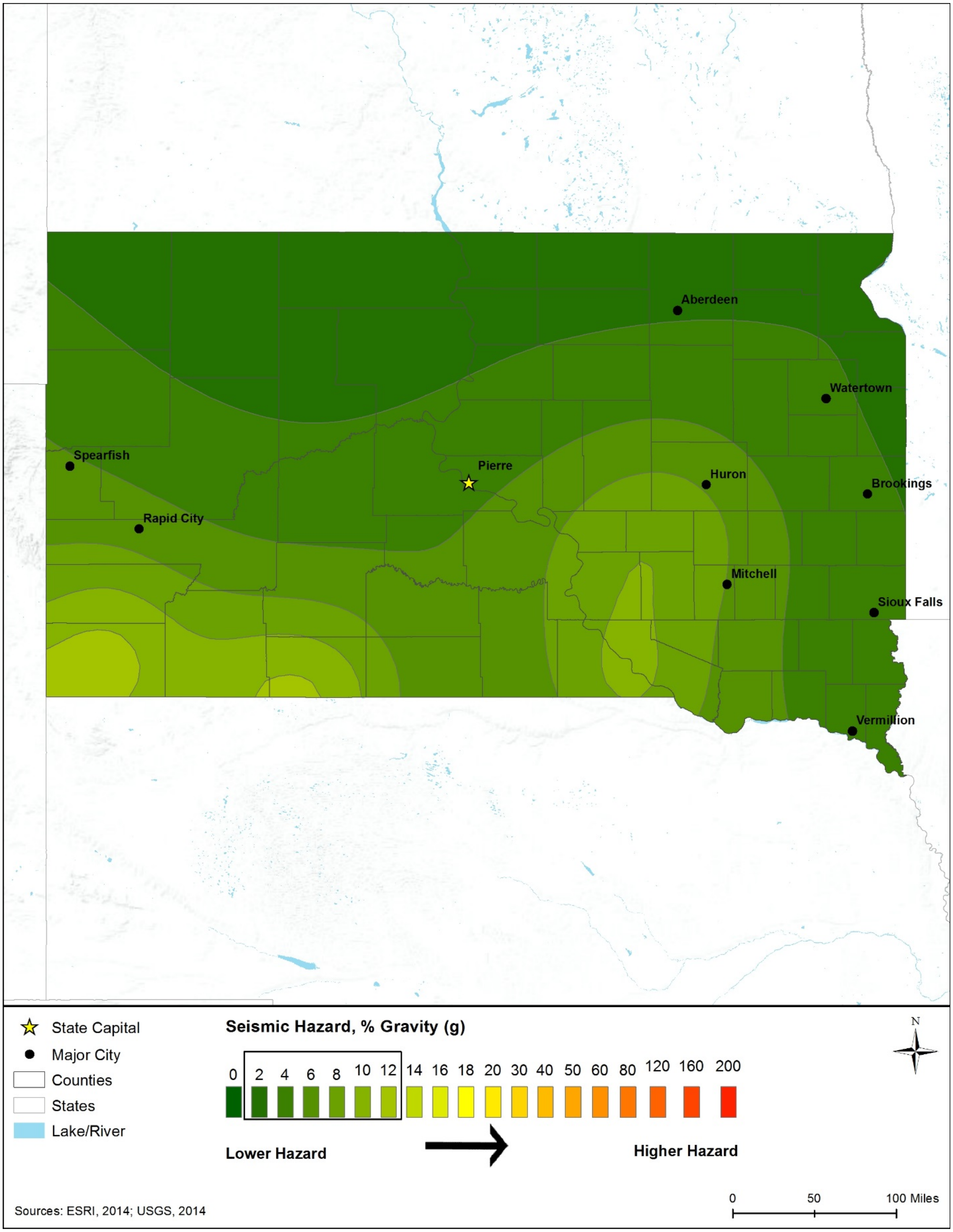

Figure 15.1.3-4: South Dakota 2014 Seismic Hazard Map

Landslides

Portions of western South Dakota are at moderate to high risk of experiencing landslide events. "The term 'landslide' describes many types of downhill earth movements, ranging from rapidly moving catastrophic rock avalanches and debris flows in mountainous regions to more slowly moving earth slides and other ground failures" (USGS, 2003a). Geologists use the term "mass movement" to describe a great variety of processes such as rock fall, creep, slump, mudflow, earth flow, debris flow, and debris avalanche regardless of the time scale (USGS, 2003a).

Landslides can be triggered by a single severe storm or earthquake, causing widespread damage in a short period. Most landslide events are triggered by water infiltration that decomposes and loosens rock and soil, lubricates frictional surfaces, adds weight to an incipient landslide, and imparts buoyancy to the individual particles. Intense rainfall, rapid snowmelt, freeze/thaw cycles, earthquakes, volcanic eruptions, and human alterations to the natural landscape can trigger mass land movements. Large landslides can dam rivers or streams, and cause both upstream and downstream flooding (USGS, 2003a).

South Dakota is most susceptible to landslides in areas of the state along, and to the west of, the Missouri River. According to the South Dakota Multi-Hazard Mitigation Plan, "it can be assumed that landslides [in South Dakota] will occur occasionally in the future, typically during wet climate cycles or following heavy rains, but in limited areas of the state. Along the Missouri River, "two of the larger slides [recorded in South Dakota] were the U.S. 12 Missouri River Crossing at Mobridge and the U.S. 212 Missouri River crossing at Forest City" (South Dakota Office of Emergency Management, 2014). Further to the west, areas underlain by shale, siltstone,[46] and sandstone, are susceptible to landslides where they possess high clay content. Collectively, these areas are referred to as the Broken Lands (Radbruch-Hall, et al., 1982). Figure 15.1.3-5 shows landslide incidence and susceptibility throughout South Dakota.

[46] Siltstone: "A sedimentary rock made mostly of silt-sized grains." (USGS, 2015f)

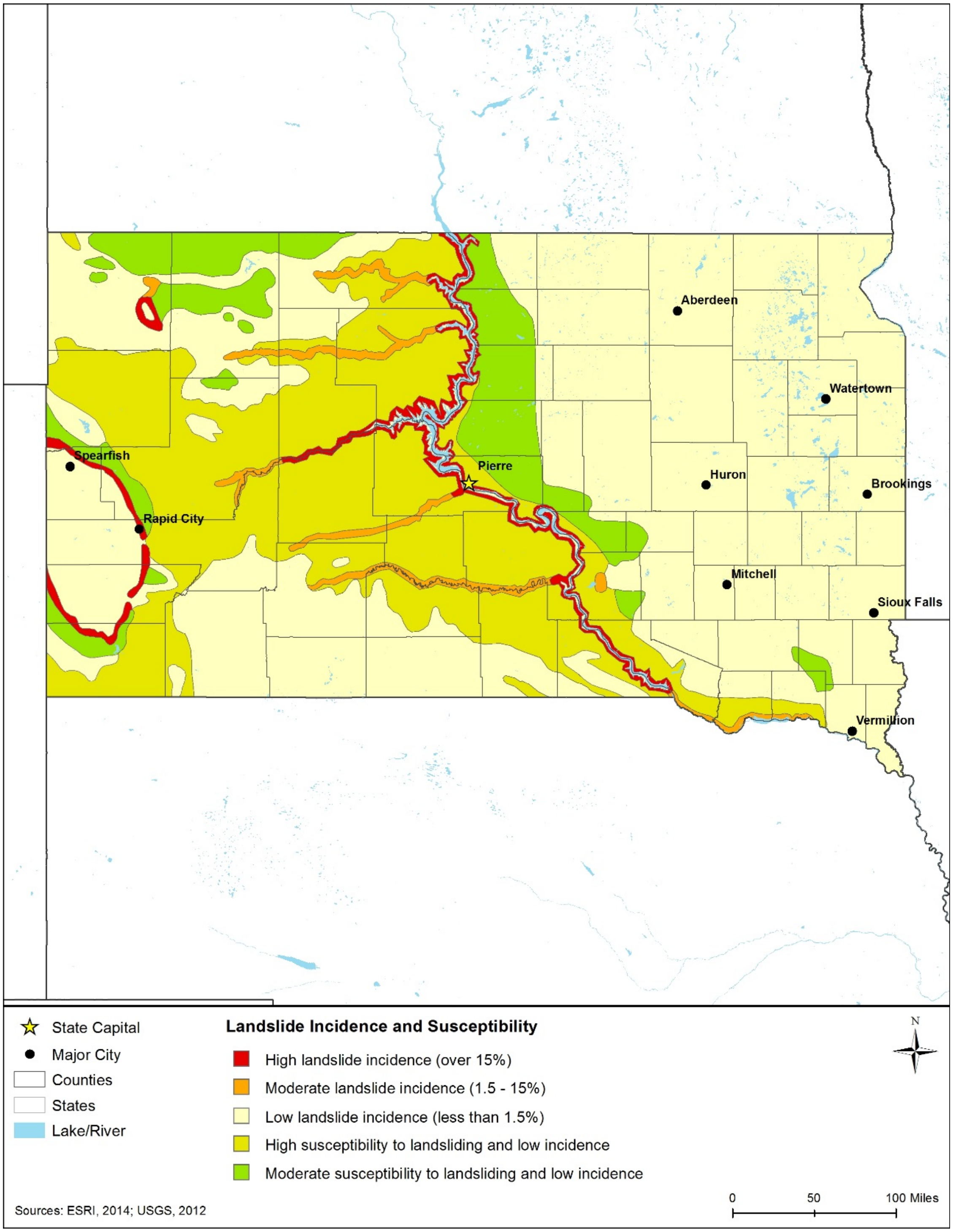

Figure 15.1.3-5: South Dakota Landslide Incidence and Susceptibility Hazard Map[47]

[47] Susceptibility hazards not indicated in Figure 15.1.3-5 where same or lower than incidence. Susceptibility to landslides is defined as the probable degree of response of areal rocks and soils to natural or artificial cutting or loading of slopes, or to anomalously high precipitation. High, moderate, and low susceptibility are delimited by the same percentages used in classifying the incidence of landslides. Some generalization was necessary at this scale, and several small areas of high incidence and susceptibility were slightly exaggerated. (USGS, 2014e)

Land Subsidence

Land subsidence is a “gradual settling or sudden sinking of the Earth's surface owing to subsurface movement of earth materials” (USGS, 2000). Nationwide, the primary causes of land subsidence are attributed to aquifer system compaction, drainage of organic soils, underground mining, sinkholes, and thawing permafrost. More than 80 percent of subsidence in the U.S. is a consequence of over-withdrawal of groundwater. In many aquifers, which are subsurface soil layers through which groundwater moves, water is pumped from pore spaces between sand and gravel grains. If an aquifer is confined by layers of silt or clay, which do not transport groundwater, the lowered water pressure in the sand and gravel causes slow drainage of water from the clay and silt beds. The reduced water pressure compromises support for the clay and silt beds, causing them to collapse on one another. The effects of this compression are seen in the lowering of the land surface elevation, which is permanent (USGS, 2000).

Land subsidence can result in altered stream elevations and slopes; detrimental effects to infrastructure and buildings; and collapse of wells due to compaction of aquifer sediments. Subsided areas can become more susceptible to inundation, both during storm events and non-events. Lowered terrain is more susceptible to inundation during high tides. Additionally, land subsidence can affect vegetation and land use (USGS, 2013a).

In South Dakota, a significant cause of land subsidence is the collapse of karst. Karst is common in areas underlain by carbonate[48] rocks, particularly in portions of eastern and western South Dakota. In southeastern South Dakota, the Niobrara Formation contains fractures that measure 1,000 feet in length and up to 100 feet in depth. Fractures are generally within 1,000 feet of one another. In western South Dakota, “caves and open fissures are common in the Paleozoic carbonate rocks. A few caves contain many miles of passages but most of the cave passages and fissures in the Black Hills area only extend up to 3,000 feet in length and are generally less than 150 feet in depth (South Dakota Office of Emergency Management, 2014). Figure 15.1.3-6 shows the location of areas in South Dakota that are susceptible to land subsidence due to karst topography.

[48] Carbonate: “A sedimentary rock made mainly of calcium carbonate ($CaCO_3$). Limestone and dolomite are common carbonate sedimentary rocks.” (USGS, 2015f)

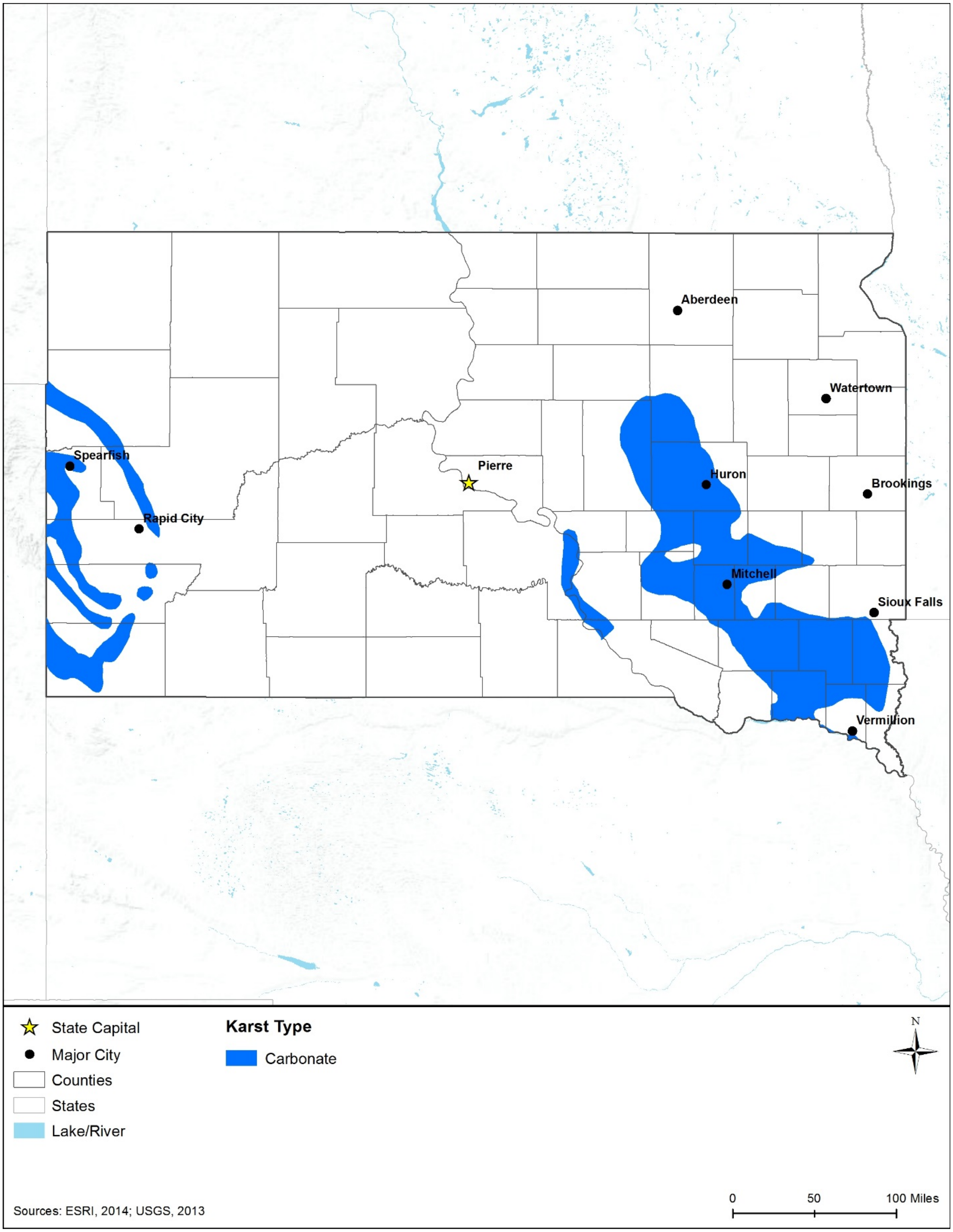

Figure 15.1.3-6: Areas Susceptible to Subsidence due to Karst Topography in South Dakota

15.1.4. Water Resources

15.1.4.1. Definition of the Resource

Water resources are defined as all surface waterbodies and groundwater systems including streams, rivers, lakes, canals, ditches, estuarine waters, floodplains, aquifers, and other aquatic habitats (wetlands are discussed separately in Section 15.1.5). These resources can be grouped into watersheds, which are defined as areas of land whose flowing water resources (including runoff from rainfall) drain to a common outlet such as a river or ocean. The value and use of water resources are influenced by the quantity and quality of water available for use and the demand for available water. Water resources are used for drinking, irrigation, industry, recreation, and as habitat for wildlife. Some water resources that are particularly pristine, sensitive, or of great economic value enjoy special protections under federal and state laws. An adequate supply of water is essential for human health, economic wellbeing, and ecological health. (USGS, 2014)

15.1.4.2. Specific Regulatory Considerations

Federal laws relevant to protecting the quality and use of water resources are summarized in Appendix C. Table 15.1.4-1 summarizes the major South Dakota laws and permitting requirements relevant to the state's water resources.

Table 15.1.4-1: Relevant South Dakota Water Laws and Regulations

State Law / Regulation	Regulatory Agency	Applicability
South Dakota Water Pollution Control Act	SD DENR	Regulates stormwater discharges from construction activities that disturb more than one acre of land. (USACE, 2012)
Nationwide Permit, South Dakota Regional Conditions	U.S. Army Corps of Engineers (USACE)	Regional conditions require pre-construction notification for regulated activities occurring within 100 feet of a natural spring; identification of possible impacts to aquatic resources by borrow sites; and minimum culvert widths/depths for stream crossings. Regional additions to the following general conditions apply spawning areas and suitable material. (USACE, 2012)
Clean Water Act (CWA)	SD DENR	In accordance with Section 401 of the CWA, activities that may result in a discharge to waters of the U.S. require a Water Quality Certification from SD DENR indicating that the proposed activity will not violate state water quality standards. (SD DENR, 2015a)
South Dakota Rule Number 41:04:03:05	South Dakota Department of Game, Fish and Parks (SDGFP)	Regulates construction, dredging, filling, and other similar activities occurring in a lake, lakebed, or lakeshore below the ordinary high-water mark. (SDGFP, 2015l)
South Dakota Common Law (SDCL) Chapter 46-2A	SD DENR	Governs domestic and commercial water right permitting for "cities towns, rural water systems, mobile home parks, subdivisions, and other common water distributions systems that pump more than 18 [gallons per minute]." (SD DENR, 2016)

15.1.4.3. Environmental Setting: Surface Water

Surface water resources are lakes, ponds, rivers, and streams. According to the SD DENR, South Dakota has about 98,009 miles of rivers and streams and 572 lakes, ponds, and reservoirs. These surface waters supply drinking water; provide aquatic and wildlife habitat; and support recreation, irrigation, agricultural uses, and manufacturing across the state. (SD DENR, 2014)

Watersheds

Watersheds, or drainage areas, consist of surface water and all underlying groundwater, and encompass an area of land that drains streams and rainfall to a common outlet (e.g., reservoir, bay). SD DENR divides South Dakota's waters (lakes, rivers, and streams) into 14 major watersheds, or drainage basins (Figure 15.1.4-1).[49] (SD DENR, 2015j)

The Missouri watershed is the largest watershed in South Dakota and includes the Missouri River. The watershed drains approximately 15,865 square miles of the central region of the state. The watershed extends from the northern border with North Dakota continues south into Nebraska. The James watershed is immediately east of the Missouri watershed. The James watershed is the second largest watershed in the state and drains 14,729 square miles from North Dakota to Nebraska. The Cheyenne watershed is in the western portion of the state and drains 9,732 square miles. (SD DENR, 2014)

Freshwater

As shown in Figure 15.1.4-1, there are 10 major rivers in South Dakota: Belle Fourche, Big Sioux, Cheyenne, Grand, James, Little Missouri, Missouri, Moreau, Vermillion, and White. The Missouri River extends from the border with North Dakota and flows south through the center of the state until Pierre where it flows in a southeasterly direction and then forms the southeastern border with Nebraska. The rest of South Dakota's major rivers flow into the Missouri River. The Belle Fourche, Cheyenne, Grand, Little Missouri, Moreau, and White rivers flow into the Missouri River from the west. The Big Sioux, James, and Vermillion rivers join the Missouri River in the southeastern corner of the state. There are 572 lakes, reservoirs, and ponds. The two major lakes in South Dakota are Lake Oahe and Lake Francis Case. Lake Oahe is near Pierre in the center of the state, and is formed by the Oahe Dam on the Missouri River. Lake Francis Case is formed by a dam on the Missouri River, in the southeastern corner of the state. These lakes provide flood control, hydroelectric power, recreation opportunities, irrigation water, and municipal water use. (SD DENR, 2014)

15.1.4.4. Sensitive or Protected Waterbodies

Wild and Scenic Rivers

The Missouri River, between Gavins Point Dam to Ponca State Park Hancock and from Fort Randall Dam to Lewis and Clark Lake, (Figure 15.1.4-1) is a federally designated a National

[49] Visit www.denr.sd.gov/dfta/wp/tmdlpage.aspx for information and additional maps about each South Dakota watershed location, size, and water quality.

Recreational River (National Wild and Scenic Rivers System, 2015b). At 98.0 miles, these two free-flowing designated segments of the Missouri River provide fish and wildlife habitat, recreation opportunities, and access to historic and cultural areas (NPS, 2015i).

15.1.4.5. Impaired Waterbodies

Several elements, including temperature, dissolved oxygen, suspended sediment, nutrients, metals, oils, observations of aquatic wildlife communities, and sampling of fish tissue, are used to evaluate water quality. Under Section 303(d) of the Clean Water Act, states are required to assess water quality and report a listing of impaired waters,[50] the causes of impairment, and probable sources. Table 15.1.4-2 summarizes the water quality of South Dakota's assessed major waterbodies by category, percent impaired, designated use,[51] cause, and probable sources. Figure 15.1.4-2 shows the Section 303(d) waters in South Dakota as of 2014.

As shown in Table 15.1.4-2, various sources affect South Dakota's waterbodies, causing impairments. Designed uses of the impaired waterbodies include aquatic life and recreation use. Probable sources of impairment include agricultural operations, sediment, and nutrients from surface water runoff, and fecal coliform and *E. coli* from livestock operations and wildlife. (USEPA, 2014) (SD DENR, 2014)

Table 15.1.4-2: Section 303(d) Impaired Waters of South Dakota, 2014

Water Type[a]	Amount of Waters Assessed[b] (Percent)	Amount Impaired (Percent)	Designated Uses of Impaired Waters	Top Causes of Impairment	Top Probable Sources for Impairment
Rivers and Streams	6.5%	59%	fish and wildlife propagation, domestic water supply, primary and secondary contact recreation, and irrigation	turbidity, salinity/chlorides, organic enrichment, and pathogens[c]	agriculture, wildlife, animal feeding and changes to stream flow
Lakes, Reservoirs and Ponds	19%	47%	fish and wildlife propagation, primary and secondary contact recreation, and irrigation	algal growth, temperature, mercury, organic enrichment, and pH/acidity	wildlife and unknown sources

Source: (USEPA, 2014)

[a] Some waters may be considered for more than one water type.

[b] South Dakota has not assessed all waterbodies within the state.

[c] Pathogen: a bacterium, virus, or other microorganism that can cause disease (USEPA, 2015a).

[50] Impaired waters: waterways that do not meet state water quality standards. Under the CWA, Section 303(d), states, territories, and authorized tribes are required to develop prioritized lists of impaired waters (USEPA, 2015a).
[51] Designated Use: an appropriate intended use by humans and/or aquatic life for a waterbody. Designated uses may include recreation, shellfishing, or drinking water supply (USEPA, 2015a).

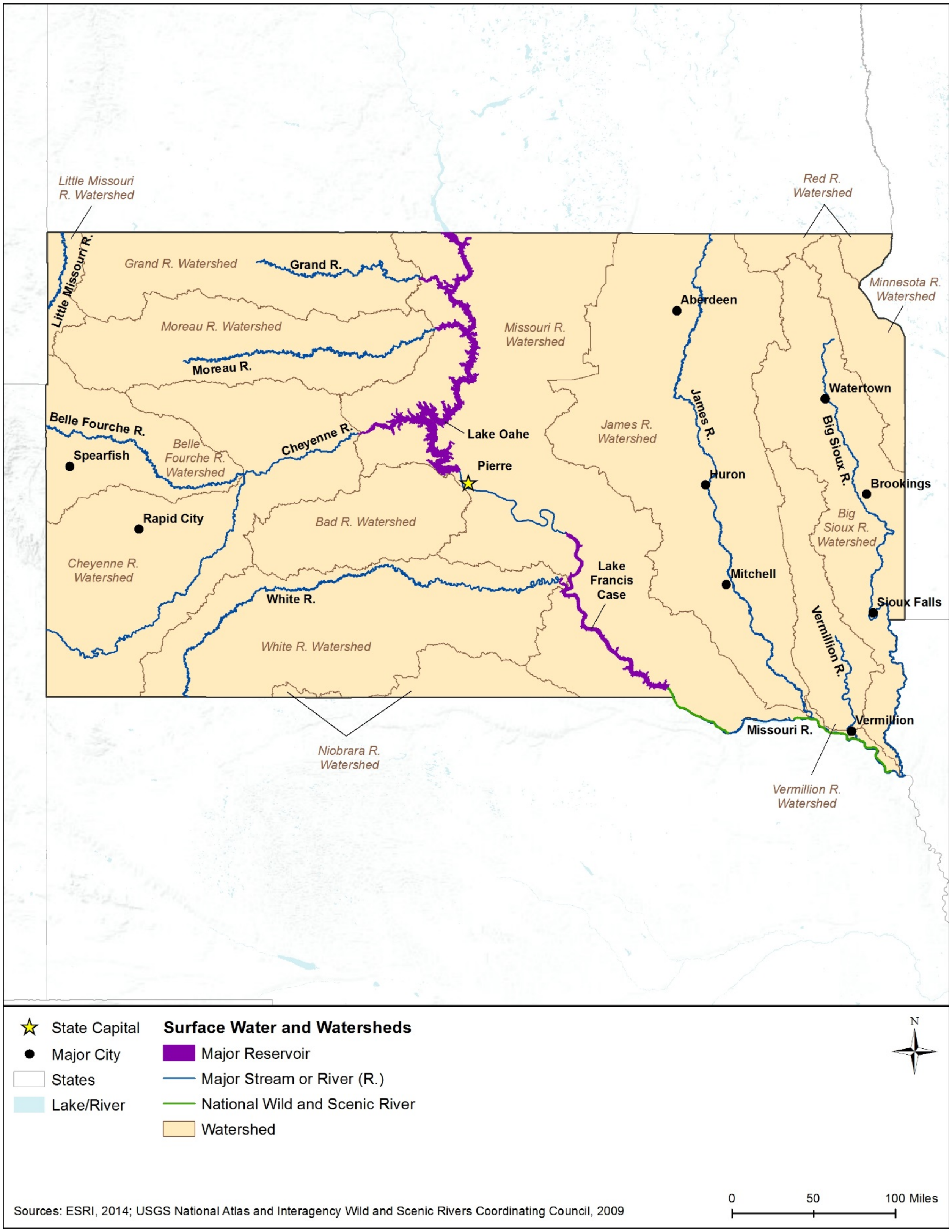

Figure 15.1.4-1: Major South Dakota Watersheds and Surface Waterbodies

To improve water quality, South Dakota has outlined the following goals: "identify water quality problems, set forth effective management programs for water pollution control, alleviate water quality problems, and achieve and preserve water quality for all intended uses." SD DENR has prioritized actions to address water quality issues in impaired waters based on the severity of pollution, the number of probable sources, and public support for water quality improvement. The leading sources of impairment are from nonpoint sources related to agricultural and livestock operations. SD DENR has established voluntary best management practices to reduce or prevent nonpoint source pollutants from entering waterbodies. (SD DENR, 2014)

15.1.4.6. Floodplains

The Federal Emergency Management Agency (FEMA) defines a floodplain or flood-prone area as "any land area susceptible to being inundated by water from any source" (44 Code of Federal Regulations [CFR] 59.1) (FEMA, 2000). Through FEMA's flood hazard mapping program, the agency identifies flood hazards and risks associated with the 100-year flood, which is defined as "a flood that has a 1 percent chance of occurring in any given year," to allow communities to prepare and protect against flood events (FEMA, 2013).

Floodplains provide suitable and sometimes unique habitat for a wide variety of plants and animals, and are typically more biologically diverse than upland areas due to the combination of both terrestrial and aquatic ecosystems. Vegetation along stream banks provides shade, which helps to regulate water temperature for aquatic species. During flood events, sediment and debris settle out and collect on the floodplain, enriching the soil with additional nutrients. Pollutants from floodwater runoff are also filtered by floodplain vegetation and soils; thereby improving water quality. Furthermore, floodplains protect natural and built infrastructure by providing floodwater storage, erosion control, water quality maintenance, and groundwater recharge. Historically, floodplains have been favorable locations for agriculture, aquaculture, and forest production due to the relatively flat topography and nearby water supply. Floodplains can also offer recreational activities, such as boating, swimming, and fishing, as well as hiking and camping (FEMA, 2014b).

Riverine and lake floodplains are the primary type of floodplains in South Dakota. They occur along rivers, streams, or lakes where overbank flooding may occur, inundating adjacent land areas. In mountainous areas, floodwaters can build and recede quickly, with fast moving and deep water. Flooding in these areas can cause greater damage than typical riverine flooding due to the high velocity of water flow, the amount of debris carried, and the broad area affected by floodwaters. Whereas, flatter floodplains may remain inundated for days or weeks, covered by slow-moving and shallow water (FEMA, 2014a).

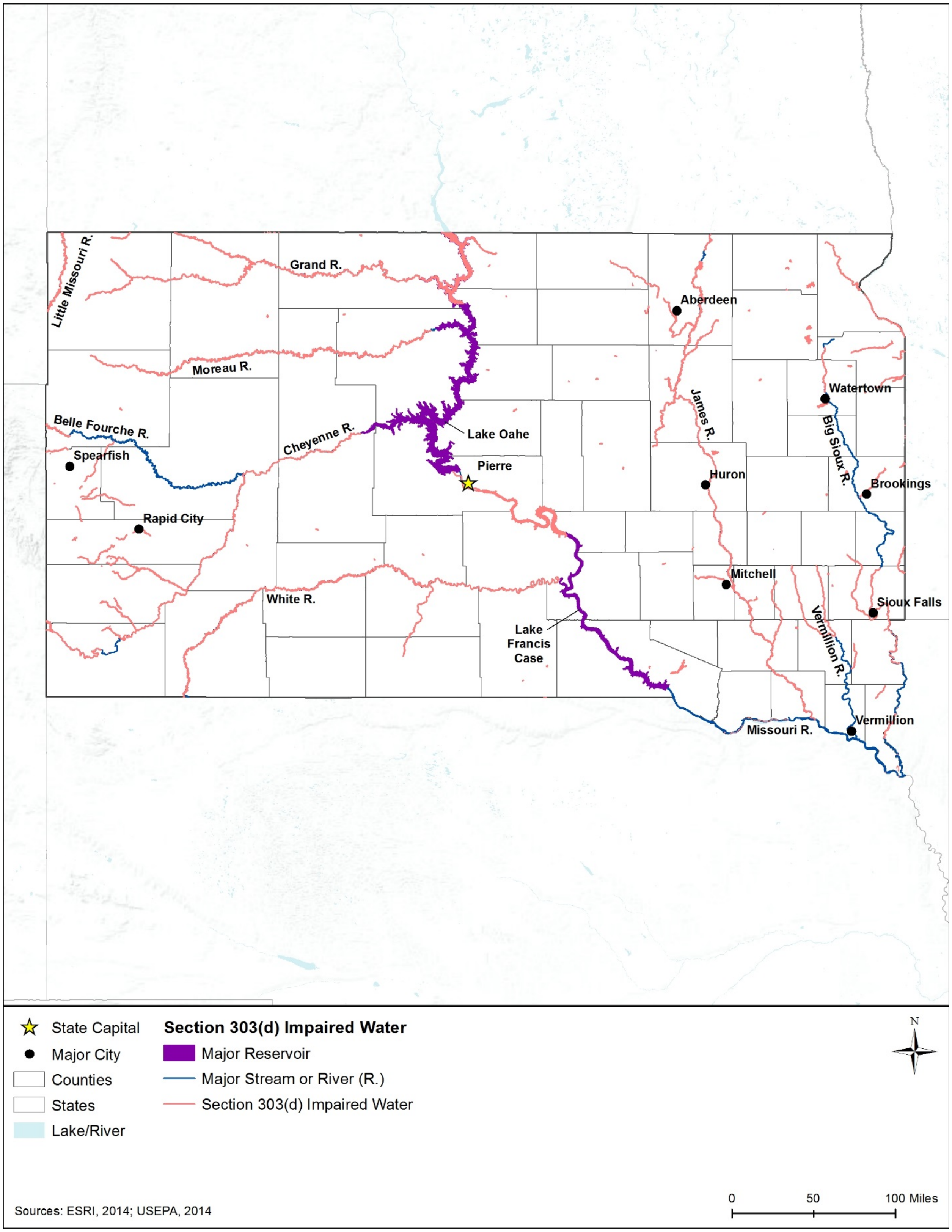

Figure 15.1.4-2: Section 303(d) Impaired Waters of South Dakota, 2014

Flooding is the leading cause for disaster declaration by the President in the U.S. and results in significant damage throughout the state annually (NOAA, 2015a). There are several causes of flooding in South Dakota, often resulting in loss of life and damage to property, infrastructure, agriculture, and the environment. These include severe and high intensity rain events, rapid snowmelt, debris and ice jams, and dam or levee failure (South Dakota Office of Emergency Management, 2014).

Although some areas, such as floodplains, are more prone to flooding than others, no area in the state is exempt from flood hazards. Based on historical flooding and flood disaster declarations, flood problems are most severe in the Big Sioux, James, Grand, Moreau, Cheyenne, White, and Bad watersheds (see Figure 15.1.4-1). The counties most vulnerable to future flood events based on potential losses are Minnehaha, Union, Yankton, Pennington, Codington, Lawrence, and Brown counties. A future flood in these counties could displace at least 1,000 people in each county. (South Dakota Office of Emergency Management, 2014)

Local communities often have floodplain management or zoning ordinances that restrict development within the floodplain. FEMA provides floodplain management assistance, including mapping of 100-year floodplain limits, to approximately 300 communities in South Dakota through the National Flood Insurance Program (NFIP) (FEMA, 2014c). Established to reduce the economic and social cost of flood damage by subsidizing insurance payments, the NFIP encourages communities “to adopt and enforce floodplain management regulations and to implement broader floodplain management programs” and allows property owners in participating communities to purchase insurance protection against losses from flooding (FEMA, 2015a). As an incentive, communities can voluntarily participate in the NFIP Community Rating System (CRS), which is a program that rewards communities by reducing flood insurance premiums in exchange for doing more than the minimum NFIP requirements for floodplain management. As of May 2014, South Dakota had four communities participating in the CRS (FEMA, 2014d).[52]

15.1.4.7. Groundwater

Groundwater systems are sources of water that result from precipitation infiltrating the ground surface, and include underground water that occupies pore spaces between sand, clay, or rock particles. An aquifer is a permeable geological formation that stores or transmits water to wells and springs. Groundwater is contained in either confined (bound by clays or nonporous bedrock) or unconfined (no layer to restrict the vertical movement of groundwater) aquifers (USGS, 1999). When the water table reaches the ground surface, groundwater will reappear as either streams, rivers, lakes, ponds, or wetlands. This exchange between surface water and groundwater is an important feature of the hydrologic (water) cycle.

[52] A list of the four CRS communities can be found in the most recent FEMA CRS report dated May 1, 2014 (FEMA, 2014d) and additional program information is available from FEMA’s NFIP CRS website (www.fema.gov/national-flood-insurance-program-community-rating-system).

South Dakota's principal aquifers consist of carbonate-rock[53] and sandstone aquifers,[54] and sand and gravel aquifers of alluvial and glacial origin.[55] Most of the drinking water systems in South Dakota rely on groundwater sources. Generally, the water quality of South Dakota's aquifers is suitable for drinking and daily water needs. (SD DENR, 1999)

Table 15.1.4-3 provides details on aquifer characteristics in the state; Figure 15.1.4-3 shows South Dakota's principal aquifers. There are no sole source aquifers (SSAs) within South Dakota (USEPA, 2011).

Table 15.1.4-3: Description of South Dakota's Principal Aquifers

Aquifer Type and Name	Location in State	Groundwater Quality
Aquifers of Alluvial and Glacial Origin These aquifers consist mainly of the sand, gravel, and bedrock eroded by the glaciers	Found in the eastern half of the state	Suitable for most uses. Water is generally soft and contains high concentrations of dissolved solids.
High Plains aquifer Unconsolidated and unconfined sediments in the upper portions of the aquifer and more consolidated and partly confined in the lower	Southcentral portion of South Dakota	Suitable for most uses with localized high concentrations of dissolved solids and sodium. High levels of selenium in some areas.
Lower Cretaceous aquifers Consolidated sandstone	Southeast corner and southwest portion of the state	Commonly contain highly mineralized water and high concentrations of dissolved solids.
Lower Tertiary aquifers Semi-consolidated and consolidated sandstone	Northwest portion of the state	Aquifer contains freshwater and are an important water source in spite of variable permeability.
Upper Cretaceous aquifers Consolidated sandstone	Northwest portion of the state	Freshwater only at shallow depths with highly mineralized water at higher depths.
Paleozoic aquifers Consist of sandstone, dolomite, and limestone	Southwest portion of the state	At depth, the water can have high concentrations of dissolved minerals and contain oil, gas, and brine. High salinity levels prohibit general use of the water.

Source: (Moody, Carr, Chase, & Paulson, 1986) (USGS, 1996)

[53] Carbonate-rock aquifers typically consist of limestone with highly variable water-yielding properties (some yield almost no water and others are highly productive aquifers) (Olcott, 1995a).
[54] Sandstone aquifers form from the conversion of sand grains into rock caused by the weight of overlying soil/rock. The sand grains are rearranged and tightly packed, thereby reducing or eliminating the volume of pore space, which results in low-permeability rocks such as shale or siltstone. These aquifer types are highly productive in many places and provide large volumes of water (Olcott, 1995b).
[55] Sand and gravel aquifers of alluvial (sand, silt, or gravel materials left by river waters) and glacial origin are highly productive aquifers in the northern part of the country, consisting of mostly sand and gravel deposits formed by melting glaciers (USGS, 2015g).

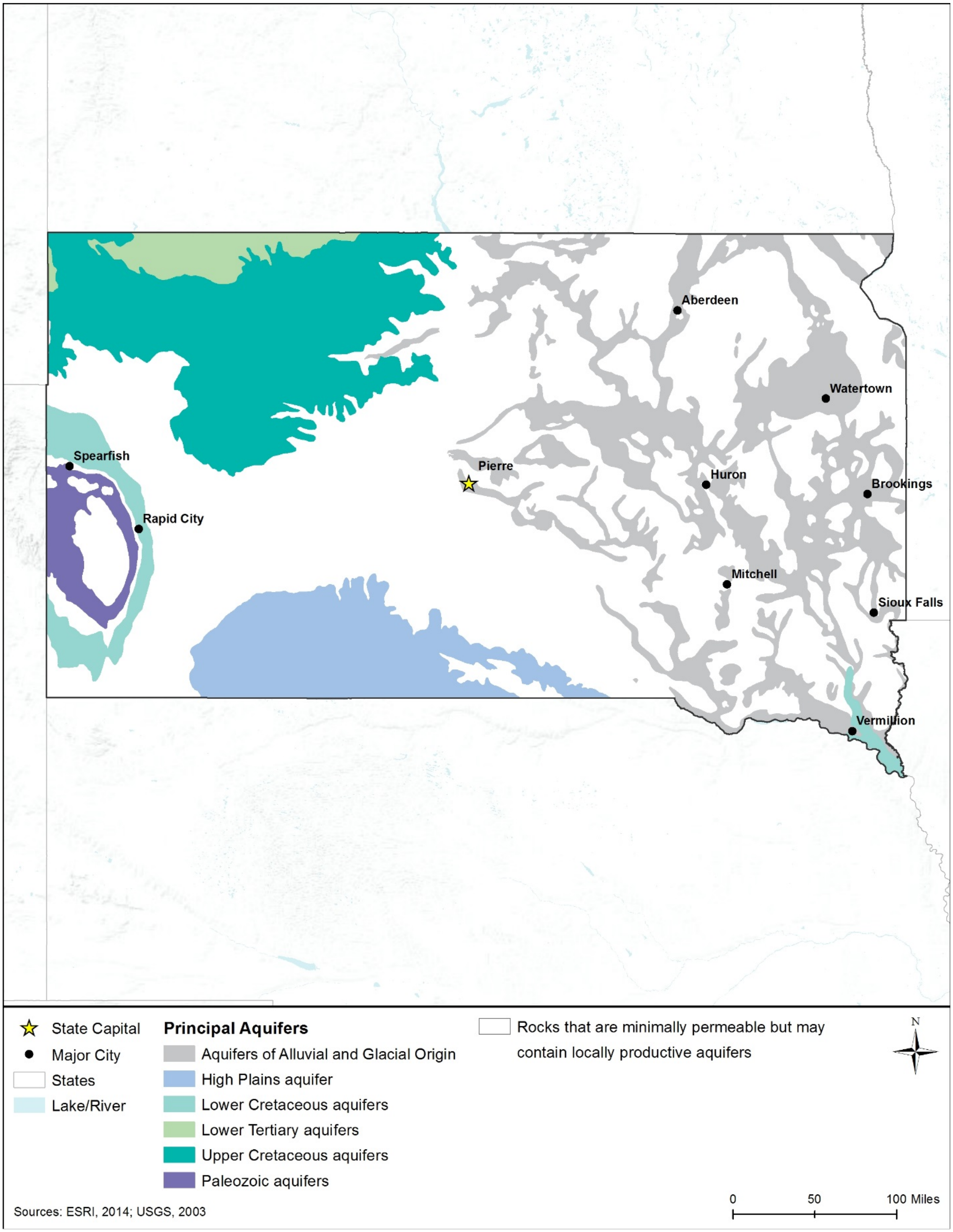

Figure 15.1.4-3: Principal Aquifers of South Dakota

15.1.5. Wetlands

15.1.5.1. Definition of the Resource

The CWA defines wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas" (40 CFR 230.3(t), 1993).

The USEPA estimates that "more than one-third of the U.S. threatened and endangered species live only in wetlands, and nearly half of such species use wetlands at some point in their lives" (USEPA, 1995). In addition to providing habitat for many plants and animals, wetlands also provide benefits to human communities. Wetlands store water during flood events, improve water quality by filtering polluted runoff, help control erosion by slowing water velocity and filtering sediments, serve as points of groundwater recharge, and help maintain base flow in streams and rivers. Additionally, wetlands provide recreation opportunities for people, such as hiking, bird watching, and photography. (USEPA, 1995)

15.1.5.2. Specific Regulatory Considerations

Appendix C describes the pertinent federal laws protecting wetlands in detail. Table 15.1.5-1 summarizes the major South Dakota state laws and permitting requirements relevant to the state's wetlands.

Table 15.1.5-1: Relevant South Dakota Wetland Laws and Regulations

State Law/ Regulation	Regulatory Agency	Applicability
CWA Section 404 permit, South Dakota regional requirements	USACE, Omaha District, Nationwide Permit (NWP)	Regulates discharges of dredged or fill material into waters of the U.S., including wetlands. (USACE, 2015)
		Regional conditions revoke all NWP for use in peatlands except for those regulating the following activities: maintenance; scientific measurement devices; response operations for oil and hazardous substances; aquatic habitat restoration, establishment, and enhancement; moist soil management for wildlife; completed enforcement actions; cleanup of hazardous and toxic waste; and repair of uplands damaged by discrete events. Pre-construction notification is required for the above listed activities. (USACE, 2012)
CWA Section 401	SD DENR	In accordance with Section 401 of the CWA, construction activities that may result in a discharge to waters of the U.S. (including wetlands) require a Water Quality Certification from SD DENR indicating that the proposed activity will not violate state water quality standards. (SD DENR, 2015a)

15.1.5.3. Environmental Setting: Wetland Types and Functions

The U.S. Fish and Wildlife Service's (USFWS) National Wetlands Inventory (NWI) mapping adopted a national Wetlands Classification Standard (WCS) that classifies wetlands according to shared environmental factors, such as vegetation, soils, and hydrology, as defined in Cowardin et al. (1979). The WCS includes five major wetland systems: Marine, Estuarine, Riverine, Lacustrine, and Palustrine (as detailed in Table 15.1.5-2). The first four of these include both wetlands and deepwater habitats but the Palustrine includes only wetland habitats. (USFWS, 2015a)

- The Marine System consists of open ocean, continental shelf, including beaches, rocky shores, lagoons, and shallow coral reefs. Normal marine salinity (saltiness) to hypersaline (more than 30 percent salty) water chemistry; minimal influence from rivers or estuaries. Where wave energy is low, mangroves, or mudflats may be present.
- "The Estuarine System consists of deepwater tidal habitats and adjacent tidal habitats that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and the ocean water is at least occasionally diluted by freshwater runoff from the land."
- "Riverine System includes all wetlands and deepwater habitats contained within a channel with two exceptions (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and (2) habitats with water containing ocean-derived salts in excess of 0.5 ppt."
- Lacustrine System includes inland waterbodies that are situated in topographic depressions, lack emergent trees and shrubs, have less than 30 percent vegetation cover, and occupy greater than 20 acres. Includes lakes, larger ponds, sloughs, lochs, bayous, etc.
- "Palustrine includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, or emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salt is below 0.5 percent." The System is characterized based on the type and duration of flooding, water chemistry, vegetation, or substrate characteristics (soil types). (Cowardin, Carter, Golet, & LaRoe, 1979) (FGDC, 2013)

In South Dakota, the main type of wetlands are palustrine (freshwater) wetlands found on river and lake floodplains across the state, as shown in Figure 15.1.5-1 and Figure 15.1.5-2. Table 15.1.5-2 uses 2014 National Wetlands Inventory (NWI) data to characterize and map South Dakota wetlands on a broad-scale.[56] The data are not intended for site-specific analyses and is not a substitute for field-level wetland surveys, delineations, or jurisdictional determinations, which may be conducted, as appropriate, at the site-specific level once those locations are known. The map codes and colorings in Table 15.1.5-2 correspond to the wetland types in the figures.

[56] The wetland acreages were obtained from the USFWS (2014) National Wetlands Inventory. Data from this inventory was downloaded by state at https://www.fws.gov/wetlands/. The wetlands data contains a wetlands classification code, which are a series of letter and number codes, adapted to the national wetland classification system in order to map from (e.g., PFO). Each of these codes corresponds to a larger wetland type; those wetland areas are rolled up under that wetlands type. The codes and associated acres that correspond to the deepwater habitats (e.g., those beginning with M1, E1, L1) were removed. The wetlands acres were derived from the geospatial datafile, by creating a pivot table to capture the sum of all acres under a particular wetland type. The maps reflect/show the wetland types/classifications and overarching codes; the symbolization used in the map is standard to these wetland types/codes, per the USFWS and Federal Geographic Data Committee.

Table 15.1.5-2: South Dakota Wetland Types, Descriptions, Location, and Amount, 2014

Wetland Type	Map Code and Color	Description[a]	Occurrence	Amount (acres)[b]
Palustrine forested wetland	PFO	PFO wetlands contain woody vegetation that is at least 20 feet tall. Floodplain forests and hardwood swamps are examples of PFO wetlands.	Forested lowlands within the state	44,870
Palustrine scrub-shrub wetland	PSS	Woody vegetation less than 20 feet tall dominates PSS wetlands. Thickets and shrub swamps are examples of PSS wetlands.	Throughout the state, often on river and lake floodplains	
Palustrine emergent wetlands	PEM	PEM wetlands have erect, rooted, green-stemmed, annual, water-loving plants present for most of the growing season in most years. PEM wetlands include freshwater marshes, wet meadows, fens,[57] prairie potholes, and sloughs.[58]	Throughout the state, often on river and lake floodplains. Greatest concentration in the east	1,639,668
Palustrine unconsolidated bottom	PUB	PUB and PAB wetlands are commonly known as freshwater ponds, and include all wetlands with at least 25% cover of particles smaller than stones and a vegetative cover less than 30%.	Throughout the state	182,792
Palustrine aquatic bed	PAB	PAB wetlands include wetlands vegetated by plants growing mainly on or below the water surface line.		
Other Palustrine wetland	Misc. Types	Farmed wetland, saline seep,[59] and other miscellaneous wetlands are included in this group.	Abandoned fields, depressions (seeps), along hillsides and highways	7,460
Riverine wetland	R	Riverine systems include rivers, creeks, and streams. They are contained in natural or artificial channels periodically or continuously containing flowing water.	Throughout the state	64,127
Lacustrine wetland	L2	Lacustrine systems are lakes or shallow reservoir basins generally consisting of ponded waters in depressions or dammed river channels, with sparse or lacking persistent emergent vegetation, but including any areas with abundant submerged or floating-leaved aquatic vegetation. These wetlands are less than 8.2 feet deep.	Eastern part of the state	144,826
			Total	**2,083,743**

Source: (Cowardin, Carter, Golet, & LaRoe, 1979) (USFWS, 2015a) (FGDC, 2013)

[57] Fens are nutrient-rich, grass- and sedge-dominated emergent wetlands that are recharged from groundwater and have continuous running water. (Edinger, et al., 2014)
[58] Slough: "swamp or shallow lake system, usually a backwater to a larger body of water" (NOAA, 2014)
[59] Saline seep is an area where saline groundwater discharges at the soil surface. Saline (salty) soils and salt tolerant plants characterize these wetlands. (City of Lincoln, 2015)

[a] The wetlands descriptions are based on information from the Federal Geographic Data Committee (FGDC)'s Classification of Wetland and Deepwater Habitats of the U.S.. Based on Cowardin, et.al, 1979, some data has been revised based on the latest scientific advances. The USFWS uses these standards as the minimum guidelines for wetlands mapping efforts. (FGDC, 2013)

[b] All acreages are rounded to the nearest whole number. The maps are prepared from the analysis of high altitude imagery. A margin of error is inherent in the use of imagery. The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. (USFWS, 2015b)

Palustrine Wetlands

In South Dakota, palustrine wetlands include the majority (about 90 percent [1,874,790 acres]) of freshwater wetlands (freshwater marshes, swamps, bogs, and ponds) (USFWS, 2014c). Common tree types found in palustrine forested (PFO) wetlands in South Dakota are cottonwood *(Populus deltoids)*, willow *(Salix sp.)*, and green ash *(Fraxinus pennsylvanica)* that tolerate wet soils within uplands or bottomlands. PFO wetlands in South Dakota are common along large river systems and oxbows (U-shaped lakes or rivers), where they receive surface water, groundwater and flood waters of adjacent streams or rivers (SDGFP, 2008). Palustrine scrub-shrub wetlands (PSS) in South Dakota consist of willows, dogwoods (*Cornus spp.*), arrowwoods (*Viburnum spp.*), western snowberry (*Symphoricarpos occidentalis*), highbush blueberries (*Vaccinium spp.*), buttonbush (*Cephalanthus occidentalis*), and saplings of trees such as red maple (*Acer rubrum*). (Bakker, 2005) (SDGFP, 2015n)

Palustrine emergent wetlands (PEM), or depressional wetlands (e.g., freshwater marsh, prairie pothole, slope, and slough), in South Dakota support diverse plant and animal populations. Common PEM marsh plants in South Dakota include cattail (*Typha sp.*), bulrush (*Scirpus sp.*), and horsetail (*Equisetem sp.*). PEM wetlands may occur within uplands, such as the prairie potholes, where they occur in shallow depressions and are filled by rain and groundwater, or on bottomlands, where they receive surface water, groundwater, and floodwaters of adjacent streams or rivers. (SDGFP, 2015n) The Prairie Pothole Region is in eastern South Dakota, north and east of the Missouri River. The entire region extends into western Minnesota, eastern North Dakota, Iowa, Alberta, Saskatchewan, and Manitoba. This unique area contains millions of depressional (PEM) wetlands that "constitute one of the richest wetland complexes in the world." (Bakker, 2005) (Young, 1992)

Slope wetlands occur where groundwater discharges to the land, usually on sloping land. Seeps, springs, and fens are examples of slope wetlands. In fen wetlands, groundwater maintains constant water level year-round, with water at or near the surface most of the time. Fens are nutrient-rich, grass- and sedge[60]-dominated PEM wetlands that are recharged from groundwater and have continuous running water. This wet meadow habitat supports distinctive plant communities, including many species that are restricted to South Dakota. Slope wetlands are found throughout mountainous regions of South Dakota. (SDGFP, 2015n) (Bakker, 2005)

Palustrine aquatic (PAB/PUB) wetlands have water that is greater than 2 feet in depth and often contain water for an extended period during the growing season. Deep water marshes are primarily open water and are sparsely vegetated with floating plants such as water lily

[60] Sedge *(Carex spp.)*: an herbaceous plant with triangular cross-sectional stems and spirally arranged leaves (grasses have alternative leaves) typically associated with wetlands or poor soils.

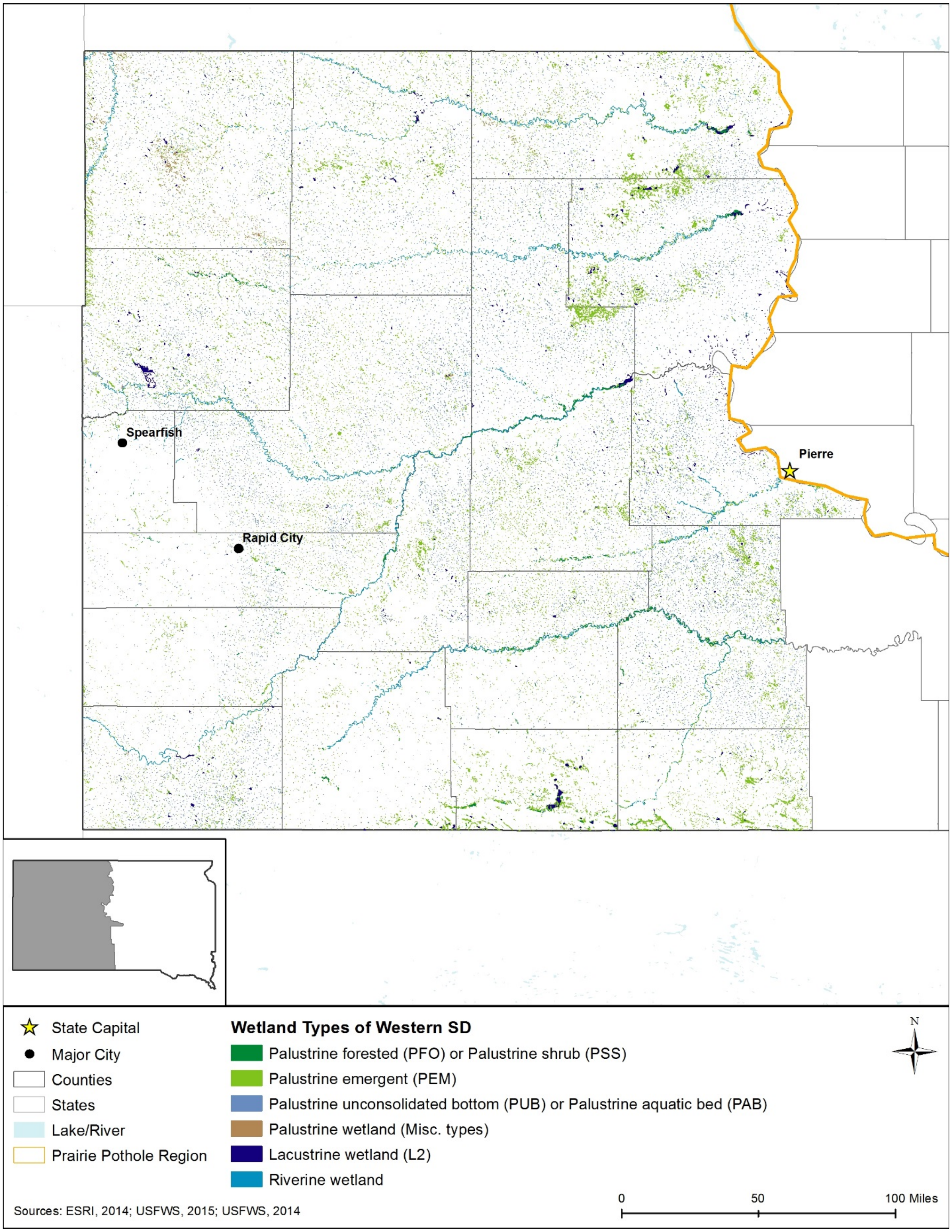

Figure 15.1.5-1: Wetlands by Type, in Western South Dakota, 2014

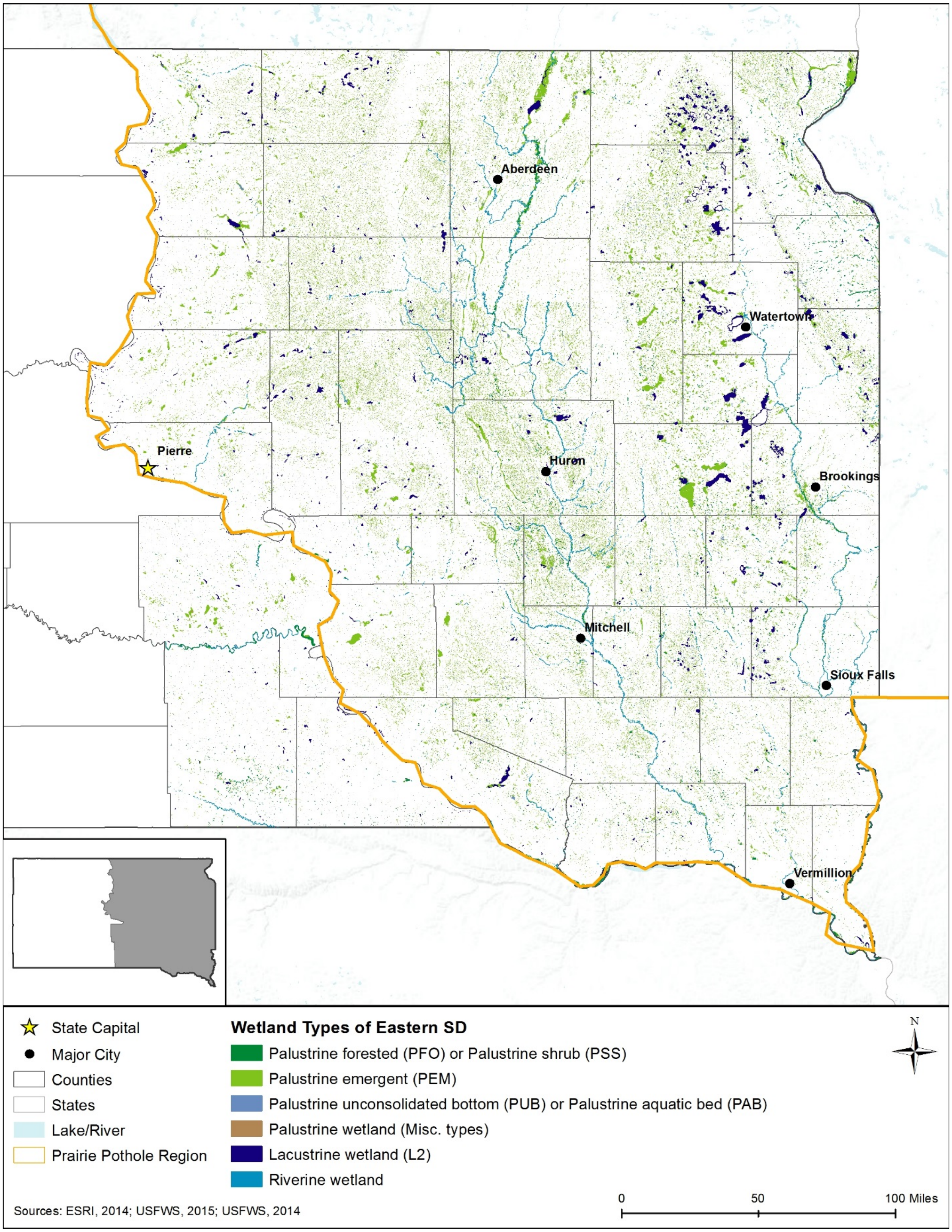

Figure 15.1.5-2: Wetlands by Type, Eastern South Dakota, 2014

(*Nymphaea odorata*), duckweeds (*Lemna minor*), and pondweed (*Potamogeton natans*) and submerged aquatic plants such as pondweeds (*P. richardsonii*), coontail (*Ceratophyllum demersum*), water milfoil (*Myriophyllum spicatum*), and bladderwort (*Utricularia macrorhiza*). Deep water marshes are not ponds and lakes. These are the easiest wetlands to recognize and occur throughout the state. (SDGFP, 2015n)

Riverine Wetlands

Riverine wetlands are associated with flowing water systems (such as rivers, creeks, perennial streams, intermittent streams, and similar waterbodies) and connecting wetlands. These wetland types are often fringing wetlands of small widths along river edges or occasionally meadows. The Missouri River and other rivers and streams sometimes have associated riverine wetlands. (SDGFP, 2015n) Riverine wetlands comprise 3 percent of total wetlands in the state (USFWS, 2014c).

Lacustrine Wetlands

Lacustrine wetlands include both open lake water and the shallow edges of lakes. Lacustrine wetlands are rare in the state, occurring mostly near dammed streams (SDGFP, 2015n). There are more than 144,800 acres of lacustrine wetlands in the state, or approximately 7 percent of all the wetlands, and are found along the southern part of the state (USFWS, 2014c).

Status

South Dakota once contained approximately 2.7 million acres of wetlands. By 1980, at least 700,000 wetland acres (35 percent) had been converted to other uses (agriculture, urban development) (SD DENR, 2014) (Young, 1992). A 2006 study by Rieger et al. found that wetlands in South Dakota were comprised of approximately 50 percent palustrine, 42 percent lacustrine and 8 percent riverine wetland types (SDGFP, 2008). Almost 35 percent of the state's wetlands have been lost, primarily from draining and filling for farming, and many are cropped today for agricultural purposes (SDGFP, 2008). Based on the USFWS NWI 2014 analysis, ratios have remained similar, with palustrine being the dominant wetland type (90 percent), followed by lacustrine (7 percent), then riverine (3 percent) (USFWS, 2014c). There are currently approximately 2.08 million acres of wetlands in the state (USFWS, 2014c). The greatest concentration of wetlands in the state occurs in the Prairie Potholes region.

15.1.5.4. Wetlands of Special Concern or Value

The majority of wetlands in South Dakota are not wetlands of special concern or value, however, some wetland communities of special concern or value do exist in certain, local geographies in the state. In addition to protections under the state's wetland regulations and national CWA, South Dakota considers such wetland communities as areas of special value due to their global or regional scarcity, "unusual local importance," or habitat they support. These include prairie potholes (discussed in 15.1.5.3) and peatlands.

In addition to protections under the state's wetland regulations and national CWA, South Dakota considers peatlands as areas of special value due to their regional scarcity, "unusual local importance," and habitat they support. Peatlands are protected under the USACE Nationwide permit regional conditions. Peatlands control water runoff during storms, reduce soil erosion, absorb, filter, and hold contaminants. They control water flow by soaking up flood and meltwater, then releasing the water more slowly. Peatlands also convert accumulated plant materials to peat, which stores carbon. There are two main types of peatlands, differentiated by how they receive water; bogs receive water only from precipitation; fens are fed by surface and groundwater. (SDGFP, 2015n)

Important Wetland Sites in South Dakota

- South Dakota Department of Game Fish and Parks (SDGFP) owns and manages approximately 165,700 acres of Game Production Areas (GPAs) across the state; these public lands are designated for wildlife protection and outdoor activities. Many of the GPAs found east of the Missouri River consist of wetland areas, totaling approximately 50,000 acres of wetlands. (SDGFP, 2008) (USACE, 2012)
- National Natural Landmarks in South Dakota range in size from 4 acres to nearly 8,700 acres, and are owned by U.S. Forest Service (USFS), tribal, state parks, and other conservation organizations and individuals. This includes Cottonwood Slough-Dry Run, a more 6,400-acre site containing prairie potholes. (NPS, 2012b) Section 15.1.8, Visual Resources, describes the state's National Natural Landmarks.
- Other wetlands protected under easements or agreements through voluntary government programs and resource conservation groups are found across the state. These include Natural Resources Conservation Service Agricultural Conservation Easement Program and easements managed by natural resource conservation groups such as state land trusts, The Nature Conservancy, USFWS, and Northern Prairies Land Trust. According to the National Conservation Easement Database, USFWS holds more than 137,670 acres in conservation easements in South Dakota. (NCED, 2015)

15.1.6. Biological Resources

15.1.6.1. Definition of the Resource

This section describes the biological resources of South Dakota. Biological resources include terrestrial[61] vegetation, wildlife, fisheries and aquatic[62] habitats,[63] and threatened[64] and endangered[65] species as well as species of conservation concern. Wildlife habitat and associated biological ecosystems are also important components of biological resources. Because of the

[61] Terrestrial: "Pertaining to land." (USEPA, 2015t)
[62] Aquatic: "Pertaining to water." (USEPA, 2015t)
[63] Habitat: "The place where a population lives, including its living and non-living surroundings." (USEPA, 2015t)
[64] Threatened: "A species that is likely to become endangered if not protected." (USEPA, 2015t)
[65] Endangered: "Animals, birds, fish, plants, or other living organisms threatened with extinction by anthropogenic (man-caused) or other natural changes in their environment. Requirements for declaring a species endangered are contained in the Endangered Species Act." (USEPA, 2015t)

significant topographic variation within the state, South Dakota supports a wide diversity[66] of biological resources, ranging from prairies and pothole wetlands throughout the state to the Rocky Mountains in the west and sand dunes in the south. Each of these topics is discussed in more detail below.

15.1.6.2. Specific Regulatory Considerations

The proposed project must meet the requirements of NEPA and other applicable laws and regulations. Pertinent federal laws relevant to the protection and management of biological resources in South Dakota are summarized in detail in Appendix C, Environmental Laws and Regulations. Table 15.1.6-1 summarizes major state laws relevant to the state's biological resources.

Table 15.1.6-1: Relevant South Dakota Biological Resources Laws and Regulations

Law / Regulation	Regulatory Agency	Applicability
South Dakota Noxious Weeds (South Dakota Codified Law [SDCL] 38-22-7, 38-22-9, and South Dakota Rule [SDR] 12:62:03:01 and 12:62:03:01.06)	South Dakota Department of Agriculture (SDDA), South Dakota Weed and Pest Control Commission (SDWPCC)	Requires the SDWPCC to create a program for the control, eradication, and prevention of weeds and pests in South Dakota; requires a list of weeds and pests be established by SDWPCC and published by SDDA; also defines a noxious weed and provides the noxious weed list.
Protection of Fishing Waters (SDCL 41-13-2 through 4)	South Dakota Department of Game, Fish, and Parks (SDGFP)	Regulates use of herbicides, introduction of fish or eggs, and emptying of bait containers into public waterbodies/game fish waters.
Nonnative Aquatic Species Introduction (SDR 41:07:01:11)	SDGFP	Prohibits release of non-native fish, mollusk, reptile, crustacean, or amphibian species into South Dakota waters, other than aquaria, without authorization from SDGFP.
Endangered and Threatened Species Act (SDCL 34A-8-1 through 34A-8-13)	SDGFP	Protects state endangered and threatened species; regulates the listing of species and delegates management, permitting, capture, possession, transportation, and sale and reintroduction of threatened and endangered species.

15.1.6.3. Terrestrial Vegetation

The distribution of flora within the state is a function of the characteristic geology,[67] soils, climate,[68] and water of a given geographic area and correlates with distinct areas identified as

[66] Diversity: "An ecological measure of the variety of organisms present in a habitat." (USEPA, 2015t)
[67] USGS defines geology as an interdisciplinary science with a focus on the following aspects of earth sciences: geologic hazards and disasters, climate variability and change, energy and mineral resources, ecosystem and human health, and ground-water availability.
[68] Climate: "The average weather conditions in a particular location or region at a particular time of the year. Climate is usually measured over a period of 30 years or more." (USEPA, 2015t)

ecoregions.[69] Ecoregions are broadly defined areas that share similar characteristics, such as climate, geology, soils, and other environmental conditions and represent ecosystems of regional extent. The boundaries of an ecoregion are not fixed, but rather depict a general area with similar ecosystem types, functions, and qualities (National Wildlife Federation, 2015) (USDA, 2015a) (WWF Global, 2015). Ecoregion boundaries often coincide with physiographic regions of a state. The ecoregions mapped by the USEPA are the most commonly referenced, although individual states and organizations have also developed ecoregions that may differ slightly from those designated by the USEPA. The USEPA divides North America into 15 broad Level I ecoregions. These Level I ecoregions are further divided into 50 Level II ecoregions. These Level II ecoregions are further divided into 182 smaller Level III ecoregions (USEPA, 2016). In South Dakota, the four main geographic regions include the Black Hills and Badlands, Great Lakes, Glacial Lakes and Prairies, and Southeast RegionU.S.(USEPA, 2015d).

As shown in Figure 15.1.6-1, the USEPA divides South Dakota into eight Level III ecoregions. The eight ecoregions support several types of communities with varying types of prairies and grasslands, agriculture, wetlands, and forests. Glaciers previously existed on many of the plains, making the soils extremely fertile and allowing for pothole and seasonally flooded wetlands, and the Great Lakes and Glacial Lakes and Prairies region reflects this. Much of the land has been converted to agriculture, producing wheat, alfalfa, potatoes, beans, soybeans, and corn. Some montane[70] forested communities exist within South Dakota, concentrated primarily in the Middle Rockies region in the Black Hills and Badlands area in the western part of the state. Additionally, a unique sand grassland community, the Nebraska Sandhills, can be found in the extreme south-central part of the state. Table 15.1.6-2 provides a summary of the general abiotic[71] characteristics, vegetative communities, and the typical vegetation found within each of the eight South Dakota ecoregions.

[69] Ecoregion: "A relatively homogeneous ecological area defined by similarity of climate, landform, soil, potential natural vegetation, hydrology, or other ecologically relevant variables." (USEPA, 2015t)

[70] Montane: "The biogeographic zone made up of relatively moist cool upland slopes below timberline that is characterized by large evergreen trees as a dominant life form." (NRCS, 2016)

[71] Abiotic: "Characterized by absence of life; abiotic materials include non-living environmental media (e.g., water, soils, sediments); abiotic characteristics include such factors as light, temperature, pH, humidity, and other physical and chemical influences." (USEPA, 2015q)

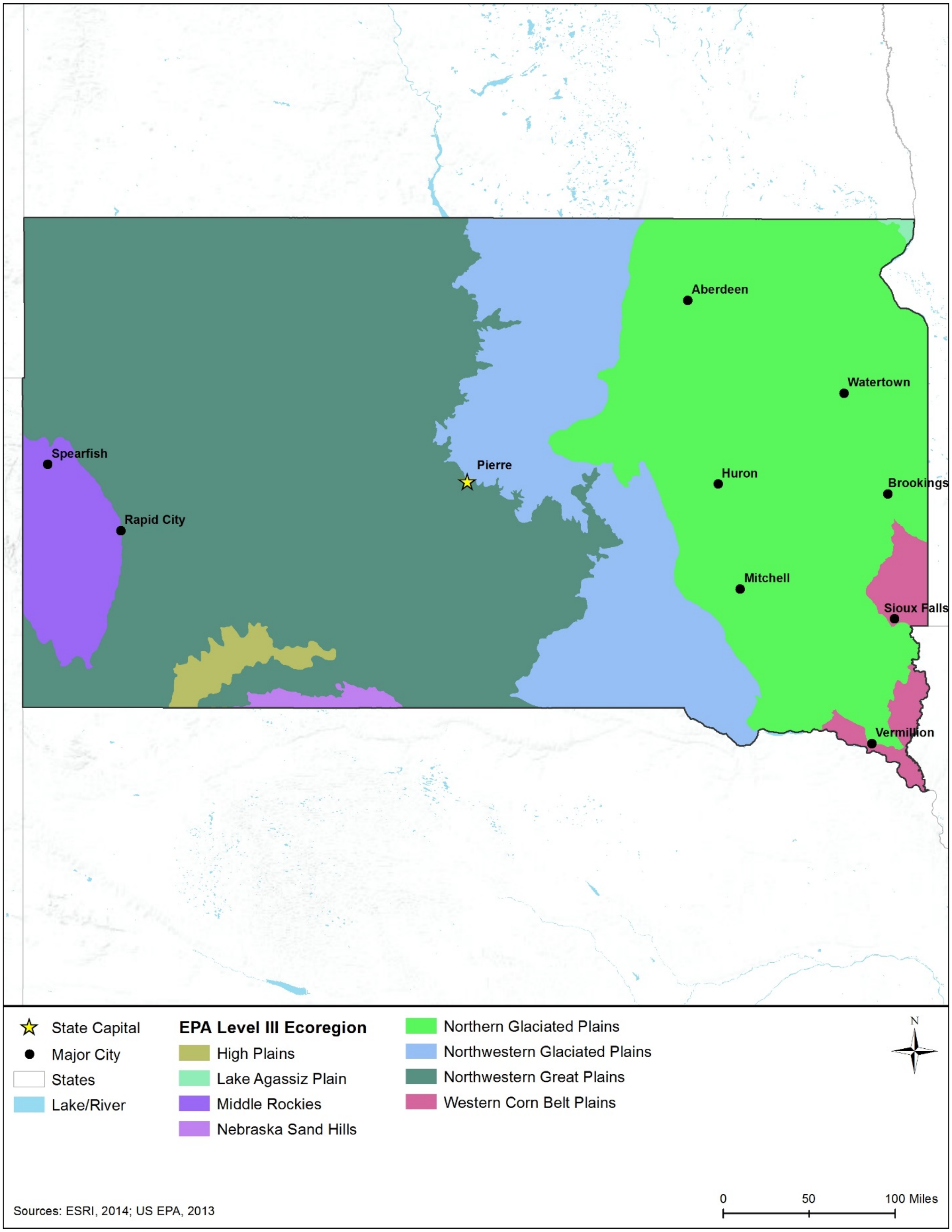

Figure 15.1.6-1: USEPA Level III Ecoregions in South Dakota

Table 15.1.6-2: USEPA Level III Ecoregions of South Dakota

Ecoregion Number	Ecoregion Description	Abiotic Characterization	General Vegetative Communities	Typical Dominant Vegetation
Geographic Region: Black Hills and Badlands				
17	Middle Rockies	A mountainous region with high elevation, individual mountain ranges. The Black Hills are present in this region and have similar climate, hydrography, and land use to the mountains.	Ponderosa pine forest, mixed montane forest	**Coniferous Trees** – ponderosa pine (*Pinus ponderosa*), white spruce (*Picea glauca*), Rocky Mountain juniper (*Juniperus scopulorum*). **Deciduous Trees** – aspen (*Populus* spp.), paper birch (*Betula papyrifera*). **Shrubs –** chokecherry (*Prunus virginiana*), buffaloberry (*Shepherdia* spp.), snowberry (*Symphoricarpos* spp.), Oregon grape (*Mahonia aquifolium*). **Herbaceous –** little bluestem (*Schizachyrium scoparium*), leadplant (*Amorpha canescens*), bearded wheatgrass (*Elymus caninus*).
25	Western High Plains	A shortgrass prairie region with rolling plains transitioning to tablelands, which were formed by the Rocky Mountains eroding.	Ponderosa pine savannah	**Coniferous Trees –** ponderosa pine, eastern red cedar (*Juniperus virginiana*). **Shrubs –** western snowberry (*Symphoricarpos occidentalis*), skunkbush sumac (*Rhus trilobata*), chokecherry. **Herbaceous –** little bluestem, western wheatgrass (*Pascopyrum smithii*), green needlegrass (*Nassella viridula*), prairie sandreed (*Calamovilfa longifolia*).
44	Nebraska Sand Hills	A mostly treeless, grass-stabilized dune region with precipitation-fed interdune lakes, wetlands, and streams that have constant annual discharge.	Sand grasslands	**Herbaceous –** sand bluestem (*Andropogon hallii*), little bluestem, prairie sandreed, big bluestem (*Andropogon gerardii*), switchgrass (*Panicum virgatum*).
43	Northwestern Great Plains	A semiarid rolling plain with some native grasslands in steeper topography. Agricultural development has replaced many native grasslands.	Level to rolling plains, badlands, deciduous riparian woodlands, salt pans	**Coniferous Trees –** Rocky Mountain juniper. **Deciduous Trees –** cottonwood (*Populus* spp.) and green ash (*Fraxinus pennsylvanica*). **Shrubs –** dwarf sagebrush (*Artemisia arbuscular*), big sagebrush (*Artemisia tridentata*), and snowberry.

Ecoregion Number	Ecoregion Description	Abiotic Characterization	General Vegetative Communities	Typical Dominant Vegetation
				Herbaceous – western wheatgrass, green needlegrass, blue grama (*Bouteloua gracilis*), buffalograss (*Bouteloua dactyloides*), and Sandberg bluegrass (*Poa secunda*).
Geographic Region: Great Lakes				
42	Northwestern Glaciated Plains	The westernmost extent of glaciation, this area has a high concentration of wetlands. The easternmost boundary marks the start of the Great Plains. Farming and ranching are abundant.	Pothole wetlands, glaciated plains, deciduous riparian woodlands	**Deciduous Trees –** cottonwood, green ash, boxelder (*Acer negundo*), and aspen. **Shrubs –** peachleaf willow (*Salix amygdaloides*), buffaloberry, and sumac (*Rhus* spp.). **Herbaceous –** western wheatgrass, needle and thread grass (*Hesperostipa comata*), blue grama, prairie cordgrass (*Spartina pectinata*), big bluestem, little bluestem, sideoats grama (*Bouteloua curtipendula*) and saltgrass (*Distichlis spicata*).
43	Northwestern Great Plains	A semiarid rolling plain with some native grasslands in steeper topography. Agricultural development has replaced many native grasslands.	Level to rolling plains, badlands, deciduous riparian woodlands, salt pans	**Coniferous Trees –** Rocky Mountain juniper. **Deciduous Trees –** cottonwood and green ash. **Shrubs –** dwarf sagebrush, big sagebrush, and snowberry. **Herbaceous –** western wheatgrass, green needlegrass, blue grama, buffalograss, and Sandberg bluegrass.
Geographic Region: Glacial Lakes and Prairies				
46	Northern Glaciated Plains	A flat and gently rolling landscape with tall and short grass prairies and seasonal wetlands. Some agriculture is present, but very dependent on climatic conditions.	Seasonal emergent wetlands, rolling plains, flat plains	**Deciduous Trees –** bur oak (*Quercus macrocarpa*), paper birch, aspen, and boxelder. **Shrubs –** red osier dogwood (*Cornus sericea*), serviceberry (*Amelanchier* spp.), and snowberry. **Herbaceous –** green needlegrass, needle and thread grass, blue grama, little bluestem, western wheatgrass.
48	Lake Agassiz Plain	Lake Agassiz was a proglacial lake that previously filled the area and left behind thick lacustrine sediments. An extremely flat area that once was tallgrass prairie is now primarily used as agriculture.	Glacial lake plains, deciduous riparian woodlands	**Deciduous Trees –** cottonwood, American elm (*Ulmus americana*), green ash, and willow (*Salix* spp.). **Herbaceous –** wheatgrass spp. (*Pascopyrum* spp.), big bluestem, little bluestem, Indiangrass (*Sorghastrum nutans*), switchgrass, and saltgrass.

Ecoregion Number	Ecoregion Description	Abiotic Characterization	General Vegetative Communities	Typical Dominant Vegetation
42	Northwestern Glaciated Plains	The westernmost extent of glaciation, this area has a high concentration of wetlands. The easternmost boundary marks the start of the Great Plains. Farming and ranching are abundant.	Pothole wetlands, glaciated plains, deciduous riparian woodlands	**Deciduous Trees –** cottonwood, green ash, boxelder, and aspen. **Shrubs –** peachleaf willow, buffaloberry, and sumac. **Herbaceous –** western wheatgrass, needle and thread grass, blue grama, prairie cordgrass, big bluestem, little bluestem, sideoats grama, and saltgrass.
Geographic Region: Southeast				
46	Northern Glaciated Plains	A flat and gently rolling landscape with tall and short grass prairies and seasonal wetlands. Some agriculture is present, but very dependent on climatic conditions.	Seasonal emergent wetlands, rolling plains, flat plains	**Deciduous Trees –** bur oak, paper birch, aspen, and boxelder. **Shrubs –** red osier dogwood, serviceberry, and snowberry. **Herbaceous –** green needlegrass, needle and thread grass, blue grama, little bluestem, western wheatgrass.
47	Western Corn Belt Plains	A flat and gently rolling plain region with fertile soil, temperate climate, and regular precipitation. Agricultural productivity is high in the region.	Deciduous riparian woodlands, tallgrass prairie	**Deciduous Trees -** cottonwood, American elm, green ash, boxelder. **Herbaceous –** big bluestem, little bluestem, Indiangrass, green needlegrass, needle and thread grass, prairie dropseed (*Sporobolus heterolepis*).

Source: (Bryce, et al., 1996) (USEPA, 2015d)

Communities of Concern

The state of South Dakota contains vegetative communities of concern that include rare natural plant communities, plant communities with greater vulnerability or sensitivity to disturbance, and communities that provide habitat for rare plant and wildlife species. The ranking system for these communities gives an indication of the relative rarity, sensitivity, uniqueness, or vulnerability of these areas to potential disturbances. This ranking system also gives an indication of the level of potential impact to a particular community that could result from implementation of an action.

The South Dakota Natural Heritage Database (SDNHD) does not have an updated list of rare plant communities present within the state (Ode 2015). However, the Association for Biodiversity Information has compiled a list of all South Dakota plant community descriptions, which provides some state rank information for plant communities (Faber-Langdendoen, 2001). South Dakota does not have its own ranking system and follows the U.S. National Vegetation Classification system (USNVC). Each natural community is assigned a rank based on its rarity and vulnerability. The USNVC ranking system assesses rarity using a state rank (S1, S2, S3, S4, S5) that indicates its rarity within South Dakota. Communities ranked as an S1 by the USNVC are of the greatest concern. This rank is typically based on the range of the community, the number of occurrences, the viability of the occurrences, recent trends, and the vulnerability of the community (Faber-Langdendoen, 2001).

Three vegetative communities are ranked as S1 communities[72] in South Dakota; these communities represent the rarest terrestrial habitat in the state. The communities can be found scattered throughout the state, and are comprised of woodland, wetland, and grassland community features. South Dakota Appendix A, Table, A-1 provides a description of the communities of conservation concern in South Dakota along with their state rank, distribution, abundance, and the associated USEPA Level III ecoregions.

Nuisance and Invasive Plants

There are a large number of undesirable plant species that are considered nuisance and invasive plants. Noxious weeds are typically non-native species that have been introduced into an ecosystem inadvertently; however, on occasion native species can be considered a noxious weed. Noxious weeds greatly affect agricultural areas, forest management, natural, and other open areas (Government Printing Office, 2011). The U.S. government has designated certain plant species as noxious weeds in accordance with the Plant Protection Act of 2000 (7 U.S.C. 7701 *et seq.*). As of September 2014, 112 federally recognized noxious weed species have been catalogued in the U.S., 88 of which are terrestrial, 19 aquatic, and 5 parasitic (USDA, 2015b).

Noxious weeds are a threat to South Dakota’s rangeland, cropland, pastureland, forests, and wildlands. Noxious weeds can have adverse ecological and economic impacts to these resources by displacing native species, degrading wildlife habitat, and increasing soil erosion. Several

[72] S1 – Communities “at high risk because of extremely limited and/or rapidly declining population numbers, range and/or habitat, making it highly vulnerable to global extinction or extirpation in the state.” (MFWP and MNHP, 2015)

South Dakota regulations govern the management of invasive species and noxious weeds. SDWPCC under SDDA must "formulate a weed and pest program for the prevention, suppression, control, and eradication of weeds and pests in South Dakota" (SDCL 38-22-7 and 38-22-9). Additionally, other plant pests that are not considered noxious weeds but that are non-native plants are quarantined; treatment methods must be established for these species (SDCL 38-24A-6).

A list of invasive quarantined plants are also provided (SDR 12:51:03:01). Seven state-listed noxious weeds (SDR 12:62:03:01.06) and 22 non-native plant species (SDR 12:51:03:01) are regulated in South Dakota. All noxious weeds are also considered non-native species. Two of the 22 species occur on the Federal Noxious Weed List (USDA 2014). Of these species/complexes, 20 of them are terrestrial and 2 are aquatic species (Burgess & Bertrand, 2008). The following species by vegetation type are regulated in South Dakota:

- **Aquatic –** Eurasian water milfoil (*Myriophyllum spicatum*), Purple loosestrife (*Lythrum salicaria*).
- **Terrestrial Forbs and Grasses –** Canada thistle (*Cirsium arvense*), common crupina (*Crupina vulgaris*), dalmatian toadflax (*Linaria dalmatica*), diffuse knapweed (*Centaurea diffusa*), dodder (*Cuscuta* spp.), field bindweed (*Convolvulus arvensis*), hoary cress (*Cardaria draba*), Johnsongrass (*Sorghum halepense*), leafy spurge (*Euphorbia esula*), multiflora rose (*Rosa multifloral*), musk thistle (*Carduus nutans*), perennial pepperweed (*Lepidium latifolium*), perennial sowthistle (*Sonchus arvensis*), plumeless thistle (*Carduus acanthoides*), rush skeletonweed (*Chondrilla juncea*), Russian knapweed (*Centaurea repens*), spotted knapweed (*Centaurea maculosa*), St. Johnswort (*Hypericum perforatum*), yellow starthistle (*Centaurea solstitialis*), and yellow toadflax (*Linaria vulgaris*).

15.1.6.4. Terrestrial Wildlife

This section discusses the terrestrial wildlife species in South Dakota, divided among mammals,[73] birds,[74] reptiles and amphibians,[75] and invertebrates.[76] Terrestrial wildlife consists of those species, and their habitats, that live predominantly on land. Terrestrial wildlife includes common big game species, small game animals, furbearers,[77] nongame animals, game birds, waterfowl, and migratory birds as well as their habitats within South Dakota. A discussion of non-native and/or invasive terrestrial wildlife species is also included within this section. Information regarding the types and location of native and non-native/invasive wildlife is useful for assessing the importance of any impacts to these resources or the habitats they occupy. South

[73] Mammals: "Warm-blooded vertebrates that give birth to and nurse live young; have highly evolved skeletal structures; are covered with hair, either at maturity or at some stage of their embryonic development; and generally have two pairs of limbs, although some aquatic mammals have evolved without hind limbs." (USEPA, 2015t)

[74] Birds: "Warm-blooded vertebrates possessing feathers and belonging to the class Aves." (USEPA, 2015t)

[75] Amphibian: "A cold-blooded vertebrate that lives in water and on land. Amphibians' aquatic, gill-breathing larval stage is typically followed by a terrestrial, lung-breathing adult stage." (USEPA, 2015t)

[76] Invertebrates: "Animals without backbones: e.g. insects, spiders, crayfish, worms, snails, mussels, clams, etc." (USEPA, 2015t)

[77] Furbearer is the name given to mammals that traditionally have been hunted and trapped primarily for fur.

Dakota is home to 95 mammal species (SDGFP, 2015k), 32 reptile species, 17 amphibian species (SDSU 2015), and 414 bird species (Bakker, 2005).

Mammals

Common and widespread mammalian species in South Dakota include beaver (*Castor canadensis*), black-tailed prairie dog (*Cynomys ludovicianus*), mule deer (*Odocoileus hemionus*), and white-tailed deer (*Odocoileus virginianus*). Most mammals are widely distributed in the state; however, there are some species, such as the river otter (*Lontra canadensis*), which very rarely found anywhere in the state, and the northern flying squirrel (*Glaucomys sabrinus*) is only found in the Black Hills region of the state (SDGFP, 2015k). Two threatened and endangered mammals are in South Dakota. Section 15.1.6.6, *Threatened and Endangered Species and Species of Conservation Concern*, identifies these protected species.

In South Dakota, white-tailed deer, mule deer, elk (*Cervus canadensis*), mountain goat (Oreamnos americanus), pronghorn antelope (*Antilocapra americana*), bighorn sheep (Ovis canadensis), turkey (*Meleagris gallopavo*), and mountain lion (*Puma concolor*) are classified as big game species, whereas small game species include small mammals (e.g., rabbits), and upland and migratory game birds. The following twelve species of furbearers may be legally hunted or trapped in the South Dakota: badger (*Meles meles*), beaver, bobcat (*Lynx rufus*), coyote (*Canis latrans*), fox (*Vulpes* spp.), jackrabbit (*Lepus* spp.), mink (*Neovison vison*), muskrat (*Ondatra zibethicus*), opossum (*Didelphimorphia* spp.), raccoon (*Procyon lotor*), skunk (*Mephitidae* spp.), and weasel (*Mustela* spp.) (SDGFP, 2015i).

South Dakota has identified 11 mammals as Species of Greatest Conservation Need (SGCN), two of which are federally listed species. The SGCN list consists of at-risk species that are rare or declining, and State Wildlife Grants can provide funding for efforts to reduce their potential to be listed as endangered. Although these species have been targeted for conservation they are not currently under legal protection. The SGCN list is updated periodically and was recently updated in 2014 (SDGFP, 2014).

Birds

The number of native bird species documented in South Dakota varies according to the timing of the data collection effort, changes in bird taxonomy,[78] and the reporting organization's method for categorizing occurrence and determining native versus non-native status. Further, the diverse ecological communities (i.e., wetlands, large rivers and lakes, plains, badlands, mountains, etc.) found in South Dakota support a large variety of bird species. As of 2002, roughly 414 species of resident and migratory birds have been documented in South Dakota (Bakker, 2005). Among the 414 extant[79] species in South Dakota, 29 SGCN have been identified (SDGFP, 2014).

South Dakota is within the Central Flyway. The eastern edge of the Central Flyway is in line with the South Dakota eastern border. Covering the entire state, the Central Flyway spans from the Gulf Coast of Texas to the Canadian boreal forest. Large numbers of migratory birds utilize

[78] Taxonomy: "A formal representation of relationships between items in a hierarchical structure." (USEPA, 2015t)
[79] Extant: "A species that is currently in existence (the opposite of extinct)." (USEPA, 2015t)

this flyway and other migration corridors and pathways throughout the state each year during their annual migrations northward in the spring and southward in the fall. "The Migratory Bird Treaty Act (MBTA) makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to Federal regulations" (USFWS, 2013a). The USFWS is responsible for enforcing the MBTA and maintaining the list of protected species. The migratory bird species protected under the MBTA are listed in 50 CFR 10.13 (USFWS, 2013a).

Bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) are protected under the Bald and Golden Eagle Protection Act. Bald eagles are generally found near large rivers and lakes along the Missouri River and are present in South Dakota year-round for breeding and wintering (SDGFP, 2005). Golden eagles are found in a variety of habitats within their range, but are generally found around the mountains and cliffs where they nest. Golden eagles are uncommon permanent residents in South Dakota, and are found near sandstone and limestone cliffs of the Black Hills and in Harding County in various locations with rocky topography and along riparian areas (Bakker, 2005).

A number of Important Bird Areas (IBAs) have also been identified in South Dakota, as can be seen in Figure 15.1.6-2. The IBA program is an international bird conservation initiative with a goal of identifying the most important places for birds, and to conserve these areas. These IBAs are identified according to standardized, scientific criteria through a collaborative effort among state, national, and international conservation-oriented non-governmental organizations (NGOs), state and federal government agencies, local conservation groups, academics, grassroots environmentalists, and birders. These IBAs link global and continental bird conservation priorities to local sites that provide critical habitat for native bird populations. IBA priority areas are based on a number of specific criteria. Generally, global IBAs are sites determined important for globally rare species or support bird populations at a global scale. Continental IBAs are sites determined important for continentally rare species or support bird populations at a continental scale, but do not meet the criteria for a global IBA. State IBAs are sites determined important for state rare species or support local populations of birds.

According to the Audubon Society, a total of 28 IBAs, providing over 900,000 acres of land, have been identified in South Dakota, including breeding ranges,[80] migratory stop-over, feeding, and over-wintering areas, and a variety of habitats such as native grasslands, grasslands, sage brush, and wetland/riparian[81] areas. These IBAs are widely distributed throughout the state, although the largest concentration of IBAs are in the eastern half of the state, within the Northwestern Glaciated Plains, Northern Glaciated Plains, and the Lake Agassiz Plains ecoregions. IBAs in South Dakota are mostly prairie and/or wetland communities that are key habitats for many migrating birds. The Wolsley Crane Stopover Areas IBA is an enormous site,

[80] Breeding range: "The area utilized by an organism during the reproductive phase of its lifecycle and during the time that young are reared." (USEPA, 2015t)
[81] Riparian: "Referring to the areas adjacent to rivers and streams with a differing density, diversity, and productivity of plant and animal species relative to nearby uplands." (USEPA, 2015t)

encompassing 236,161 acres of land, and provides stopover habitat for migrating sandhill cranes (*Grus canadensis*) and whooping cranes (*Grus americana*) (Audubon, 2015).

A number of threatened and endangered birds are in South Dakota, including the whooping crane discussed above. Section 15.1.6.6, Threatened and Endangered Species and Species of Conservation Concern, identifies these protected species.

Reptiles and Amphibians

A total of 49 reptile and amphibian species, such as snakes and salamanders, occur in the state of South Dakota, including two salamanders, 15 frogs and toads, seven turtles, eight lizards, and 17 snakes (SDSU, 2015). Of the 49 reptile and amphibian species, 12 SGCN have been identified. Three of the 12 SGCN are state listed species, including the lined snake (*Tropidoclonion lineatum*), eastern hognose snake (*Heterodon platirhinos*), and false map turtle (*Graptemys pseudogeographica*) (SDGFP, 2014).

South Dakota does not have a specific regulation for the possession of reptiles or amphibians. However, it does required permits for possession of nondomestic animals, which assumes the inclusion of reptiles and amphibians (SDR 12:68:18:03).

Invertebrates

South Dakota is home to numerous species of invertebrates, including a wide variety of flies, moths, wasps, bees, ants, and beetles. Eleven terrestrial insect species are considered SGCN. Three of these species are listed under the Endangered Species Act (ESA), including the Dakota skipper (*Hesperia dacotae*), the American burying beetle (*Nicrophorus americanus*), and the Poweshiek skipperling (*Oarisma poweshiek*) (SDGFP, 2014). The state is known to have 177 butterfly species (SDGFP 2015c). One of the most studied species in the state is the American burying beetle. This species has been reduced to 10 percent of its historical range. In 1995, the species was rediscovered in the state after not being seen since 1945. A large population of over 500 American burying beetles has now been studied and monitored extensively in Gregory and Tripp Counties (SDGFP, 2015a).

There are two threatened and endangered invertebrates with critical habitat in South Dakota. Section 15.1.6.6, Threatened and Endangered Species and Species of Conservation Concern, identifies these protected species.

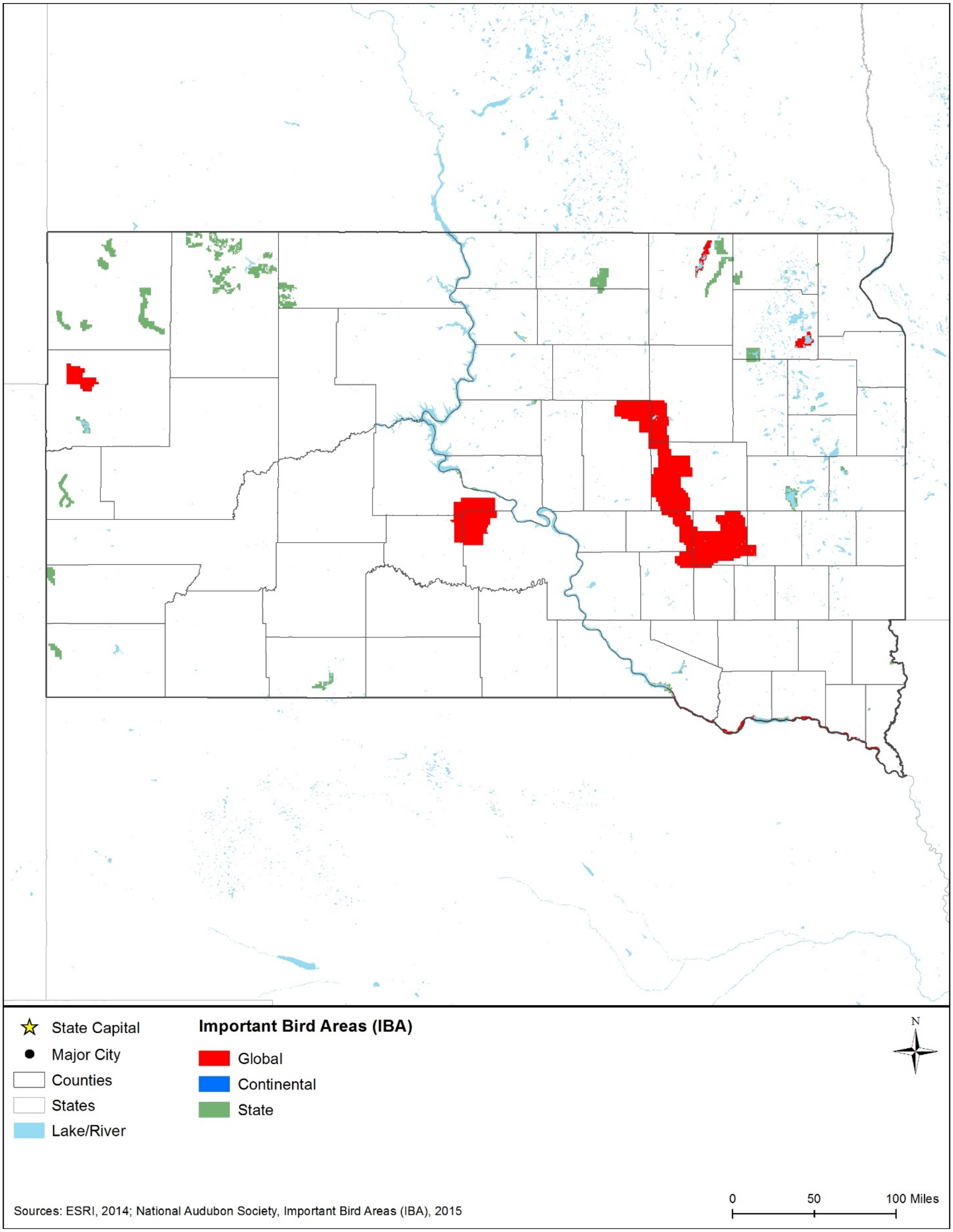

Figure 15.1.6-2: Important Bird Areas of South Dakota

Invasive Wildlife Species

South Dakota maintains a list of prohibited mammal animals (SDR 12:68:18:03.01), which includes any species in the family *Suidae* (e.g., nondomestic pigs and hogs) and raccoon dogs (*Nyctereutes procyonoides*). Additionally, South Dakota has a list of restricted nondomestic mammals (SDR 12:68:18:03.02). Also, species such as the gypsy moth (*Lymantria dispar dispar*), Asian longhorn beetle (*Anoplophora glabripennis*), and emerald ash borer (*Agrilus planipennis*) represent emerging concerns in the region (North Dakota State University, 2014). Species on this list are limited to the east of the Missouri River in South Dakota, which runs north to south through the middle of the state. Species included in this list include any nondomestic mammals capable of crossbreeding with wild elk, deer, sheep, or goats (SDR 12:68:18:03.02).

15.1.6.5. Fisheries and Aquatic Habitat

This section discusses the aquatic wildlife species in South Dakota, including freshwater fish and invertebrates. A summary of non-native and/or invasive aquatic species is also presented. No essential fish habitat (EFH) identified by the Magnuson-Stevens Fishery Conservation and Management Act exists in the state of South Dakota. One endangered fish species, the pallid sturgeon (*Scaphirhynchus albus*), exists within South Dakota and is discussed in Section 15.1.6.6, Threatened and Endangered Species and Species of Conservation Concern.

Freshwater Fish

South Dakota is home to populations of more than 100 species of freshwater fish, ranging in size from small darters and minnows to larger species such as salmon and sturgeon (Hoagstrom, Adams, Neumann, & Willis, 2011). Of the 100 species, 21 species are listed as SGCN (SDGFP, 2014). These species are grouped into 25 families; a brief description of those families that contain common species, notable sport fish species, or species of concern is listed below (Hoagstrom, Adams, Neumann, & Willis, 2011).

One species of basal ray-finned fish, the bowfin (*Amia calva*), occurs in South Dakota. Limited information exists on the range of this species within South Dakota. Bowfin typically are found in deeper waters in daytime and shallower waters at night. Adult bowfin are piscivorous, but also may eat crayfish and frogs. Bowfin spawn in spring, and eggs typically hatch in eight to 10 days (TPWD, 2015).

The bullheads/catfishes family includes eight species, which include the blue catfish (*Ictalurus furcatus*), channel catfish (*Ictalurus punctatus*), stone cat (*Noturus flavus)*, yellow bullhead (*Ameiurus natalis*), black bullhead (*Ameiurus melas*), brown bullhead (*Ameiurus nebulosus*), flathead catfish (*Pylodictis olivaris*), and tadpole madtom (*Noturus gyrinus*). All eight species are native to South Dakota. The black bullhead, channel catfish, and stonecat are present throughout most of the state in various habitats. The flathead catfish is less common and is restricted to the rivers of the southeast. The yellow bullhead is also less common and can be found in the Missouri River and associated tributaries to the east, but is rarely found in the western half of the state (Hoagstrom, Adams, Neumann, & Willis, 2011).

One cichlid species, Jack Dempsey (*Cichlasoma octofasciatum*), can be found in South Dakota (Hoagstrom, Adams, Neumann, & Willis, 2011). This species is non-native to the state and has been documented as established in Fall River hot springs. Jack Dempsey are aggressive species that compete with native sunfish for resources (Nico & Neilson, 2015).

The codfish family includes one species, burbot (*Lota lota*), which is native to South Dakota. Burbot are most commonly found in cold streams, rivers, lakes, and impoundments in South Dakota. It can be found primarily in the Missouri River and associated tributaries. In South Dakota, this species may reach up to 30 in. and 24 pounds (Hoagstrom, Adams, Neumann, & Willis, 2011).

The drum family includes one species, freshwater drum (*Aplodinotus grunniens*), which is native to South Dakota. Freshwater drum live in large lakes, rivers, and impoundments and is tolerant of poor water quality, including turbidity. In South Dakota, this species is present in eastern rivers, the Missouri River and associated impoundments, and the Cheyenne River basin (Hoagstrom, Adams, Neumann, & Willis, 2011).

One species of eel, the American eel (*Anguilla rostrate*), is present within South Dakota. This species can be found in warm and cool water rivers and tributaries. This species has become less abundant in South Dakota due to damming of major rivers, which impedes migration. American eel spawn in the Sargasso Sea in the Atlantic Ocean and migrate into freshwater rivers after spawning. In South Dakota, this species may be found in the Missouri River and tributaries in the Minnesota River Drainage, below Gavin's Point Dam (Hoagstrom, Adams, Neumann, & Willis, 2011).

The shortnose gar (*Lepisosteus platostomus*) and the longnose gar (*Lepisosteus osseus*) are the two species of gar in South Dakota. Both species are native to the state. The shortnose gar can be found in quiet backwaters of the Missouri River and other tributaries and feeds on insects, crustaceans and other fish (Hoagstrom, Adams, Neumann, & Willis, 2011). The longnose gar can be found in eastern South Dakota in the lower James River and the Vermillion River and in central South Dakota in the Missouri River. The longnose gar is not as prevalent as the shortnose gar because South Dakota is part of the longnose gar's western-most range (SDGFP, 2015j).

Three herring species are present in South Dakota. Skipjack herring (*Alosa chrysochloris*) and gizzard shad (*Dorosoma cepedianum*) are native species to the state, and alewife (*Alosa pseudoharengus*) is non-native. The gizzard shad is common in the Missouri River and in southeastern tributaries and streams. It is an important prey fish for walleye and northern pike. Most individuals of this species in South Dakota do not persist during the winter season, but populations are naturally replenished through spawning of those that survive (Hoagstrom, Adams, Neumann, & Willis, 2011).

Three killifish species are present in South Dakota and include banded killifish (*Fundulus diaphanous*), northern plains killifish (*Fundulus kansae*), and plains topminnow (*Fundulus sciadicus*). The plains topminnow is uncommon in the state and declining due to habitat alteration and removal. It prefers quiet pools and backwaters with ample vegetation. This species is found in drainages throughout the state, including the James, Vermillion, and Big Sioux Rivers (SDGFP, 2015m). The banded killifish is also quite rare in the state due to habitat alteration and loss (SDGFP 2015g). It is a state endangered species and a SGCN (SDGFP, 2014). Habitat for the species varies but generally includes quiet waters with or without vegetation. Banded killifish are important prey items for large sportfish and birds such as kingfishers (*Alcedines* spp.) (SDGFP, 2015b).

One lamprey species, silver lamprey (*Ichthyomyzon unicuspis*), was previously present in South Dakota, but is now considered to be extirpated. Lamprey can be found in medium to large rivers or large reservoirs (Hoagstrom, Adams, Neumann, & Willis, 2011).

Approximately 42 species of minnows occur in South Dakota. This family has the largest number of fish species in the state. Of these, nine species are introduced to the state. These species include goldfish (*Carassius auratus*), grass carp (*Ctenopharyngodon idella*), spotfin shiner (*Cyprinella lutrensis*), common carp (*Cyprinus carpio*), silver carp (*Hypophthalmichthys molitrix*), bighead carp (*Hypophthalmichthys nobilis*), mimic shiner (*Notropis volucellus*), bullhead minnow (*Pimephales vigilax*), and rudd (*Scardinius erythrophthalmus*). Two species are presumed to be extirpated from the state and include blackchin shiner (*Notropis heterodon*) and silverband shiner (*Notropis shumardi*). Common minnow species in South Dakota include common carp, silver carp, bighead carp, common shiner (*Luxilus cornutus*), and golden shiner (*Notemigonus crysoleucas*). Carp are introduced and may cause severe aquatic ecosystem impacts. Common carp are essentially found throughout the entire state (Hoagstrom et al. 2011). This family contains 11 SGCN, one of which includes the federally endangered Topeka shiner (*Notropis topeka*) (SDGFP, 2014).

Two species in the mooneye family, goldeye (*Hiodon alosoides*) and mooneye (*Hiodon tergisus*), are present in South Dakota. Goldeye are present throughout much of the state in cool and warm water habitats. Goldeye are an important forage fish for species such as walleye and pike. The mooneye is thought to be extirpated but were once found within South Dakota (Hoagstrom, Adams, Neumann, & Willis, 2011).

One species of mudminnow, the central mudminnow (*Umbra limi*), is present in South Dakota and is considered an SGCN (Hoagstrom, Adams, Neumann, & Willis, 2011) (SDGFP, 2014). Mudminnow are unique as a fish species because they are able to breathe air, allowing them to survive in low-oxygen waters. They prefer streams and backwaters with slow-moving water, ample vegetation, muddy substrates, and debris. In South Dakota, this species can be found in the northeastern part of the state, in the very western portion of its overall range (SDGFP, 2015c).

The paddlefish family in South Dakota is comprised of just one species, paddlefish (*Polyodon spathula*). This species inhabits slow or quiet areas of large rivers or reservoirs, and is only found in free-flowing reaches of the Missouri River in South Dakota. In South Dakota, the species commonly grows up to 100 pounds (Hoagstrom, Adams, Neumann, & Willis, 2011).

A total of nine species of perches occur in South Dakota, including large members such as yellow perch (*Perca flavescens*), walleye (*Sander vitreus*), and sauger (*Sander canadensis*).

Darters are also included and are much smaller than the other species included, and rarely exceed 4 inches (10.16 cm) in length. One species, the slenderhead darter (*Percina phoxocephala*), is considered extirpated from the state (Hoagstrom, Adams, Neumann, & Willis, 2011). Two species are on the SGCN list and include blackside darter (*Percina maculata*) and logperch (*Percina caprodes*) (SDGFP, 2014).

Four species of pikes/pickerels occur in South Dakota's waters including grass pickerel (*Esox americanus*), the northern pike (*Esox lucius*), the tiger muskellunge (*Esox masquinongy* X *Esox lucius*), and pure muskellunge (*Esox masquinongy)*. Northern pike and grass pickerel are both native to the state. The northern pike is spread throughout the state in cool and cold-water lakes, rivers, streams, impoundments, and ponds. The muskellunge is not as widespread as the northern pike, and has been stocked in several lakes and the lower Missouri River. The tiger muskellunge is an artificial hybrid of the two species and has been stocked throughout the state for sport fishing (Hoagstrom, Adams, Neumann, & Willis, 2011).

One species in the sculpin family, mottled sculpin (*Cottus bairdii*), is present in South Dakota (Hoagstrom, Adams, Neumann, & Willis, 2011). Limited information is available regarding the distribution of this species in the state. This species is non-native to South Dakota. Mottled sculpin are typically found in swiftwaters of headwaters, creeks, and small rivers with gravel to rocky substrates and occasionally in lakes and reservoirs (Fuller & Neilson, 2015).

The rainbow smelt (*Osmerus mordax*) is the only species in the smelt family that occurs in South Dakota and are non-native to the state. This species can be found in the Missouri River. Rainbow smelt were originally introduced in North Dakota and spread down the Missouri River into South Dakota. It was introduced intentionally to provide a food source for sport fish (Hoagstrom, Adams, Neumann, & Willis, 2011).

Brook stickleback (*Culaea inconstans*) are the only species in the stickleback family in South Dakota. Brook stickleback are native to South Dakota and are present throughout much of the state, with higher concentrations in the east. They are a very small fish that often do not exceed 3.5 inches (8.89 cm) in length. Preferred habitat includes spring-fed waters with ample vegetation, but the species can be found in a variety of aquatic habitat (Hoagstrom, Adams, Neumann, & Willis, 2011).

The sturgeon family is comprised of three species in South Dakota including pallid sturgeon (*Scaphirhynchus albus*), shovelnose sturgeon (*Scaphirhynchus platorynchus*), and lake sturgeon (*Acipenser fulvescens*) (Hoagstrom, Adams, Neumann, & Willis, 2011). The pallid sturgeon and shovelnose sturgeon are listed as SGCN (SDGFP, 2014). The pallid sturgeon is listed as endangered and the shovelnose sturgeon is listed as threatened under the federal ESA (see Section 15.1.6.6). The pallid sturgeon is rare in South Dakota, but can be found in the free-flowing parts of the Missouri River. The shovelnose sturgeon is more common that the pallid sturgeon in South Dakota, but still is considered rare. It can be found in larger tributaries and the free flowing areas of the Missouri River (Hoagstrom, Adams, Neumann, & Willis, 2011).

The sucker family includes 13 species in South Dakota. Two species are presumed to be extirpated from the state and include northern hog sucker (*Hypentelium nigricans*) and black buffalo (*Ictiobus niger*) (Hoagstrom, Adams, Neumann, & Willis, 2011). Three species are listed as a SGCN and include blue sucker (*Cycleptus elongatus*), longnose sucker (*Catostomus catostomus*), and mountain sucker (*Catostomus platyrhynchus*) (SDGFP, 2014). The blue sucker prefers medium to large rivers with strong currents and can be found in eastern South Dakota in the James, Vermillion, and Big Sioux Rivers (SDGFP, 2014). The longnose sucker is also rare in the state and is considered a state threatened species (SDGFP, 2014).

The sunfish family includes 12 species, many of which are highly popular with sport fishermen. Two species, Sacramento perch (*Archoplites interruptus*) and redear sunfish (*Lepomis microlophus*) are non-native to the state. Additionally, the bluegill-green sunfish hybrid (*Lepomis macrochirus* X *Lepomis cyanellus*) was intentionally crossed to produce sport fish and therefore is not native to the state. Green sunfish (*Lepomis cyanellus*) are common throughout much of the state and prefer wetlands, ponds, and small streams but are tolerant of degraded, turbid waters. Other common species include orangespotted sunfish (*Lepomis humilis*), pumpkinseed (*Lepomis gibbosus*), and bluegill (*Lepomis macrochirus*). (Hoagstrom, Adams, Neumann, & Willis, 2011)

The temperate bass family consists of white bass (*Morone chrysops*), yellow bass (*Morone mississippiensis*), striped bass (*Morone saxatilis*), and wiper (*Morone chrysops* X *Morone saxatilis*). Striped bass are not native to South Dakota, and wiper are a crossbreed of white bass and striped bass, and therefore are also a non-native species. White bass are native to the state and are found throughout the entire state, in the Missouri River, tributaries, and glacial lakes. (Hoagstrom, Adams, Neumann, & Willis, 2011)

South Dakota has fourteen species in the trout/salmon family, all of which are non-native. Two of these species were artificially bred and introduced as sport fish and include tiger trout (*Salmo trutta* x *Salmo fontinalis)* and splake (*Salmo fontinalis* x *Salmo namaycush*). Brook trout have a naturally-reproducing population in Black Hills streams that provide preferred cold water habitats. Brown trout, rainbow trout, and Chinook salmon are artificially stocked throughout the state for anglers. Some populations within the state are able to successfully reproduce and spawn, but most populations are sustained through annual stocking. (Hoagstrom, Adams, Neumann, & Willis, 2011)

South Dakota has one species of trout-perch in the state (Hoagstrom, Adams, Neumann, & Willis, 2011). Trout-perch (*Percopsis omiscomaycus*) are native to the state and are considered an SGCN (SDGFP, 2014). Trout-perch are typically found in lakes and streams with gravel to sandy bottoms, which is required for spawning. In South Dakota, the species is concentrated in the far eastern part of the state, within the Big Sioux River, Split Rock Creek, Lake Kampeska, and Pelican Lake (SDGFP, 2015p).

Shellfish and Other Invertebrates

Limited information is available regarding freshwater invertebrate species in the state. A total of four aquatic insects and nine mussel species are considered SGCN. This list includes two federally endangered mussel species, Higgins eye (*Lampsilis higginsii*) and scaleshell (*Leptodea leptodon*). Higgins eye has been reduced to about 50 percent of its historical range due to habitat alteration and invasive mussel species. It typically prefers large rivers, with medium flows and sand or gravel substrates (USFWS, 2015a). Similar to Higgins eye, scaleshell may be found in clear waters with sand or gravel substrates. Their populations have decreased due to poor water quality, water impoundments, and invasive mussel species (USFWS, 2015e). SDGFP identifies four species of crayfish, including Devil crayfish (*Cambarus diogenes*), Calico crayfish (*Orconectes immunis*), Northern crayfish (*Orconectes virilis*), Rusty crayfish (*Orconectes rusicus*) (SDGFP, 2015q).

Invasive Aquatic Species

South Dakota does not have a set of comprehensive invasive aquatic species regulations. However, several regulations pertain to the prevention and management of invasive aquatic species, with SDR 41:07:01:11 being the most relevant. This regulation prohibits the release of non-native species into state waters without receiving a permit from SD GFP. SDCL 41-13-2 through 41-13-4 regulates use of herbicides in game fish waters, the introduction of fish or eggs, and emptying bait containers into public waterbodies.

15.1.6.6. Threatened and Endangered Species and Species of Conservation Concern

The USFWS is responsible for administering the ESA (16 U.S.C. §1531 et seq.) in the state of South Dakota. The USFWS has identified nine federally endangered and six federally threatened species known to occur in South Dakota (USFWS, 2015c). Of these 15 federally listed species, four of them have designated critical habitat (USFWS, 2015d). The 15 federally listed species include two mammals, four birds, two fish, five invertebrates, and two plants (USFWS, 2015c), and are discussed in detail under the following sections. There are no listed reptiles or amphibians in the state of South Dakota. Federal land management agencies maintain lists of species of concern for their landholdings; these lists are not discussed below as they are maintained independently from the ESA. For future site-specific analysis on those lands, consultation with the appropriate land management agency would be required.

Mammals

One endangered and one threatened mammal species are federally listed for South Dakota as summarized in Table 15.1.6-3. The Black-footed Ferret (*Mustela nigripes*) occurs throughout the western half of South Dakota. The Northern Long-eared Bat (*Myotis septentrionalis*) occurs throughout South Dakota. Information on the habitat, distribution, and threats to the survival and recovery of each of these species in South Dakota is provided below.

Table 15.1.6-3: Federally Listed Mammal Species of South Dakota

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in South Dakota	Habitat Description
Black-footed Ferret	*Mustela nigripes*	E, XN	No	Native grasslands inhabited by prairie dogs. Found in seven counties throughout the western half of South Dakota.

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in South Dakota	Habitat Description
Northern Long-eared Bat	*Myotis septentrionalis*	T	No	Hibernates in caves and mines that exhibit constant temperatures, high humidity, and no air currents in winter. In the summer, roosts singly or in colonies beneath bark, or in crevices or cracks of both live and dead trees. Found in 66 counties throughout South Dakota.

Source: (USFWS, 2015c)

[a] E = Endangered, T = Threatened, XN = Non-Essential Experimental Population

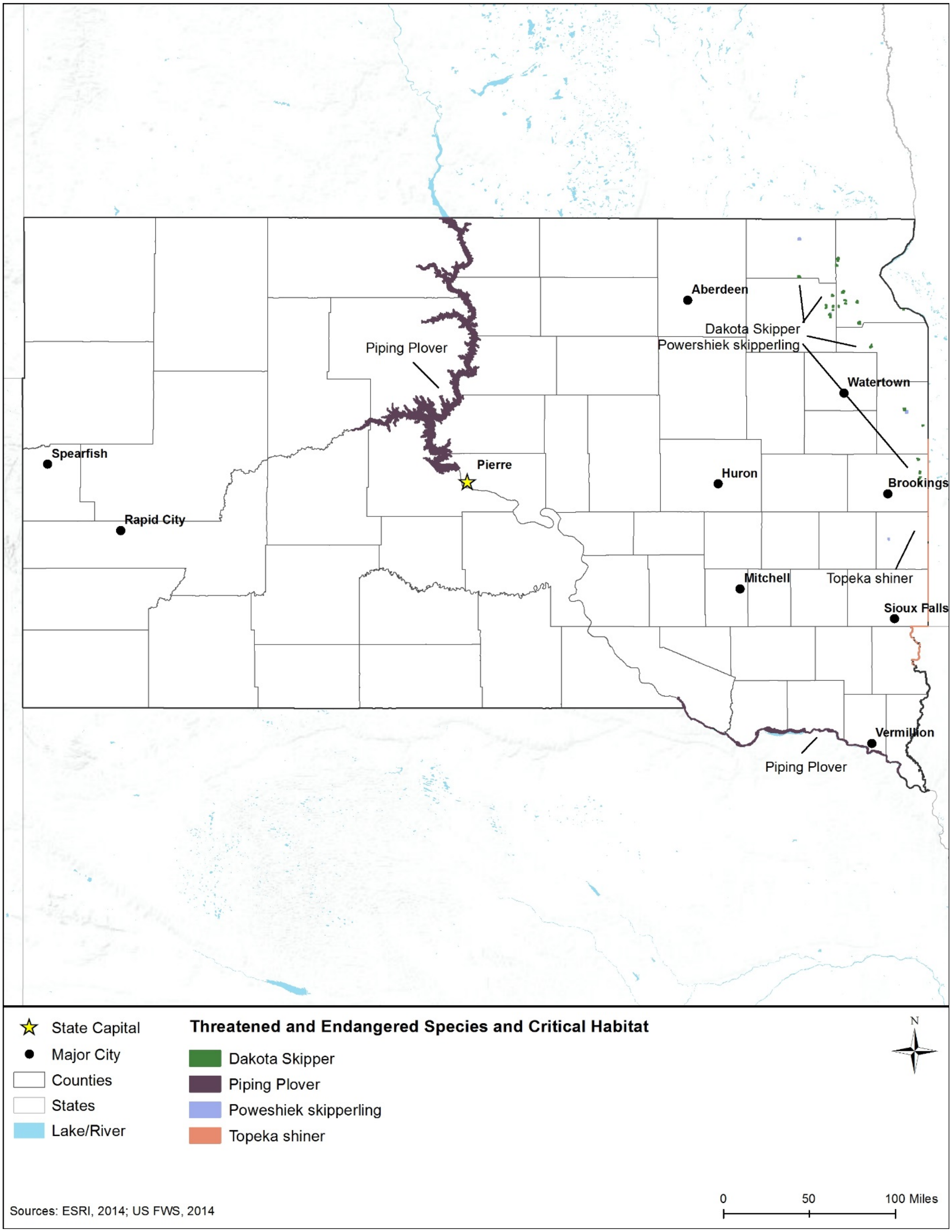

Figure 15.1.6-3: ESA Designated Critical Habitat for the State of South Dakota


Black-footed ferret Photo credit: USFWS

Black-footed Ferret. The endangered black-footed ferret is a member of the weasel family; it is a "slender, wiry animal with black feet, a black face mask, and black-tipped tail" that ranges from 19 to 24 inches in length and 1.4 to 2.5 pounds in weight (USFWS, 2010a). It was first listed as endangered under early endangered species legislation in 1967 (32 FR 4001, March 11, 1967) and was incorporated into the ESA as an endangered species (16 U.S.C. § 1531 et seq.). In 1986, only 18 individuals were known to exist within its range. The last remaining individuals in the wild were captured near Meeteetse, Wyoming, and later were used to develop experimental populations in several western states, including South Dakota. Two separate populations were reintroduced in Badlands National Park and in Conata Basin in August 1994, and two additional populations were reintroduced in the Cheyenne River Indian Reservation and Rosebud Indian Reservation in October 2000 and May 2003, respectively (USFWS, 2013b). In South Dakota, it is found in seven counties throughout the western half of the state (USFWS, 2015f), though "the recent encroachment of plague into South Dakota may pose a significant risk at reintroduction sites in that State" (USFWS, 2013b).

Suitable habitat for the black-footed ferret consists of native grasslands inhabited by prairie dogs. The survival of black-footed ferrets is directly connected to prairie dog abundance and habitat, as prairie dog burrows are used for shelter as well as dens to rear their young. In addition, over 90 percent of the black-footed ferret's diet is composed of prairie dogs. The primary causes for this species' near extinction were the loss of habitat and prey resulting from conversion of prairies to agriculture or other uses, and prairie dog eradication programs (USFWS, 2013b).

Northern Long-eared Bat. The northern long-eared bat is a brown furred, insectivorous bat with long ears. This bat is medium-sized, relative to other members of the genus *Myotis*, reaching a total length of 3 to 3.7 inches in length (USFWS, 2015g). The northern long-eared bat was listed as endangered in 2013 (78 FR 72058 72059, Dec. 02, 2013) and was relisted as threatened in 2015 (80 FR 17973 18033, April 2, 2015). In the U.S., its range includes most of the eastern and north central states. In South Dakota, it is found in 66 counties throughout the state. (USFWS, 2015h)

This species hibernates in caves and mines that exhibit constant temperatures, high humidity, and no air currents. In the summer, they roost singly or in colonies beneath bark, or in crevices or cracks of both live and dead trees. Although mating occurs in the fall, fertilization occurs following hibernation, from which pregnant females then migrate to summer areas where they roost in small colonies (USFWS, 2015g). White Nose Syndrome is the leading cause for the decline of this species. The numbers of northern long-eared bats in hibernacula has decreased by 99 percent in the northeast U.S. (USFWS, 2015h). Other threats include temperature or air flow impacts to their hibernating habitat, forest management practices that are incompatible with this species' habitat needs, habitat fragmentation, and wind farm operations (USFWS, 2015g).

Birds

Two endangered and two threatened bird species are federally listed for South Dakota as summarized in Table 15.1.6-4. The Least Tern (*Sterna antillarum*) occurs along sections of the Missouri and Cheyenne rivers in South Dakota. The Piping Plover (*Charadrius melodus*) occurs along the Missouri River and reservoirs in South Dakota. The Red Knot (*Calidris canutus rufa*) occurs near the East and Missouri Rivers and throughout South Dakota during migration. The Whooping Crane (*Grus americana*) occurs throughout South Dakota on its spring and fall migration. Information on the habitat, distribution, and threats to the survival and recovery of each of these species in South Dakota is provided below.

Table 15.1.6-4: Federally Listed Bird Species of South Dakota

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in South Dakota	Habitat Description
Least Tern	*Sterna antillarum*	E	No	Relatively unvegetated sandbars near rivers, reservoirs and other open water habitat. In South Dakota, it nests on flowing sections of the Missouri River and Cheyenne River and is found in 22 counties.
Piping Plover	*Charadrius melodus*	T	Yes; parts of the Missouri River in South Dakota.	Open, sparsely vegetated beaches composed of sand or gravel on islands or shorelines of inland lakes or rivers. In South Dakota, it nests on sandbar islands and shorelines of reservoirs along the Missouri River and reservoirs, and is found in 23 counties.
Red Knot	*Calidris canutus rufa*	T	No	During migration, uses inland saline lakes and freshwater areas as stopover habitat. Found in the East River region of the state[82], near the Missouri River and throughout South Dakota.
Whooping Crane	*Grus americana*	E	No	Marshes, wet meadows and prairies, riverine habitats, and agricultural fields. Migrates through South Dakota in the spring and fall; found in 55 counties throughout the state.

Source: (USFWS, 2015c) (USFWS, 2015e)

[a] E = Endangered, T = Threatened

[82] The East River region of South Dakota refers to a region of land east of the Missouri River.

Least Tern. The least tern is a 9-inch long, grey and white gull, with black markings on its head. The species was federally listed as endangered in 1985 (50 FR 21784 21792, May 28, 1985). In South Dakota, it nests on flowing sections of the Missouri River and Cheyenne River (USFWS, 1990). It is found in 22 counties in South Dakota (USFWS, 2015i).

Least Tern Photo Credit: USFWS

Suitable habitat for least terns consists of relatively unvegetated sandbars near rivers, reservoirs and other open water habitat. The primary threat to this species is the destruction and degradation of habitat. Nest disturbance and predation can also be factors. The primary causes of habitat loss historically have been dam construction, recreational activities, and the alteration of flow regimes along major river systems (USFWS, 2013c).

Piping Plover. The piping plover is a small, migratory shorebird of approximately 7 inches in length, with a wingspan of 19 inches. The species has a grey back, white underbelly, and black head markings and neck ring. In the northern plains region, the species was listed as threatened in 1985 (50 FR 50726 50734, December 11, 1985). The piping plover occurs in Northern Great Plains, along the Atlantic Coast, and in the Great Lakes Area within the U.S. for approximately 3 to 4 months during the summer breeding season. It nests on sandbar islands and shorelines of reservoirs along the Missouri River and reservoirs in South Dakota (USFWS, 2003) (USFWS, 2012). It is found in 23 counties in South Dakota (USFWS, 2015j). Critical habitat for the Northern Great Plains breeding population of the piping plover was designated in 2002 (67 FR 57638 57717, September 11, 2002) in parts of the Missouri River in South Dakota (USFWS, 2002).

Suitable habitat consists of open, sparsely vegetated beaches composed of sand or gravel on islands or shorelines of inland lakes or rivers. Nesting often occurs in palustrine wetlands[83] in the Northern Great Plains. Threats to piping plovers include destruction and degradation of preferred habitat resulting from construction and development activities and water control structures, nest predation, and nest abandonment caused by human presence or disturbance (USFWS, 2003) (USFWS, 2012).

Red Knot. The red knot is a ruddy brown bird with grey and white speckled wings of approximately 9 inches in length. The species was listed as threatened in 2014 (79 FR 73705 73748, December 11, 2014). The knot migrates annually from its breeding grounds above the Arctic Circle to the tip of South America where it winters. During spring and fall migration, the red knot travels in “non-stop segments of 1,500 miles and more, ending at stop sites called staging areas” (USFWS, 2005). Red knots have been sighted stopping over in South Dakota

[83] Palustrine wetlands: “Palustrine wetlands include nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens.” (USEPA, 2015t)

during spring migration. Most of the sightings were on the East River portion of South Dakota or near the Missouri River (USFWS, 2014b). It can be found in 66 counties throughout South Dakota (USFWS, 2015k).

During migration, the red knot uses inland saline lakes and freshwater areas as stopover habitat. Threats to this species include impacts to the reduced availability for foraging at staging areas and reduction of arctic breeding habitat as a result of climate change (USFWS, 2014b).

Whooping Crane. The whooping crane is a large, snowy white, plumed bird with a black beak and feet. It is the tallest bird of North America, reaching a height of up to 5 feet. The species was listed as endangered in 1967 (32 FR 4001, March 11, 1967) and was incorporated into the ESA as an endangered species (16 U.S.C. § 1531 et seq.) (USFWS, 2015m). The Aransas Wood Buffalo Population migrates through South Dakota in the spring and fall (USFWS, 2007). It is found in 55 counties throughout South Dakota (USFWS, 2015m).

Whooping Crane Photo Credit: USFWS

Suitable habitat for the whooping crane consists of marshes, wet meadows and prairies, riverine habitats, and agricultural fields. Historically, threats to the whooping crane included hunting, displacement by humans, and loss of habitat. Contributing factors to this species' decline include their isolated populations, loss and degradation of migration stopover habitat, construction of additional power lines, degradation of coastal ecosystems, and threat of chemical spills (USFWS, 2007).

Fish

Two endangered fish species are federally listed for South Dakota as summarized in Table 15.1.6-5. The Pallid Sturgeon (*Scaphirhynchus albus*) occurs in large rivers and lakes throughout South Dakota. The Topeka Shiner (*Notropis topeka (=tristis)*) occurs in small streams throughout South Dakota. Information on the habitat, distribution, and threats to the survival and recovery of each of these species in South Dakota is provided below.

Table 15.1.6-5: Federally Listed Fish Species of South Dakota

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in South Dakota	Habitat Description
Pallid Sturgeon	*Scaphirhynchus albus*	E	No	Large rivers with strong currents. Found in the headwaters of Lake Oahe, from Oahe Dam downstream to Lake Sharpe, between Fort Randall and Gavins Point Dams, and the lower Big Sioux River in 19 counties throughout South Dakota.

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in South Dakota	Habitat Description
Topeka Shiner	*Notropis topeka (=tristis)*	E	No	Small prairie streams in pools containing clear, clean water, clean gravel, rock, or sand bottoms. Found in 28 counties throughout South Dakota.

Source: (USFWS, 2015c)

[a] E = Endangered

Pallid sturgeon. The pallid sturgeon is a long, slender, pale colored fish growing up to 60 inches in length with a shovel shaped snout, armored body, and skeleton made of cartilage. The pallid sturgeon is one of two species of sturgeon found east of the Continental Divide; it is the larger of the two species, and weighs up to 60 pounds. The sturgeon was listed as endangered in 1990 (55 FR 36641 36647, September 6, 1990) and its range extends the length of the Missouri and Mississippi Rivers. In South Dakota, the pallid sturgeon is found in the headwaters of Lake Oahe, from Oahe Dam downstream to Lake Sharpe, between Fort Randall and Gavins Point Dams, and the lower Big Sioux River. It is found in 19 counties throughout South Dakota. (USFWS, 2014d; USFWS, 2015n)

The Pallid sturgeon prefers large rivers with strong currents; they can withstand a wide range of turbidity conditions. The key reason for this species' decline has been habitat fragmentation and alteration from the damming of major rivers and other large tributaries (USFWS, 2014d).

Topeka Shiner. The Topeka shiner is a silvery minnow with a dark stripe on its side growing to approximately 3 inches in length (KDWPT, 2015). The species was federally listed as endangered in 1998 (63 FR 69008 69021, December 15, 1998) and critical habitat that had previously been designated in South Dakota was excluded in 2004 (69 FR 44736 44770, July 27, 2004). The Topeka shiner is known to occur in portions of South Dakota, Minnesota, Kansas, Iowa, Missouri, and Nebraska. In South Dakota, it can be found in 28 counties throughout the state (USFWS, 2015o).

The Topeka shiner occurs primarily along small prairie streams in pools containing clear, clean water, clean gravel, rock, or sand bottoms. Threats to the species include alterations to stream quality such as increases in sedimentation or nutrients from fertilizers, changes in stream flow volume or temperatures, and restricted access for species river movement and isolation of populations (USFWS, 2010b).

Invertebrates

Four endangered and one threatened invertebrate species are federally listed for South Dakota as summarized in Table 15.1.6-6. The Dakota skipper (*Hesperia dacotae*) and the Poweshiek skipperling (*Oarisma poweshiek*) occur in northeastern South Dakota. The American burying beetle (*Nicrophorus americanus*) occurs in southern South Dakota. The Higgins eye (pearlymussel) (*Lampsilis higginsii*) and the scaleshell mussel (*Leptodea leptodon*) can both be found in the southeastern part of the state. Information on the habitat, distribution, and threats to the survival and recovery of each of these species in South Dakota is provided below.

Table 15.1.6-6: Federally Listed Invertebrate Species of South Dakota

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in South Dakota	Habitat Description
American Burying Beetle	*Nicrophorus americanus*	E	No	Flat topography with forest litter and decomposing plant matter in the top layers of well-drained soil. Found in Bennett, Gregory, Todd, and Tripp counties in southern South Dakota.
Dakota Skipper	*Hesperia dacotae*	T	Yes; in Brookings, Day, Deuel, Grant, Marshall, and Roberts counties, South Dakota.	Moist bluestem prairie and upland prairie that is somewhat dry and usually found on ridges and hillsides. Found in 12 counties in northeastern South Dakota.
Higgins Eye (Pearlymussel)	*Lampsilis higginsii*	E	No	Deep, moderately flowing rivers with firm, loose riverbeds. Found in Yankton County in southeastern South Dakota.
Poweshiek Skipperling	*Oarisma poweshiek*	E	Yes; in Brookings, Day, Deuel, Grant, Marshall, Moody, and Roberts counties, South Dakota.	High-quality prairie tallgrass and moist prairie fens. Found in 10 counties in northeastern South Dakota.
Scaleshell Mussel	*Leptodea leptodon*	E	No	Medium to large rivers in stable riffles and runs with gravel or mud substrates and moderate current. Found in the Missouri River in Clay, Union, and Yankton counties, in the southeastern corner of South Dakota.

Source: (USFWS, 2015c)

[a] E = Endangered, T = Threatened

American Burying Beetle. The American burying beetle is the largest carrion beetle in North America with a length of between 1 to 2 inches with a shiny black shell, smooth shiny black legs, pronounced orange markings on its body, and orange club shaped antennae. The beetle buries carcasses to feed its larvae and feed on while caring for its young. The species was listed as endangered in 1989 (54 FR 29652 29655, July 13, 1989) (USFWS, 1991).

The American burying beetle can be found in flat topography with forest litter and decomposing plant matter in the top layers of well-drained soil. Historically, the species ranged in more than 150 counties in 35 states of the eastern and central U.S. (USFWS, 1991), but today is found in five distinct populations across 10 states. In 2012, Missouri established a non-essential experimental population with efforts to reintroduce the American burying beetle. In South Dakota, the American burying beetle is found in Bennett, Gregory, Todd, and Tripp counties in the southern portion of the state (USFWS, 2015p). Threats to the species include habitat loss, fragmentation, and overall loss of reduction of small vertebrates to host the species (USFWS, 1991).

Dakota Skipper. The Dakota skipper is a small butterfly with a wingspan of 1 inch. It has a thick body and flies faster and more powerfully than most butterflies. Males have tawny-orange to brown colored upper wings with a mark on the forewing, and a dusty yellow-orange lower surface. Females have darker brown colored upper wings with tawny-orange spots and some white spots on the edge of the forewing, and a gray-brown colored lower surface with a faint white spot across the middle (USFWS, 2015q). The Dakota skipper was federally listed as threatened in 2014 (79 FR 63671 63748, October 24, 2014). Regionally, this species is known or believed to occur in Iowa, Minnesota, North Dakota, and South Dakota. In South Dakota, it can be found in 12 counties in the northeastern part of the state (USFWS, 2015r).

Critical habitat was designated in 2015 (80 FR 59247 59384, October 1, 2015) in Brookings, Day, Deuel, Grant, Marshall, and Roberts counties, South Dakota (USFWS, 2015s). It inhabits two types of prairies; moist bluestem prairie and upland prairie that are somewhat dry and usually found on ridges and hillsides. The biggest threat to the Dakota skipper is habitat loss and degradation due to overgrazing and land conversion (USFWS, 2015q).

Higgins Eye. The Higgins eye is a larger river mussel species which was listed as endangered in 1976 (41 FR 24062 24067, June 14, 1976) (USFWS, 2004). The species' range is primarily limited to the northern third of the Mississippi tributaries from between Louisiana and Indiana to between Minnesota and Wisconsin. Within South Dakota, it can be found in Yankton County in the southeastern part of the state (USFWS, 2015t).

The species is usually found in mussel beds with at least 15 other types of mussels, in portions of rivers with firm, loose bottoms such as sand and gravel, and not clay or concrete. The river environment should be deep with a moderate flow. The primary limiting factor to the Higgins eye is the threat of invasive species such as the Zebra mussel, which has intensively impacted mussel communities in various locations throughout the species' range (USFWS, 2004).

Poweshiek Skipperling. The Poweshiek skipperling is a small slender bodied butterfly which wingspan varies across its range, generally ranging from 0.9 inches to 1.2 inches wide. The upper sides of the wings are dark brown with light orange margins and a light orange head. The species was listed as endangered in 2014 (79 FR 63671 63748, October 24, 2014). The range for the Poweshiek skipperling has historically extended from Canada to Iowa, however has been reduced to the eastern regions of North and South Dakota to the eastern edge of Michigan (USFWS, 2014e). In South Dakota, it can be found in 10 counties in the northeastern part of the state (USFWS, 2015u).

Critical habitat was designated in 2015 (80 FR 59247 59384, October 1, 2015) in Brookings, Day, Deuel, Grant, Marshall, Moody, and Roberts counties, South Dakota (USFWS, 2015s). Habitat for the Poweshiek skipperling consists of high-quality prairie tallgrass and moist prairie fens, feeding on prairie flower nectar and utilizing sedges for larvae development. Habitat loss and habitat fragmentation are the primary reasons for the species' decline, and remain as current threats to the species' survival. Incompatible grazing or controlled burning techniques pose significant threats to the species' habitat health (USFWS, 2014e).

Scaleshell Mussel. The scaleshell mussel is a smooth, brownish green colored freshwater mussel of approximately 4 inches in length with a paper-thin shell and lighter brown markings. The scaleshell was federally listed as endangered in 2001 (66 FR 54808 54832, October 30, 2001). Regionally, this species is found in Arkansas, Illinois, Missouri, Nebraska, Oklahoma, and South Dakota. In South Dakota, it can be found in the Missouri River in Clay, Union, and Yankton counties, in the southeastern corner of the state (USFWS, 2015v).

It inhabits medium to large rivers in stable riffles and runs with gravel or mud substrates and moderate current. Though each mussel produces more than 400,000 larvae (approximately double to comparable mussels), the scaleshell has specific host requirements met by the freshwater drum *(Aplodinotus grunniens)* and requires specific ranges for temperature, flow, and oxygen in its habitat, which limit species populations. Present threats to the scaleshell include: declining oxygen levels in streams (eutrophication), sedimentation from mining and dredging operations, contamination from municipal and industrial wastes or agricultural run-off, competition from non-native species (such as the Asian clam and Zebra mussel), and impoundment of rivers which modify stream and river hydrology (USFWS, 2010c).

Plants

Two threatened plant species are federally listed for South Dakota as summarized in Table 15.1.6-7. The Western Prairie Fringed Orchid (*Platanthera praeclara*) occurs in eastern South Dakota. The Leedy's Roseroot (*Rhodiola integrifolia ssp. leedyi*) occurs in southwestern South Dakota. Information on the habitat, distribution, and threats to the survival and recovery of each of these species in South Dakota is provided below.

Table 15.1.6-7: Federally Listed Plant Species of South Dakota

Common Name	Scientific Name	Federal Status [a]	Critical Habitat in South Dakota	Habitat Description
Leedy's Roseroot	*Rhodiola integrifolia ssp. leedyi*	T	No	Moist wooded cliffs. Found in Pennington County, southwestern South Dakota.
Western Prairie Fringed Orchid	*Platanthera praeclara*	T	No	Prairies and meadows. Found in 16 counties in eastern South Dakota.

Source: (USFWS, 2015c)

[a] T = Threatened

Leedy's Roseroot. Leedy's roseroot is a Cliffside-dwelling wildflower with a long, leafy stem and small, 4- to 5-petaled flowers in colors from dark red to yellow or orange. Leedy's roseroot was federally listed as threatened in 1992 *(*57 FR 14649 14653, April 22, 1992*)*. Regionally this species is found in Minnesota, South Dakota, and New York. In South Dakota, it can be found in Pennington County, in the southwestern portion of the state (USFWS, 2015w).

It inhabits moderate cliffs, very specialized habitats in which groundwater seeps through rock and is cooled by air coming out of underground air passages in karst topography. This creates a wet, dripping environment (USFWS, 2015x). Threats to the Leedy's roseroot include habitat disturbances, groundwater contamination, and its low numbers (USFWS, 1998).

Western Prairie Fringed Orchid. The western prairie fringed orchid grows stalks up to 4 feet tall that bear 24 large white flowers. The lower petal of each flower has three lobes and is fringed, which gives this species its name. The western prairie fringed orchid was federally listed as threatened in 1989 (54 FR 39857 39863, September 28, 1989) and can be found along the edge of the plains from Minnesota south to Oklahoma. In South Dakota, it is found in 16 counties in the eastern part of the state (USFWS, 2015y).

It inhabits prairies and meadows and utilizes support from mycorrhizal fungi during seed germination. The western prairie fringed orchid requires measured periodic disturbance (i.e., fire, mowing, or grazing) and consistent soil moisture. Threats to the species include land conversion, impacts to the few species of sphinx moths, which pollinate the orchid, and lowering of groundwater levels. (USFWS, 1996)

15.1.7. Land Use, Recreation, and Airspace

15.1.7.1. Definition of the Resource

The following summarizes major land uses, recreational venues, and airspace considerations in South Dakota, characterizing existing, baseline conditions for use in evaluating the potential environmental consequences resulting from implementing the Proposed Action or Alternatives.

Land Use and Recreation

Land use is defined as "the arrangements, activities and inputs people undertake in a certain land cover type to produce, change, or maintain it" (Di Gregorio & Jansen, 1998). A land use designation can include one or more pieces of land, and multiple land uses may occur on the same piece of land. Land use also includes the physical cover, observed on the ground or remote sensing and mapping, on the earth's surface; land cover includes vegetation and manmade development (USGS, 2012).

Recreational uses are activities in which residents and visitors participate. They include outdoor activities, such as hiking, fishing, boating, athletic events (e.g., golf), and other attractions (e.g., historic monuments and cultural sites) or indoor activities, such as museums and historic sites. Recreational resources can include trails, lakes, forests, beaches, recreational facilities, museums, historic sites, and other areas/facilities. Recreational resources are typically managed by federal, state, county, or local governments.

Descriptions of land uses are presented in three primary categories: forest and woodlands, agricultural, and developed. Descriptions of land ownership are presented in four main categories: private, federal, state, and tribal. Descriptions of recreational opportunities are presented in a regional fashion.

Airspace

Airspace is generally defined as the space lying above the earth, above a certain area of land or water, or above a nation and the territories that it controls, including territorial waters (Merriam Webster Dictionary, 2015b). Airspace is a finite resource that can be defined vertically and horizontally, as well as temporally, when discussing it in relation to aircraft activities. Airspace management addresses how and in what airspace aircraft fly. Air flight safety considers aircraft flight risks, such as aircraft mishaps and bird/animal-aircraft strikes. The Federal Aviation Administration (FAA) is charged with the safe and efficient use of the nation's airspace and has established criteria and limits to its use.

The FAA operates a network of airport towers, air route traffic control centers, and flight service stations. The FAA also develops air traffic rules, assigns use of airspace, and controls air traffic in U.S. airspace. "The Air Traffic Organization (ATO) is the operational arm of the FAA responsible for providing safe and efficient air navigation services to approximately 30.2 million square miles of airspace. This represents more than 17 percent of the world's airspace and includes all of the U.S. and large portions of the Atlantic and Pacific Oceans and the Gulf of Mexico" (FAA, 2014). The ATO is comprised of Service Units (organizations) that support the operational requirements.

The FAA Air Traffic Services Unit (the Unit) manages the National Airspace System (NAS) and international airspace assigned to U.S. control and is responsible for ensuring efficient use, security, and safety of the nation's airspace. FAA field and regional offices (e.g., Aircraft Certification Offices, Airports Regional Offices, Flight Standards District Offices [FSDOs], Regional Offices & Aeronautical Center, etc.) assist in regulating civil aviation to promote safety, and develop and carry out programs that control aircraft noise and other environmental effects (e.g., air pollutants) attributed from civil aviation (FAA, 2015i). The FAA works with state aviation officials and airport planners, military airspace managers, and other organizations in deciding how best to use airspace.

15.1.7.2. Specific Regulatory Considerations

Appendix C summarizes numerous federal environmental laws and regulations that, to one degree or another, may affect land use in South Dakota. However, local county and city laws and regulations govern most site-specific land use controls and requirements. Furthermore, many land use controls and requirements are implemented and enforced under the umbrella of land use planning, often with the help and support of state authorities. Chapters 11-2, 11-4, and 11-6 of the South Dakota Code provide the regulatory framework to prepare county and municipal comprehensive plans (South Dakota Legislature, 2015f).

Because the Nation's airspace is governed by federal laws, there are no specific South Dakota state laws that would alter the existing conditions relating to airspace for this PEIS. South Dakota Statutes, Codified Law Title 50 Aviation, addresses aviation for the state (South Dakota Legislature, Legislative Research Council, 2015c).

15.1.7.3. Land Use and Ownership

For the purposes of this analysis, South Dakota has been classified into four primary land use groups, and a secondary category: forest and woodlands, shrub and grassland, agricultural, and developed land, as well as the secondary category of public land, surface water, and other land covers. Land ownership within South Dakota has been classified into four main categories: private, federal, state, and tribal.

Land Use

Table 15.1.7-1 identifies the major land uses in South Dakota. Shrub and grassland constitutes the largest portion of land use with 49 percent of South Dakota's total land occupied by this category (Table 15.1.7-1 and Figure 15.1.7-1). Agriculture is the second largest area of land use with 36 percent of the total land area. Forest and woodland areas account for approximately 6 percent and developed areas account for approximately 3 percent of the total land area. The remaining percentage of land includes public land and other land covers, shown in Figure 15.1.7-1, that are not associated with specific land uses (USGS, 2011).

Table 15.1.7-1: Major Land Uses in South Dakota

Land Use	Square Miles[a]	Percent of Land
Forest and Woodland	4,375	6.0%
Shrub and Grassland	37,568	49.0%
Agricultural Land	28,105	36.0%
Developed Land	2,181	3.0%
Public Land, Surface Water, and other Land Covers	2,267	6.0%

[a] Square miles are rounded to the nearest whole number. The maps and tables are prepared from the analysis of GIS data and imagery; a margin of error may result in the use of imagery. The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data, and the amount of ground truth verification work conducted. Other federal or state data sources may have slightly different totals.

Source: (USGS, 2011)

Forest and Woodland

Forest and woodland are concentrated in the southwestern portion of the state. The largest concentration of forest are in the Black Hills National Forest managed by the USFS. Most forest and woodland areas in South Dakota are publicly owned (approximately 60 percent) (USFS, 2013). Section 15.1.6 presents additional information about terrestrial vegetation.

<u>State Forests</u>

While there are no state forests in South Dakota, forest and woodland areas owned by the state of South Dakota consists of approximately 122 square miles. These lands are primarily within state parks and the South Dakota School and Public Lands (South Dakota Department of Agriculture Resource Conservation and Forestry Division, 2010).

Private Forest and Woodland

Approximately 39 percent of South Dakota's total forestland is owned by private landowners (USFS, 2014). Private forest ownership is concentrated in the Black Hills area in western South Dakota with some private forest also in southern and southcentral South Dakota (South Dakota Department of Agriculture Resource Conservation and Forestry Division, 2007). For additional information regarding forest and woodland areas, see Section 15.1.6, Biological Resources, and Section 15.1.8, Visual Resources.

Shrub and Grassland

Approximately 49 percent of South Dakota's surface area is classified as shrub and grassland. The largest concentrations of grasslands are in the western two-thirds of the state. Portions of these grasslands are within the Buffalo Gap National Grassland, Dakota Prairie Grasslands, and Fort Pierre National Grassland managed by the USFS. These areas provide a variety of land uses such as wildlife habitat, recreation, hunting, and livestock grazing (USFS, 2015a) (USFS, 2015e). For additional information on shrub and grassland, see Section 15.1.6, Vegetation.

Agricultural Land

Agricultural land exists in every region of the state, with the largest concentrations in the eastern third of the state (Figure 15.1.7-1). Slightly more than one-third of South Dakota's total land area is classified as agricultural land (approximately 36 percent, or 28,105 square miles). In 2012, there were 31,989 farms in South Dakota and 86 percent were owned and operated by small, family businesses, with the average farm size of 1,352 acres (USDA, 2014b). Some of the state's largest agricultural uses include corn, soybeans, hay, wheat, and sunflower. Other agricultural uses include cattle and calves, sheep, hogs, pigs, and turkeys (USDA, 2015c). For more information by county, access the USDA Census of Agriculture website: http://www.agcensus.usda.gov/Publications/2012/Full_Report/Census_by_State/South_Dakota/.

Developed Land

Developed land in South Dakota tends to be concentrated within major metropolitan areas and surrounding cities, towns, and suburbs (Figure 15.1.7-1). Although only 3 percent of South Dakota land is developed, these areas are highly utilized for residential, commercial, industrial, recreational, and government purposes. Table 15.1.7-2 lists the top five developed metropolitan areas within the state and their associated population estimates, and Figure 15.1.7-1 shows where these areas are within the Developed land use category.

Table 15.1.7-2: Top Five Developed Metropolitan Areas in South Dakota (2014 estimate)

Metropolitan Area	Population Estimate
Sioux Falls	168,586
Rapid City	72,638
Aberdeen	27,800
Brookings	23,225
Watertown	22,057
Total Estimated Population of Metropolitan Areas	**314,306**
Total State Estimated Population	**853,175**

Source: (U.S. Census Bureau, 2015w)

Land Ownership

Land ownership within South Dakota has been classified into four main categories: private, federal, state, and tribal (Figure 15.1.7-2).[84]

Private Land

The majority of land in South Dakota is privately owned, with most of this land falling under the land use categories of agricultural, forest and woodland, and developed (Figure 15.1.7-1). Highly developed, urban, metropolitan areas transition into suburban, agriculture, shrub, and woodland areas, which then transition into more wild and remote areas. Private land exists in all regions of the state.[85]

Federal Land

The federal government manages 5,371 square miles (7 percent) of South Dakota land with a variety of land types and uses, including military bases, national wildlife refuges, national forest, national grasslands, national parks, national monuments, water projects, and wilderness areas (Figure 15.1.7-2) (USGS, 2012) (NDEQ, 2015h). Six federal agencies manage federal lands throughout the state (Table 15.1.7-3).

[84] Land ownership data were retrieved from the Protected Areas Database of the United States (PAD-US), produced by USGS (http://gapanalysis.usgs.gov/padus/). This dataset categorizes lands across the U.S. by conservation, land management, planning, recreation, and ownership, as well as other uses. It is an extensive data set that contains large quantities of information relevant to the Proposed Action. The data was queried to show Owner and used USGS' PAD-US ownership symbolization for consistency. The PADUS 1.3 geodatabase was downloaded in the summer of 2015, and used consistently throughout all these maps for each state and D.C.

[85] Total acreage of private land could not be obtained for the state.

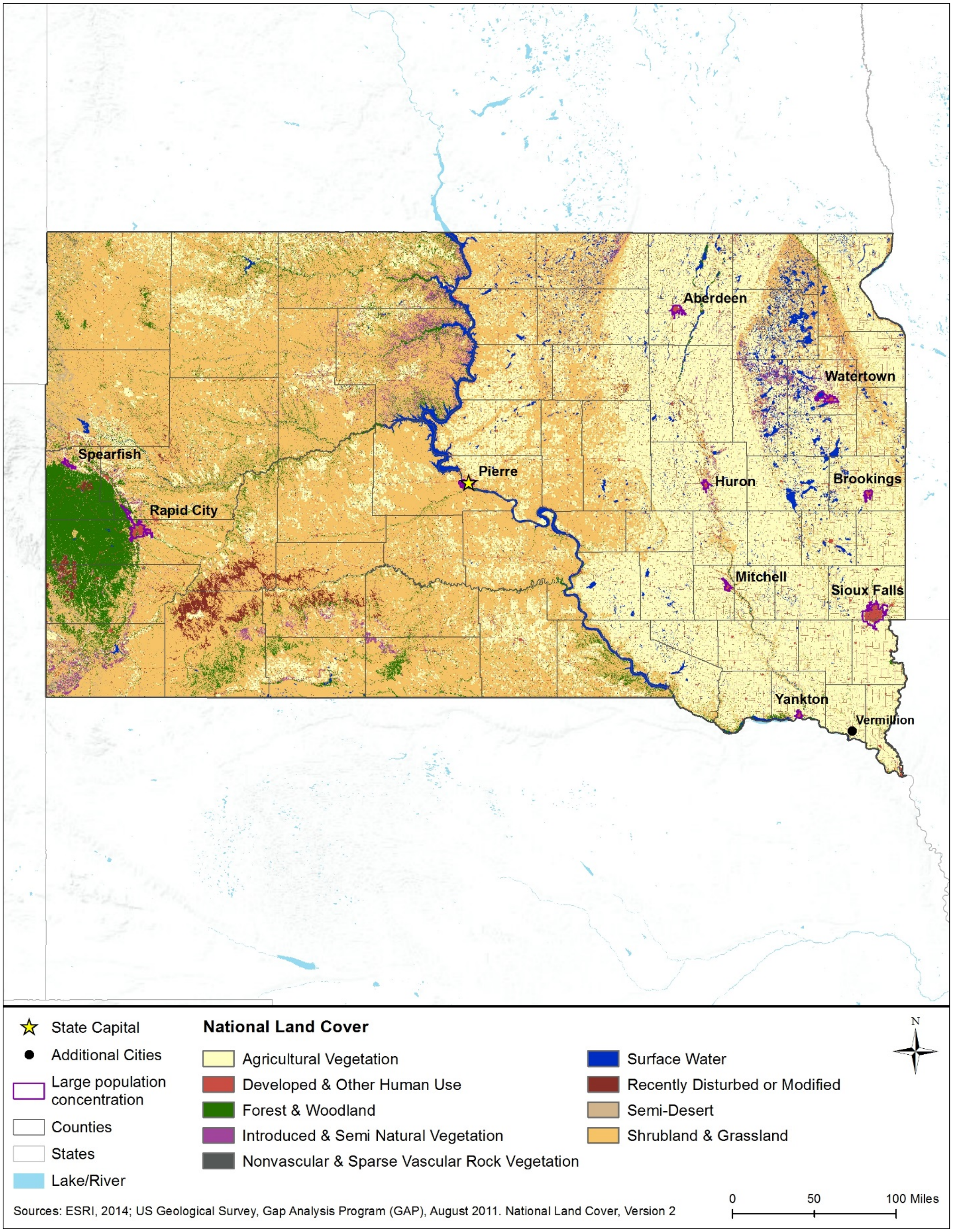

Figure 15.1.7-1: Land Use Distribution

Table 15.1.7-3: Federal Land in South Dakota

Agency	Square Miles	Representative Type
Department of Defense	841	Military Bases
USFWS	413	National Wildlife Refuges
USFS	3,152	National Forest, National Grasslands
NPS	453	Parks, Monuments, Historic Sites
Bureau of Reclamation	51	Water Projects, Dams
Bureau of Land Management (BLM)	461	Grasslands, Forest and Woodlands, National Monuments, Wilderness Area
Total	**5,371**	

Sources: (USGS, 2012) (USGS, 2014)

- The Department of Defense (DoD) owns and manages 841 square miles used for military bases (Department of Defense 2014);
- The USFWS owns and manages approximately 413 square miles of NWR land in South Dakota (USFWS, 2014);
- The USFS owns and manages 3,152 square miles consisting of National Forest and National Grasslands;
- The NPS manages 453 square miles consisting of National Parks, National Monuments, and National Historic Sites;
- The Bureau of Reclamation manages 51 square miles of land (USGS 2012) (USGS, 2014); and
- The BLM manages 461 square miles of Grasslands, Forest and Woodlands, National Monuments, Wilderness Areas in South Dakota.

State Land[86]

The South Dakota state government owns approximately 506 square miles of land comprised of state parks, recreation areas, wildlife habitat, wildlife production areas, and public access sites. Two main state agencies, the Division of Parks and Recreation and Division of Wildlife, manage the majority of state lands (Table 15.1.7-4). (USGS, 2012) (NDEQ, 2015h)

[86] State land use data for tables and narrative text were derived from specific state sources and may not correspond directly with USGS data that was used for developing maps and figures.

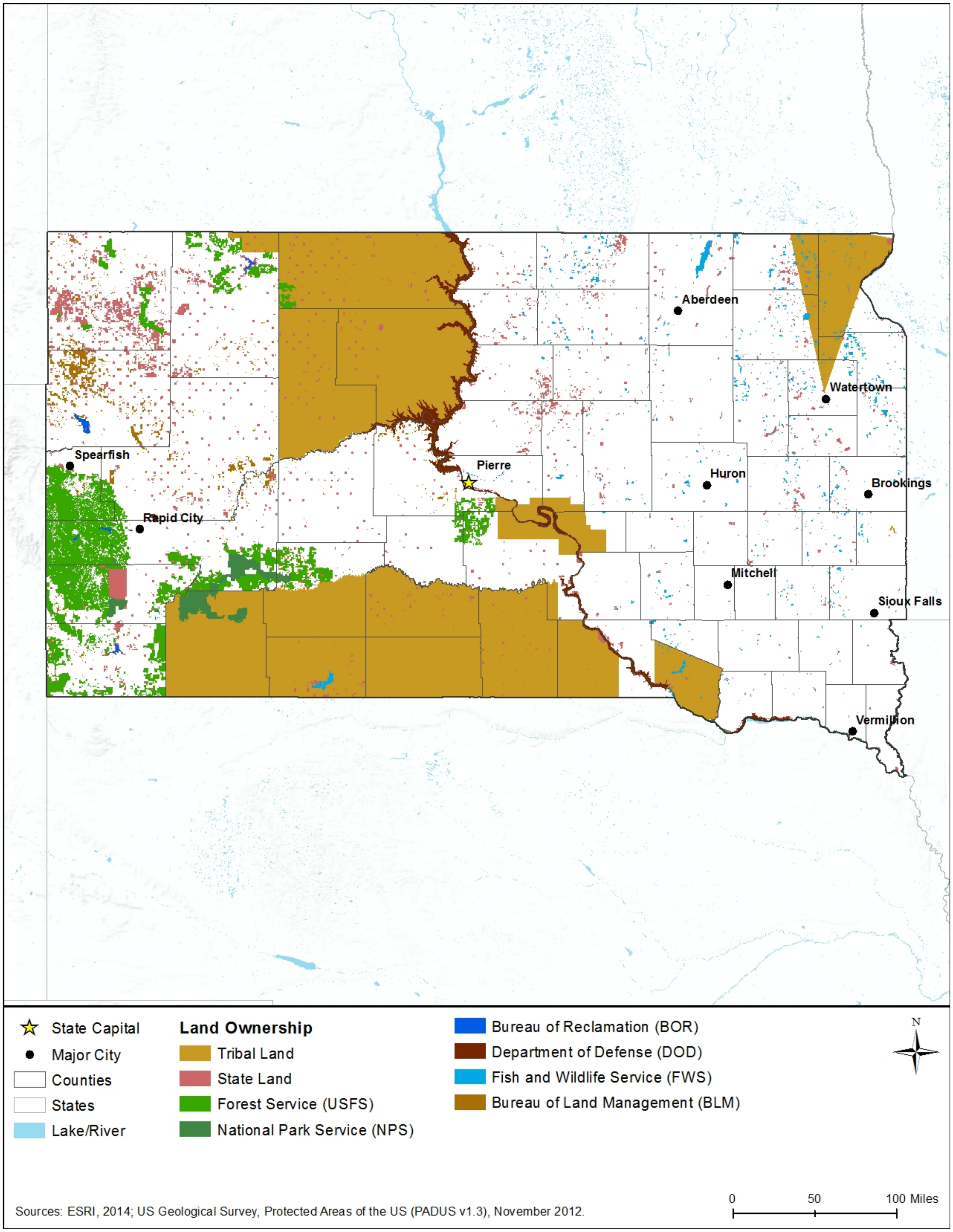

Figure 15.1.7-2: Federal, State and Tribal Land Ownership Distribution

Table 15.1.7-4: State Land in South Dakota

Agency	Square Miles	Representative Type
Division of Parks and Recreation	156	State Parks, Recreation Areas
Division of Wildlife	350	Wildlife Production Areas, Public Access
Total	**506**	NA

Source: (USGS, 2012) (USGS, 2014)

- The South Dakota Division of Parks and Recreation manages 156 square miles consisting of 12 state parks, 44 recreation areas, 69 lakeside use areas, and six nature areas; and
- The Division of Wildlife manages 350 square miles consisting of wildlife habitat areas, wildlife production, and public access areas for fishing and hunting. (SDGFP, 2013) (USGS, 2012) (USGS, 2014)

Tribal Land

The Bureau of Indian Affairs, along with individual tribes, manages 19,401 square miles, or 25 percent of the total land within South Dakota.[87] These lands are composed of 11 Indian Reservations and other land holdings currently in the state (Table 15.1.7-5). For additional information regarding tribal land, see Section 15.1.11, Cultural Resources.

Table 15.1.7-5: Indian Reservations and Other Land Holdings in South Dakota

Reservation Name	Square Miles
Cheyenne River Reservation	4,391
Crow Creek Reservation	463
Flandreau Reservation	4
Lake Traverse (Sisseton) Reservation	1,400
Lower Brule Reservation	382
Northern Cheyenne Trust Land	1
Pine Ridge Reservation	4,355
Rosebud Reservation	5,197
Standing Rock Reservation	2,527
Turtle Mountain Public Domain Tracts	1
Yankton Reservation	678
Total	**19,399**

Source: (USGS, 2012) (USGS, 2014)

15.1.7.4. Recreation

South Dakota's terrain consists of grasslands, prairies, plains, and plateaus, with 440-miles of the Missouri River bisecting the center of the state. The southwest corner is mountainous, forested, and with unique rock outcroppings and canyons, while the northeast has many glacial lakes.

[87] Although the Bureau of Indian Affairs "manages" American Indian lands, the Bureau of Indian Affairs is different than other land management agencies as the lands are held in trust and are sovereign nations.

Water-based recreation like boating and fishing are very popular activities across the state. Tourism is a major industry in South Dakota, especially in the southwestern area where there is a notable concentration of National Parks, Monuments, and Memorials. (South Dakota Department of Tourism, 2015h)

On the community level, the larger cities and towns provide an assortment of indoor and outdoor recreational facilities including community and recreation centers, theaters, museums, athletic fields and courts, golf courses, multi-use trails, playgrounds, picnicking areas, and boat launches. Availability of community-level facilities is typically commensurate to the population's distribution and interests, and the natural resources prominent in the vicinity. There are 12 state parks, 44 state recreation areas, and numerous natural areas and state lakeside use areas (SDGFP, 2015o). South Dakota's rich fossil, American Indian, frontier explorer, prairie pioneer, and “wild west” legends history is preserved in numerous cultural/heritage sites, trails, and towns. Federally, the BLM, NPS, USFS, USFWS, and the USACE manage areas in South Dakota with substantial recreational attributes.

This section discusses key recreational opportunities and activities representative of various regions of South Dakota. The state can be categorized by four distinct recreational regions, each of which are presented in the following sub-sections (South Dakota Department of Tourism, 2015h). For information on visual resources such as National Scenic Byways and state-designated Byways, see Section 15.1.8, Visual Resources; and for information on culturally/historically significant resources (e.g., National Historic Sites, National Historic Landmarks [NHLs], sites on the National Register of Historic Places [NRHP], and Natural Heritage Areas [NHAs]), see Section 15.1.11, Cultural Resources.

West Region

The area west of the Missouri River and Lake Oahe and bordered by the states of North Dakota, Montana, Wyoming, and Nebraska roughly defines South Dakota's West Region. The terrain in this region is mostly grasslands, plains with buttes, and rolling hills, except for the Black Hills area that has low mountains and is heavily forested. The Badlands area has severely eroded buttes and deep canyons in a mixed grass prairie setting (Figure 15.1.7-3).[88] The southeast corner of this region is packed with special recreational destinations such as Badlands and Wind Cave National Parks, Mt. Rushmore National Memorial and Crazy Horse Memorial, Jewel Cave National Monument, Black Hills National Forest and Buffalo Gap National Grassland. Custer State Park's plentiful wildlife, bison herd, and “Needles” rock climbing formation draw many visitors. This 71,000-acre park has four mountain lakes, four lodges, cabins, campgrounds, several scenic drives, and multi-use trails. (South Dakota Department of Tourism, 2015i)

[88] Recreational area data was retrieved from the Protected Areas Database of the United States (PAD-US), produced by USGS (http://gapanalysis.usgs.gov/padus/). This dataset categorizes lands across the U.S. by conservation, land management, planning, recreation, and ownership, as well as other uses. It is an extensive data set that contains large quantities of information relevant to the Proposed Action. The data was queried to show the Primary Designation Type of area. To show these in the map, recognizable symbols (e.g., varying shades of green for National Parks and Forests) were used as PAD-US does not have a standard symbolization for recreational resources. The PADUS 1.3 geodatabase was downloaded in the summer of 2015, and used consistently throughout all these maps for each state and D.C.

Angostura Recreation Area is popular for its beaches along the 36-mile shoreline. The 109-mile George S. Mickelson Trail traverses through the Black Hills with 15 trailheads, 4 rock tunnels, and 100 covered railroad bridges (SDGFP, 2015g). Rapid City's "Main Street Square" has a well-attended outdoor venue for arts, music, culture, sports, and special events. Now in its 75th year, nearby Sturgis hosts an annual motorcycle rally that brings thousands of enthusiasts to this small city (South Dakota Department of Tourism, 2015j). Spearfish's canyon and falls are popular tourist destinations, as is Deadwood, for its historic sites, museums, and casinos.

Central Region

The Central Region frames the entire segment of the Missouri River from North Dakota to Nebraska. The Great Plains are dominant in this area, with river valleys cut in the plateau. The Standing Rock, Lower Brule, Crow Creek, Yankton, and half of the Cheyenne River Reservation makeup a substantial portion of the lands in this region (Figure 15.1.7-3). Pierre, the capital, is at the center of this region and residents utilize nearby Farm Island and West Bend State Recreation Areas (SRAs) for easy access to campgrounds, water-based recreation, bicycling, and hiking. SRAs and Lakeside Use Areas (LUAs) are prominent in this region, primarily at the upper and lower sections of the state's Missouri River channel. Upland bird and waterfowl hunting is popular along this corridor. With more than 2,000 miles of shoreline, Lake Oahe Reservoir (fourth largest reservoir in the U.S.) has excellent water-based recreation opportunities such as swimming, water skiing, scuba diving, boating, sailing, and fishing; as well as camping, hiking, cross-country skiing, and bicycling. Lake Francis Case is also surrounded by seven recreation sites that provide similar opportunities (SDGFP, 2015d). Explorers Lewis and Clark followed the entire length of the Missouri River through South Dakota. There are numerous interpretive centers, stops, and museums along the route that capture key sites and events from their historic journey (South Dakota Department of Tourism, 2015g).

Northeast Region

The Northeast Region is roughly from the cities of Brookings and Huron north to the North Dakota border, and east of Aberdeen to the Minnesota state border. In addition to many SRAs and LUAs, this region has the majority of the South Dakota State Parks. Most all of these recreation sites are near the numerous glacial lakes that are present in this region (Figure 15.1.7-3). Hartford Beach State Park on Big Stone Lake, Oakwood Lakes, and Roy Lake State Parks are popular destinations for those wanting to swim, boat, fish, camp, hike, snowshoe, cross country ski, and snowmobile. (SDGFP, 2015e)

Southeast Region

The Southeast Region is roughly east of the city of Mitchell and is bordered on the south by the Missouri River and Nebraska, and on the east by the Big Sioux River and Minnesota and Iowa. It is the most developed and populated part of the state. Sioux Falls, the largest city, is at the intersection of the state's two interstate highways, I-29 & I-90, and on the banks of the Big Sioux River (Figure 15.1.7-3). The 123-acre Falls Park features the namesake waterfall and is the centerpiece for the downtown district. (South Dakota Department of Tourism, 2015k) The Big

Sioux SRA is a popular recreation site for local Sioux Falls residents, providing opportunities for hikers, bicyclists, cross country skiers, canoers, snowmobilers, disc golfers, archers, and campers. Lake Alvin and Vermillion provide good boating, swimming, and fishing opportunities due to their proximity to Sioux Falls. Nearby Palisades State Park's Split Rock Creek, gorge, and quartzite formations attract hikers, climbers, photographers, and picnickers (SDGFP, 2015f). The Lewis and Clark Recreation Area with its beach, marina, cabins, and campgrounds is one of the most popular resort destinations in this region. The South Dakota segment of the Missouri National Recreational River runs from the Fort Randall Dam to the junction of the border with Nebraska and Iowa, and has many opportunities for boating, fishing, hiking, and camping (NPS, 2015).

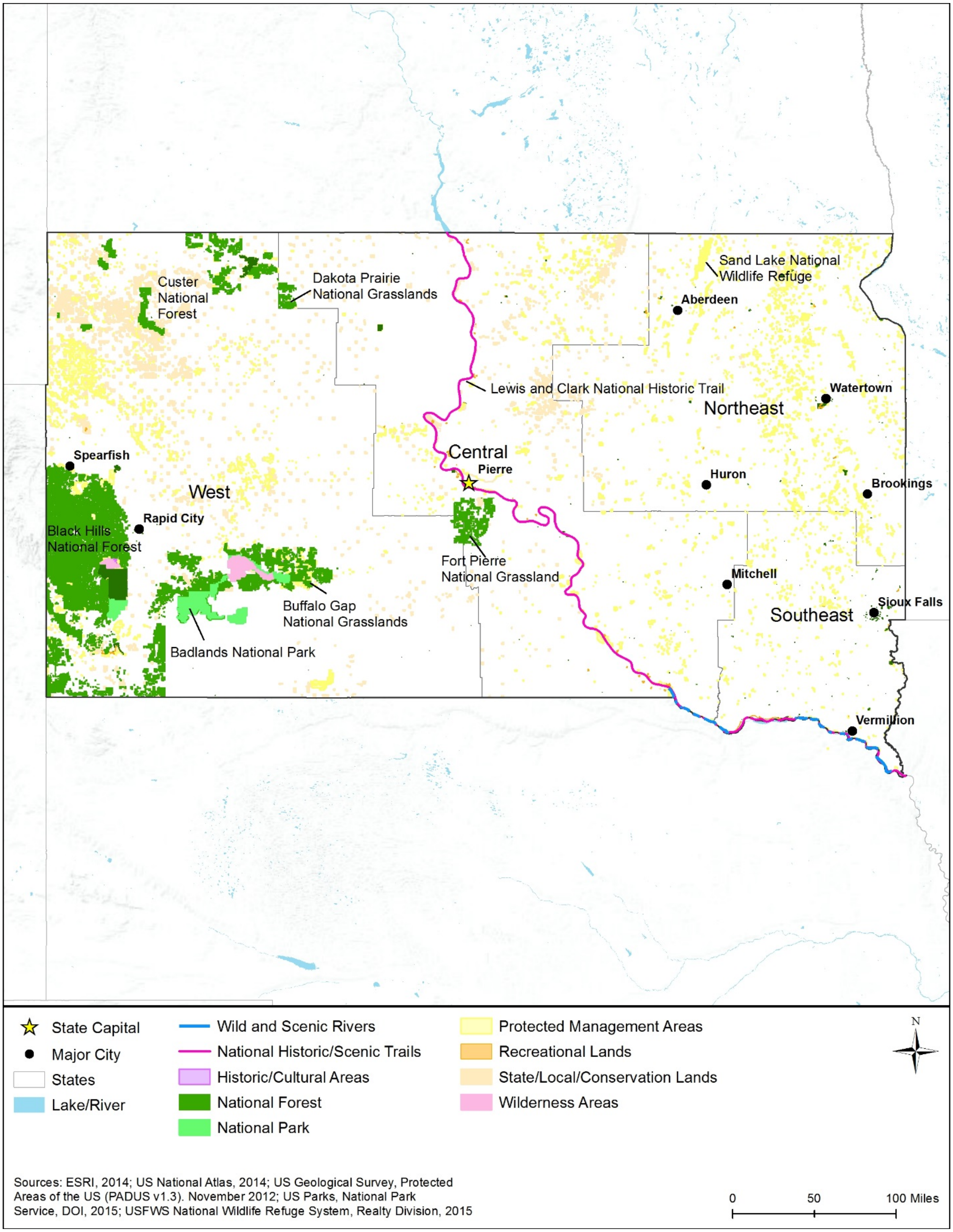

Figure 15.1.7-3: South Dakota Recreation Resources

15.1.7.5. Airspace

The FAA uses the NAS to provide for aviation safety. The NAS includes Special Use Airspace (SUA) consisting of Restricted Areas, Warning Areas, and Military Operation Areas (MOAs). The FAA controls the use of the NAS with various procedures and practices (such as established flight rules and regulations, airspace management actions, and air traffic control procedures) to ensure the safety of aircraft and protection of the public.

Airspace Categories

There are two categories of airspace or airspace areas:

1) Regulatory airspace consists of controlled airspace (Class A, B, C, D, and E airspace areas in descending order of restrictive operating rules), and restricted and prohibited areas.
2) Non-regulatory airspace consists of MOAs, warning areas, alert areas, and controlled firing areas.

Within each of these two categories, there are four types of airspace: controlled, uncontrolled, special use, and other airspace. The categories and types of airspace are dictated by the complexity or density of aircraft movements, the nature of the operations conducted within the airspace, the level of safety required, and the national and public interest.

Figure 15.1.7-4 depicts the different classifications and dimensions for controlled airspace. Air Traffic Control (ATC)[89] service is based on the airspace classification (FAA, 2008).

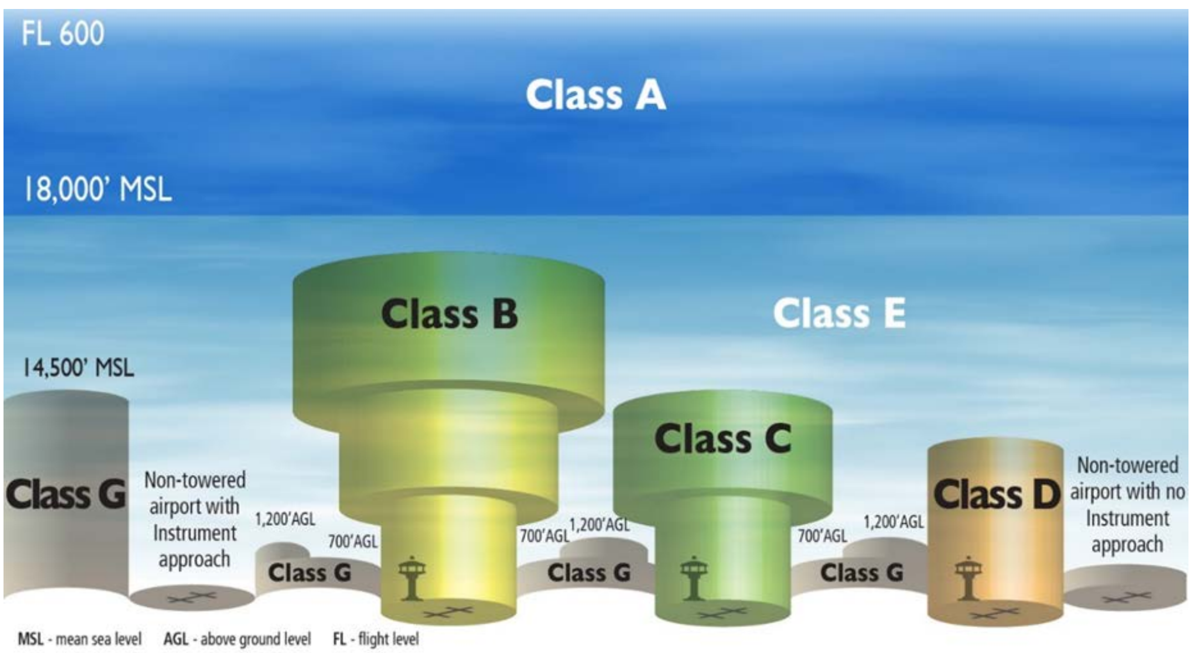

Figure 15.1.7-4: National Air Space Classification Profile

[89] ATC – Approved authority service to provide safe, orderly and expeditious flow of air traffic operations (FAA, 2015a).

Controlled Airspace

- **Class A:** Airspace from 18,000 feet to 60,000 feet Mean Sea Level (MSL).[90] Includes the airspace over waters off the U.S. coastlines (48 contiguous States and Alaska) within 12 Nautical Miles (NM). All operations must be conducted under Instrument Flight Rules (IFR).[91]
- **Class B:** Airspace from the surface up to 10,000 feet MSL near the busiest airports with heavy traffic operations. The airspace is tailored to the specific airport in several layers. An ATC clearance is required for all aircraft to operate in this area.
- **Class C:** Airspace from the surface to 4,000 feet above the airport elevation surrounding the airport. Applies to airports with an operational control tower, serviced by a radar approach control, and certain number of IFR operations or total number of passengers boarding aircrafts. Airspace is tailored in layers, but usually extends out to 10 NM from 1,200 feet to 4,000 feet above the airport elevation. Entering Class C airspace requires radio contact with the controlling ATC authority, and an ATC clearance is ultimately required for landing.
- **Class D:** Airspace from the surface to 2,500 feet above the airport elevation surrounding airports with an operational control tower. Airspace area is tailored. Aircraft entering the airspace must establish and maintain radio contact with the controlling ATC.
- **Class E:** Controlled airspace not designated as Class A, B, C, or D. Class E airspace extends upward from the surface or a designated altitude to the overlying or adjacent controlled airspace (FAA, 2008).

Uncontrolled Airspace

- **Class G:** No specific definition. Refers generally to airspace not designated as Class A, B, C, D, or E. Class G airspace is from the surface to the base of Class E airspace.

Special Use Airspace

SUA designates specific airspace that confines or imposes limitations on aircraft activities (See Table 15.1.7-6).

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[90] MSL – The average level of for the surface of the ocean; "The height of the surface of the sea midway between the average high and low tides" (Merriam Webster Dictionary, 2015a).
[91] IFR – Rules for the conduct of flights under instrument meteorological conditions (FAA, 2015a).

Table 15.1.7-6: SUA Designations

SUA Type	Definition
Prohibited Areas	"Airspace of defined dimensions identified by an area on the surface of the earth within which the flight of aircraft is prohibited. Such areas are established for security or other reasons associated with the national welfare. These areas are published in the Federal Register and are depicted on aeronautical charts."
Restricted Areas	"Airspace identified by an area on the surface of the earth within which the flight of aircraft, while not wholly prohibited, is subject to restrictions. Activities within these areas must be confined because of their nature or limitations imposed upon aircraft operations that are not a part of those activities or both. Restricted areas denote the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Penetration of restricted areas without authorization from the using or controlling agency may be extremely hazardous to the aircraft and its occupants. Restricted areas are published in the Federal Register and constitute 14 CFR Part 73."
Warning Areas	"Airspace of defined dimensions, extending from three NM from the U.S. coast, which contains activity that may be hazardous to nonparticipating aircraft. The purpose of such warning areas is to warn non-participating pilots of the potential danger. A warning area may be located over domestic or international waters or both."
MOAs	"Airspace of defined vertical and lateral limits established for separating certain military activities (e.g., air combat maneuvers, air intercepts, testing, etc.) from IFR traffic. Whenever an MOA is in use, non-participating IFR traffic may be cleared through a MOA if IFR separation can be provided by ATC. Otherwise, ATC will reroute or restrict nonparticipating IFR traffic."
Alert Areas	"Depicted on aeronautical charts to inform non-participating pilots of areas that may contain a high volume of pilot training or an unusual type of aerial activity. Pilots should be particularly alert when flying in these areas. All activity within an alert area must be conducted in accordance with CFRs, without waiver, and pilots of participating aircraft and pilots transiting the area are responsible for collision avoidance."
Controlled Firing Areas (CFAs)	"Activities that, if not conducted in a controlled environment, could be hazardous to nonparticipating aircraft. The distinguishing feature of the CFA, as compared to other special use airspace, is that its activities are suspended immediately when spotter aircraft, radar, or ground lookout positions indicate an aircraft might be approaching the area. There is no need to chart CFAs since they do not cause a nonparticipating aircraft to change its flight path."
National Security Areas (NSA)	"Airspace of defined vertical and lateral dimensions established at locations where there is a requirement for increased security and safety of ground facilities. Pilots are requested to voluntarily avoid flying through the depicted NSA. When it is necessary to provide a greater level of security and safety, flight in NSAs may be temporarily prohibited by regulation under the provisions of 14 CFR Section 159.7. Regulatory prohibitions are issued by System Operations, System Operations Airspace and Aeronautical Information Manual (AIM) Office, Airspace and Rules, and disseminated via Notices to Airmen (NOTAM). Inquiries about NSAs should be directed to Airspace and Rules."

Source: (FAA, 2015a) (FAA, 2008)

Other Airspace Areas

Other airspace areas, explained in Table 15.1.7-7, include Airport Advisory, Military Training Routes (MTRs), Temporary Flight Restrictions (TFRs), Parachute Jump Aircraft Operations, published Visual Flight Rules (VFR) and IFRs, and Terminal Radar Service Areas.

Table 15.1.7-7: Other Airspace Designations

Type	Definition
Airport Advisory	There are three types: • Local Airport Advisory – Operated within 10 statute miles (5,280 feet/mile) of an airport where there is a Flight Service Station (FSS) on an airport, but no operational control tower. The FSS advises the arriving and departing aircraft on particular conditions. • Remote Airport Advisory – Operated within 10 statute miles for specific high activity airports with no operational control tower. • Remote Airport Information Service – Used for short-term special events.
MTRs	MTRs are for use by the military for training, specifically low level combat tactics where low altitudes and high speed are needed.
TFRs	TFRs are established to: • Protect people and property from a hazard; • Provide safety for disaster relief aircraft during operations; • Avoid unsafe aircraft congestion associated with an incident or public interest event; • Protect the U.S. President, Vice President, and other public figures; • Provide safety for space operations; and • Protect in the State of Hawaii declared national disasters for humanitarian reasons. Only those TFRs annotated with an ending date and time of "permanent" are included in this Draft PEIS, since it indicates a longer, standing condition of the airspace. Other TFRs are typically a shorter duration of for a one-time specific event.
Parachute Jump Aircraft Operations	Parachute jump area procedures are in 14 CFR Part 105, while the U.S. parachute jump areas are contained in the regional Airport/Facility Directory.
Published VFRs and IRs	These are established routes for moving around and through complex airspace, like Class B airspace. VFRs are procedures used to conduct flights under visual conditions. IFRs are procedures used to conduct flights with instruments and meteorological conditions.
Terminal Radar Service Areas	Airspace areas that are not one of the established U.S. airspace classes. These areas provide additional radar services to pilots.

Source: (FAA, 2015a) (FAA, 2008)

15.1.7.6. Aerial System Considerations

Unmanned Aerial Systems

Unmanned Aerial Systems (UASs) are widely used by the military, private entities, public service, educational institutions, federal/state/local governments, and other agencies. The FAA's Unmanned Aircraft Systems Integration Office integrates UAS into the NAS. The *Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap of 2013* addresses the actions and considerations needed to integrate UAS into the NAS "without reducing existing capacity, decreasing safety, negatively impacting current operators, or increasing the risk to airspace users or persons and property on the ground any more than the integration of comparable new and novel technologies" (FAA, 2013).

UAS at airports is a complex operational challenge with the need to separate UAS flight operations from mainstream air traffic. Separation can be achieved with specific UAS launch windows, special airports, or off-airport locations that allow the UAS to easily launch and recover. Special aviation procedures are applied to UAS flights. There must be the capability of Sense and Avoid (SAA) and Control and Communication (C2) during UAS operations. An Unmanned Aircraft (UA) must be able to see (or sense) other aircraft in the area and avoid the aircraft through corrected flight path changes. General equipment and operational requirements can include aircraft anti-collision lights, an altitude encoding transponder, cameras, sensors, and collision avoidance maneuvers. The C2 of the UA occurs with the pilot/operator, the UAS control station, and ATC. Research efforts, a component of the FAA's UAS roadmap, continue to mature the technology for both SAA and C2 capabilities.

Balloons

Moored balloons and unmanned free balloons cannot be operated in a prohibited or restricted area unless approval is obtained from the controlling agency. Balloons also cannot be operated if they pose a hazard to people and their property.

15.1.7.7. Obstructions to Airspace Considerations

The Airports Division of the FAA is responsible for the evaluation and analysis of proposed construction or alterations on airports. The FAA Air Traffic Office is responsible for determining obstructions to air navigation as a result of construction off airports that may affect the safe and efficient use of navigable airspace and the operation of planned or existing air navigation and communication facilities. Such facilities include air navigation aids, communication equipment, airports, federal airways, instrument approach or departure procedures, and approved off-airway routes. An Obstruction Evaluation and Airport Airspace Analysis (OE/AAA) is required when there is the potential for airport construction/alteration of a facility that may impinge upon the NAS. Per 14 CFR Part 77.9, the FAA is to be notified about construction or alterations when:

- “Any construction or alteration exceeding 200 feet AGL
- Any construction or alteration:
  - within 20,000 feet of a public use or military airport which exceeds a 100:1 surface from any point on the runway of each airport with its longest runway more than 3,200 feet
  - within 10,000 feet of a public use or military airport which exceeds a 50:1 surface from any point on the runway of each airport with its longest runway no more than 3,200 feet
  - within 5,000 feet of a public use heliport which exceeds a 25:1 surface
- Any highway, railroad, or other traverse way whose prescribed adjusted height would exceed the above noted standards
- When requested by the FAA

- Any construction or alteration located on a public use airport or heliport regardless of height or location" (FAA, 2015j).

Construction or alternative facilities (such as towers) that are subject to FCC licensing requirements are also required to have an OE/AAA performed by the FAA Airport Division.

15.1.7.8. South Dakota Airspace

The South Dakota Department of Transportation Aviation Office is responsible for planning and administration of the state's airport improvement program. The Aviation Office also inspects annually each general aviation airport, and handles aircraft registrations and permits for tall structures. (SDDOT, 2015c) South Dakota's Aeronautics Commission "promotes aeronautics, fosters air commerce, and assists the development of aviation and aviation facilities" for the state (SDDOT, 2015a). There is one FAA FSDO for South Dakota in Rapid City (FAA, 2015i).

South Dakota airports are classified as those included in the State Aviation System Plan (SASP) and those that are not part of the SASP. The SASP addresses the strategic planning and future development for the State's airport system, as well as addressing key associated with their airports (National Association of State Aviation Officials (NASAO), 2015). Figure 15.1.7-5 presents the different aviation airports/facilities residing in South Dakota, while Figure 15.1.7-6 and Figure 15.1.7-7 present the breakout by public and private airports/facilities. There are approximately 169 airports within South Dakota as presented in Table 15.1.7-8 and Figure 15.1.7-5, Figure 15.1.7-6, and Figure 15.1.7-7 (USDOT, 2015b).

Table 15.1.7-8: Type and Number of South Dakota Airports/Facilities

Type of Airport or Facility	Public	Private
Airport	72	65
Heliport	0	32
Seaplane	0	0
Ultralight	0	0
Balloonport	0	0
Gliderport	0	0
Total	**72**	**97**

Source: (USDOT, 2015b)

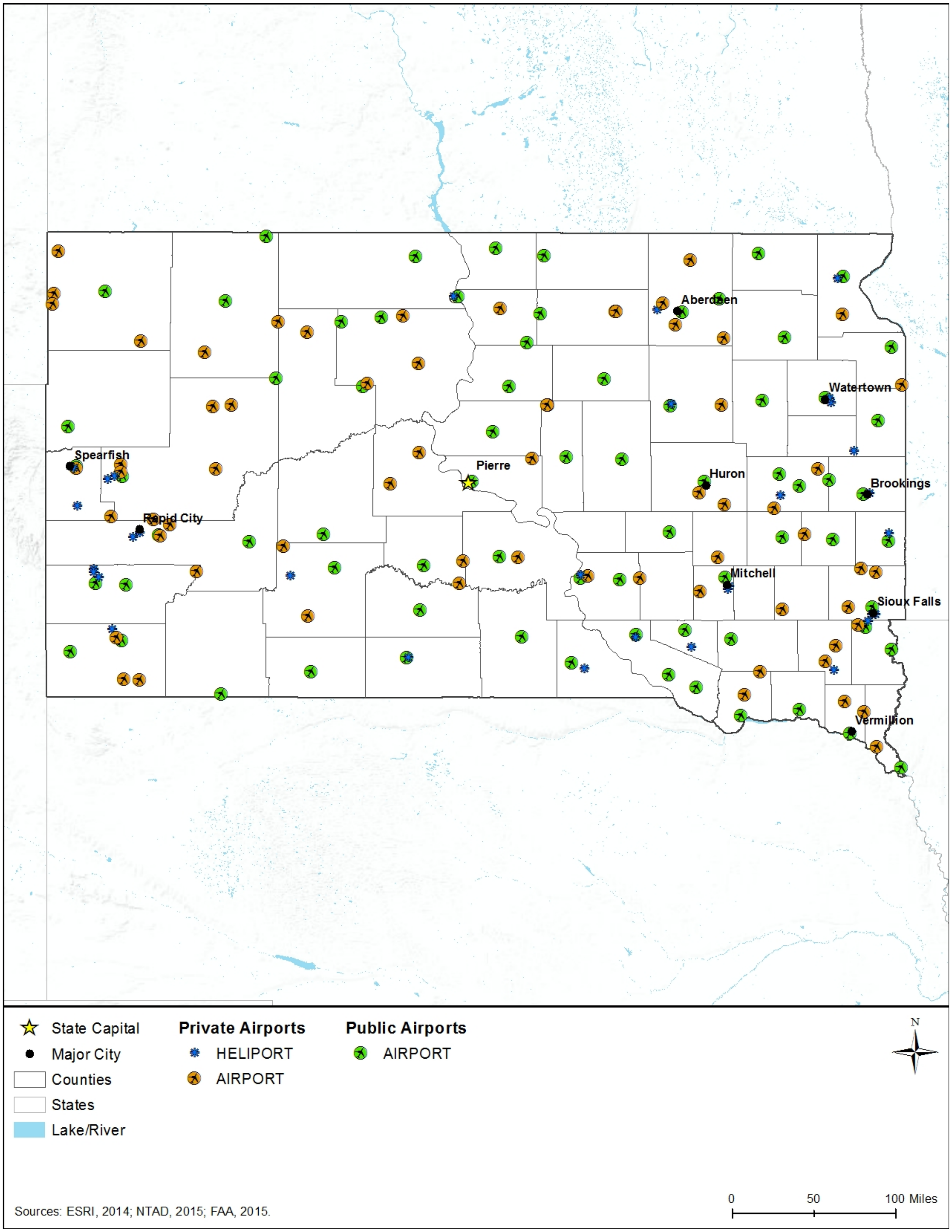

Figure 15.1.7-5: Composite of South Dakota Airports/Facilities

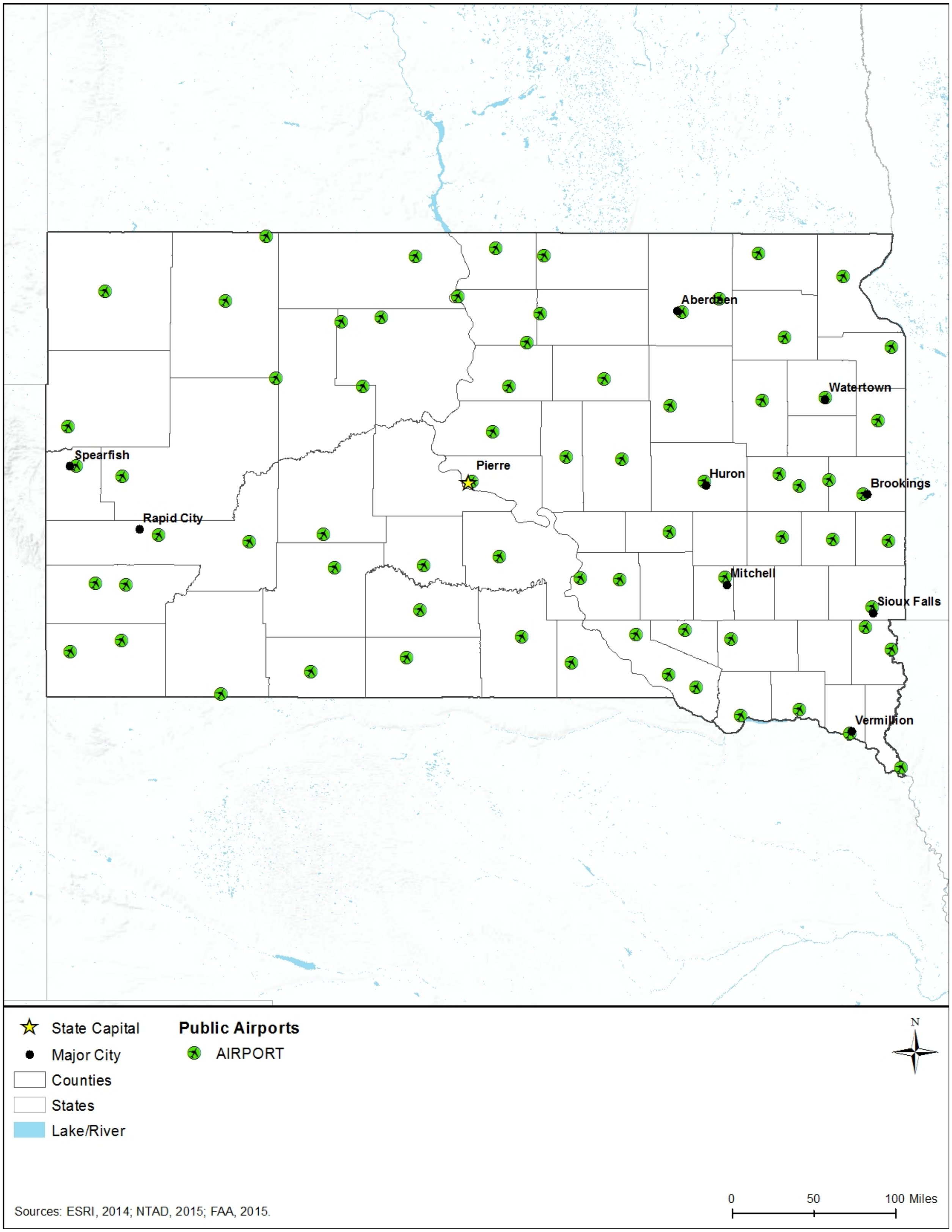

Figure 15.1.7-6: Public South Dakota Airports/Facilities

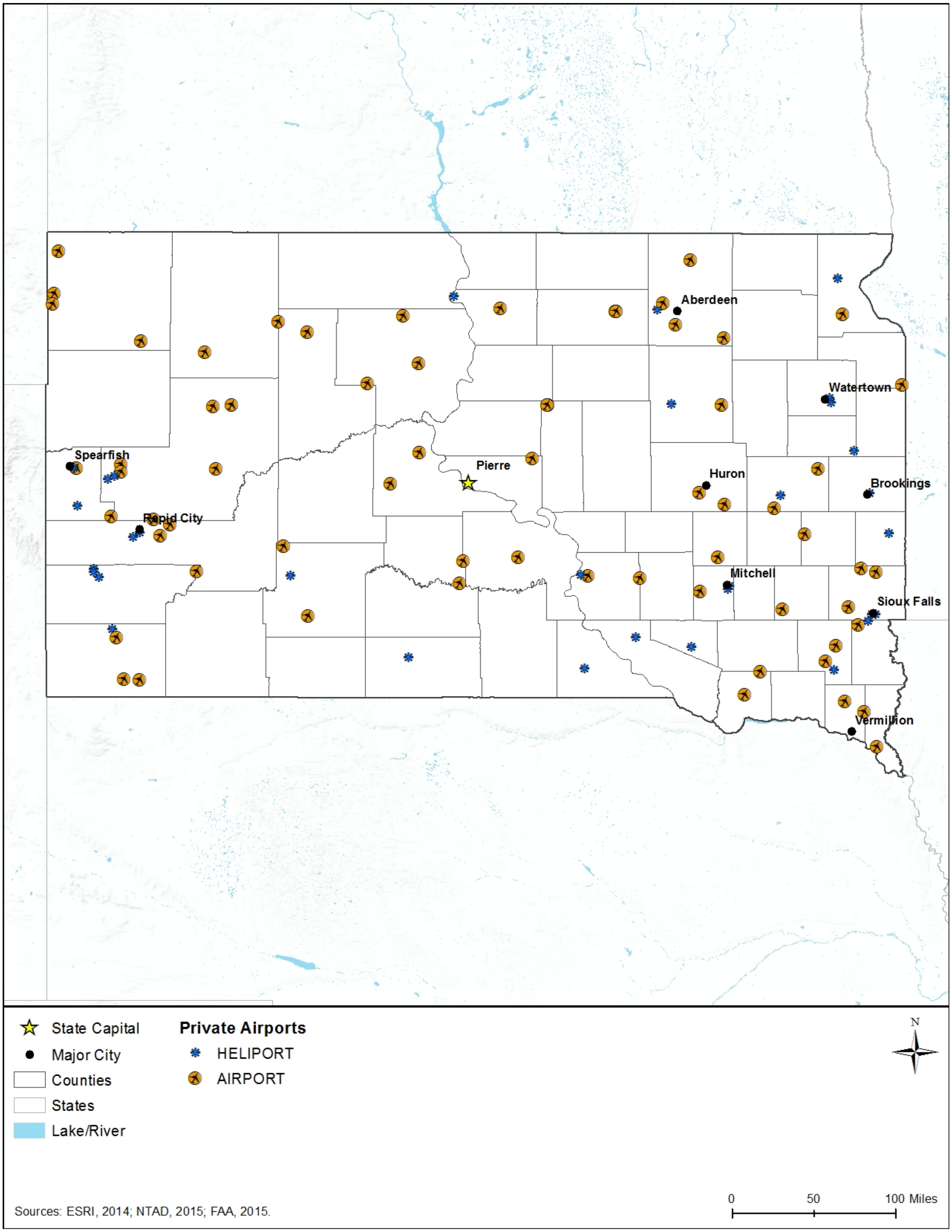

Figure 15.1.7-7: Private South Dakota Airports/Facilities

There are Class D controlled airports in South Dakota as follows:

- Three Class D airports –
    - Rapid City Regional
    - Ellsworth Air Force Base, Rapid City
    - Joe Foss Field, Sioux Falls (FAA, 2015f)

The SUA (i.e., one MOA) in South Dakota is Lake Andes – 6,000 feet MSL to, but not including FL 180 (FAA, 2015b). MOAs of Montana (Powder River 2, 3, and 4; Gap B Low and High; and Gap C Low and High) extend into the northwestern portion of the state (FAA, 2015e). The SUAs for South Dakota are presented in Figure 15.1.7-8. There are no TFRs (See Figure 15.1.7-8) (FAA, 2015h). MTRs in South Dakota, presented in Figure 15.1.7-9, consist of three Visual Routes and eight Instrument Routes.

UAS Considerations

The NPS signed a policy memorandum on June 20, 2014 that "directs superintendents nationwide to prohibit launching, landing, or operating unmanned aircraft on lands or waters administered by the National Park Service" (NPS, 2014d). There are two National Parks in South Dakota that must comply with this agency directive (NPS, 2015k).

Obstructions to Airspace Considerations

Several references in the South Dakota statutes address airspace hazards. As defined in Section 50-10-1 of Title 50 Aviation, Chapter 50-10 Airport Zoning, an airport hazard is "any structure, or tree, or use of land, which obstructs an aerial approach of such an airport or is otherwise hazardous to its use for landing or taking off" (South Dakota Legislature, Legislative Research Council, 2015a). Airport hazards are also further defined in Section 50-10-2. Regulation of structures is addressed in Sections 50-9-1 through 50-90-5 of Title 50 Aviation, Chapter 50-9 Air Navigation Hazards. Per Section 50-9-1, the South Dakota Aeronautics Commission and the Aviation Office approve permits where construction or alternative of a structure:

- "Exceeds two hundred feet AGL;
- Is within 20,000 feet of a state approved public airport or military airport that has at least one runway more than 3,200 feet in actual length and the construction or alteration exceeds a 100:1 surface ratio from any point on the runway;
- Is within 10,000 feet of a state approved public airport or military airport that has its longest runway no more than 3,200 feet in actual length and the construction or alteration exceeds a 50:1 surface ratio from any point on the runway;
- Is within 5,000 feet of a state approved public heliport and the construction or alteration exceeds a twenty-five to one surface ratio; or

- Is a highway, railroad, or other traverse way that the prescribed adjusted height exceeds the standards provided in this section. (South Dakota Legislature, Legislative Research Council, 2015b)"

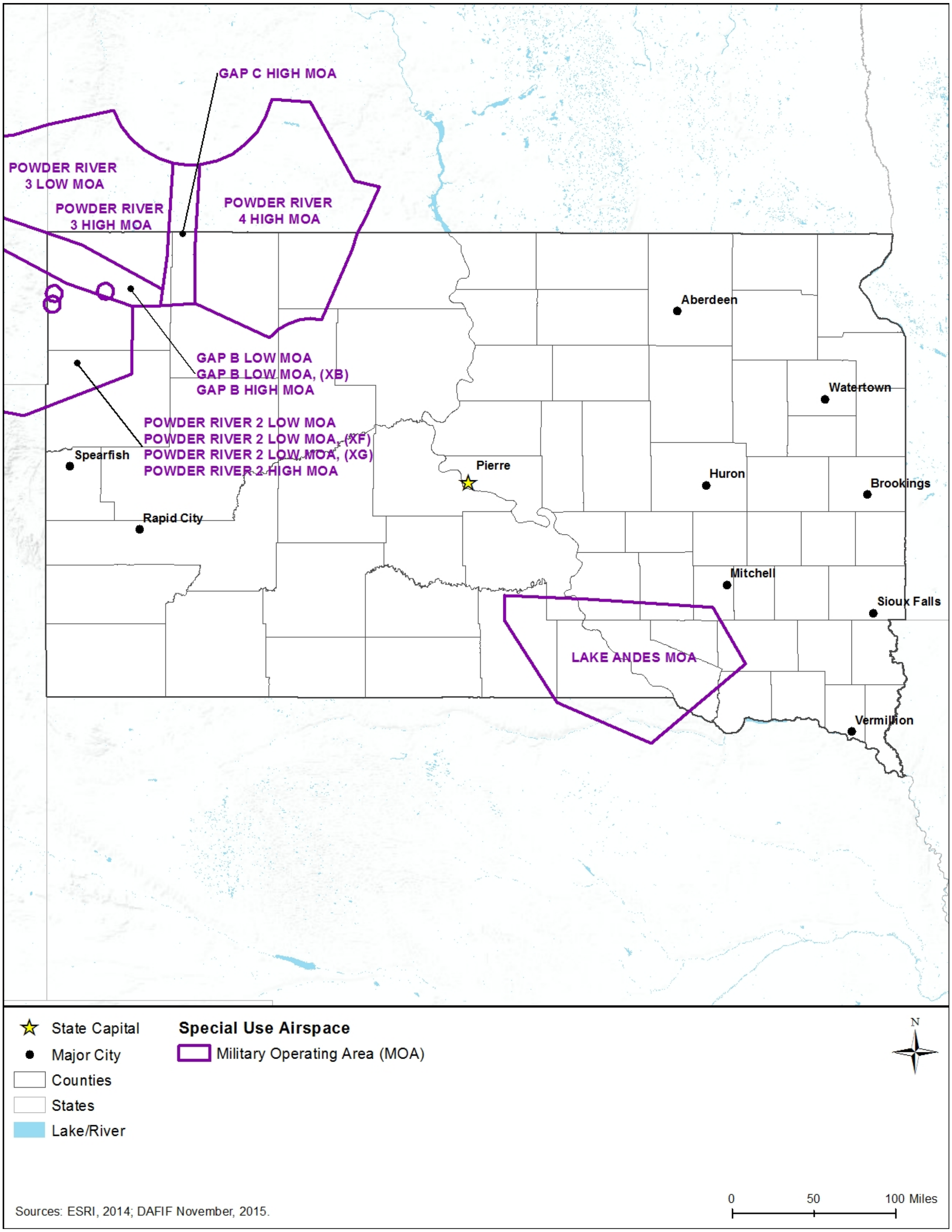

Figure 15.1.7-8: SUAs in South Dakota

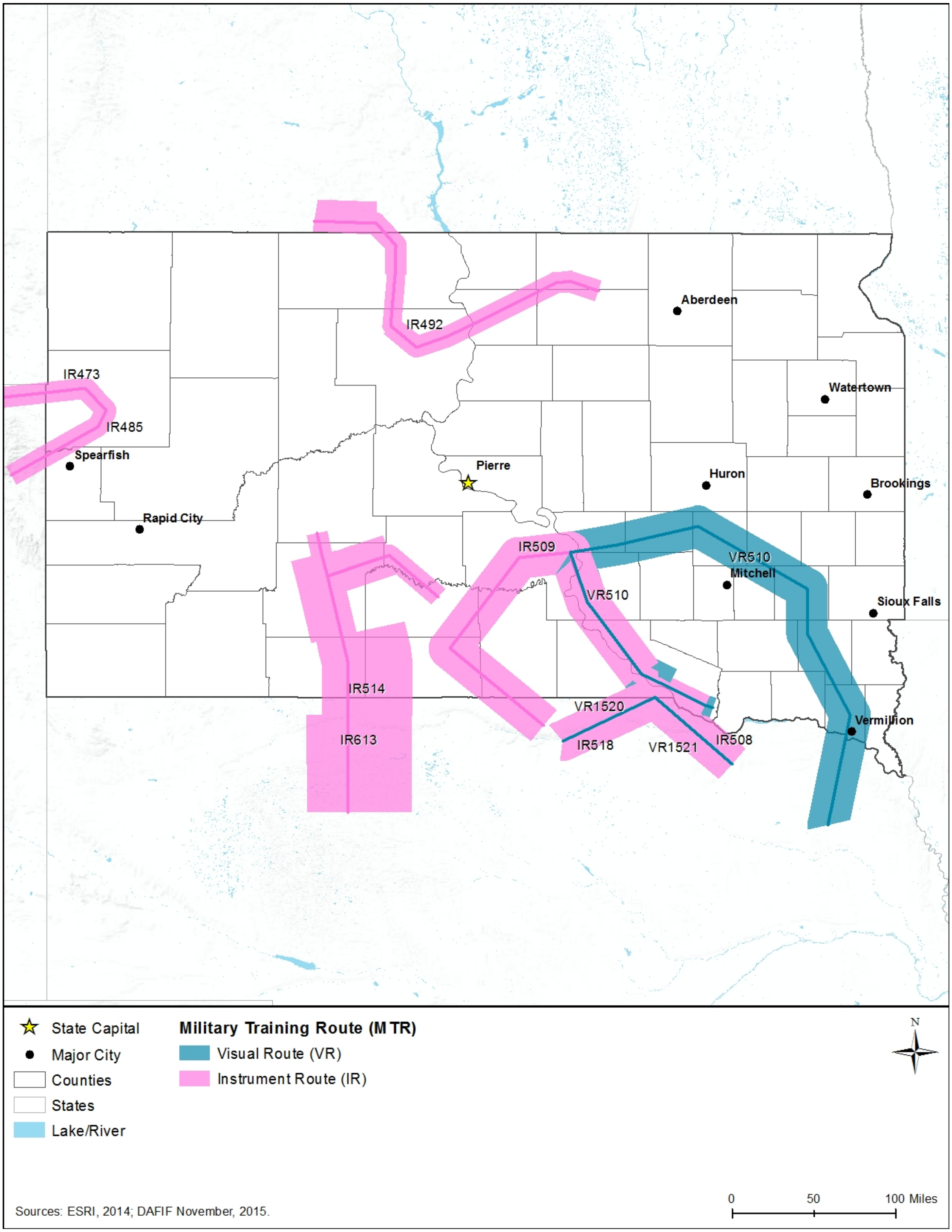

Figure 15.1.7-9: MTRs in South Dakota

15.1.8. Visual Resources

15.1.8.1. Definition of the Resource

Visual resources influence the human experience of a landscape. Various aspects combine to create visual resources, such as color, contrast, texture, line, and form. Features (e.g., mountain ranges, city skylines, ocean views, unique geological formations, rivers) and constructed landmarks (e.g., bridges, memorials, cultural resources, or statues) are considered visual resources. For some, cityscapes are valued visual resources, whereas others prefer natural areas. While many aspects of visual resources are subjective, evaluating potential impacts on the character and continuity of the landscape is a consideration when evaluating proposed actions for NEPA and National Historic Preservation Act (NHPA) compliance. The federal government does not have a single definition of what constitutes a visual resource; therefore, this PEIS will use the general definition of visual resources used by the BLM, "the visible physical features on a landscape (e.g., land, water, vegetation, animals, structures, and other features)" (BLM, 1984).

15.1.8.2. Specific Regulatory Considerations

Table 15.1.8-1 presents state and local laws and regulations that relate to visual resources.

Table 15.1.8-1: Relevant South Dakota Visual Resources Laws and Regulations

State Law / Regulation	Regulatory Agency	Applicability
46-A-1-15. Consideration of wild, scenic, and recreational rivers.	The Board of Water and Natural Resources and Game, Fish, and Parks Commission	"The Board of Water and Natural Resources shall along with its review of the state water plan consider, in cooperation with the Game, Fish and Parks Commission, the designation of certain rivers or sections of rivers as "wild, scenic, and recreational rivers" upon which no development may occur that is detrimental to the natural and scenic beauty of the designated river." (South Dakota Legislature, 1972b)
1-19-A Preservation of Historic Sites	State Historical Society	"…to provide for the preservation of its historical, architectural, archaeological, paleontological, and cultural sites by protecting, restoring, and rehabilitating sites, buildings, structures, and antiquities of the state which are of historical significance." (South Dakota Legislature, 1972a)
24:52:16:02. Heritage Area Designation: Natural and scenic criteria	State Historical Society	"Land areas recognized by state or national conservation organizations as having outstanding or exceptional natural or scenic qualities qualify for inclusion in heritage areas." (South Dakota Legislature, 1994)
Chapter 70:04:05. Utility Accommodations on Noninterstate Rights-of-Way, 70:04:05:09. Criteria for protecting and enhancing the environment	Transportation Commission	"Designated areas including scenic strips, overlooks, rest areas, recreation areas, public parks, and historic sites are subject to limited utility installations…." (South Dakota Legislature, 1989)

In addition to the state laws and regulations, local zoning laws may apply related to visual resources. Viewsheds and scenic vistas are increasingly important to the state's towns and cities as they look at the future planning of their municipalities.

15.1.8.3. Character and Visual Quality of the Existing Landscape

South Dakota is probably best known as the home to Mount Rushmore in the Black Hills near the western edge of the state. While this National Memorial is the most famous scenic resource in the state, there are countless other visual resources throughout South Dakota. The Badlands, the Black Hills, rocky buttes, forests, and waterfalls are some of the many scenic resources in western South Dakota. The highest point in the state, 7,242 foot Harney Peak, is in the Black Hills and is the highest point in North America east of the Rocky Mountains. The central portion of the state is dissected by the majestic Missouri River running from north to south. When the river arrives in the capital of Pierre, it gently curves southeast where it eventually defines the southern border between South Dakota and Nebraska. The eastern prairie plains vary from vast grasslands and farms, to rolling hills, hundreds of lakes, rivers, and waterfalls. The major cities fall along Interstate 90, with Rapid City in the west and Sioux Falls in the east. (USGS, 2009; South Dakota Department of Tourism, 2015a; Encyclopaedia Britannica, 2015a)

One aspect of importance for visual resources is to maintain the character of the area. For example, in a farm community, keeping the character of the town consistent with farm-style houses, barns, and silos would be key in maintaining the character of the community. In a more metropolitan area, there may be many different visual styles within each neighborhood, but keeping the character of the neighborhood is important to maintain if new development were to occur. Section 15.1.7 discusses land use and contains further descriptions of land cover within the state.

South Dakota has considered the management and protection of historic resources and location of telecommunication infrastructure. Those policies may allow for consideration of visual resources in certain landscapes. While the state and many municipalities have some regulation of scenic and visual resources, not all scenic areas within the state have been identified or have policy or regulations for management or protection by the state. The areas listed below have additional management, significance, or protection through state or federal policy, as well as being identified as visually significant areas.

15.1.8.4. Visually Important Historic Properties and Cultural Resources

Visual and aesthetic qualities of historic properties can contribute to the overall importance of a particular site. Such qualities relate to the integrity of the appearance and setting of these properties or resources. Viewsheds (the natural and manmade environment visible from one or more viewing points) can also contribute to the significance of historic properties or cultural resources. (NASA, 2013)

Viewsheds containing historic properties and cultural resources may be considered important because of their presence in the landscape. Figure 15.1.8-1 shows areas that are included in the NRHP that may be considered visually sensitive. In South Dakota, there are 1,294 NRHP listed sites, which include 16 NHL, 1 National Historic Site, and one National Memorial (NPS, 2015k). Some State Historic Sites, State Heritage Areas, and State Historic Districts may also be included in the NRHP, whereas others are not designated at this time.

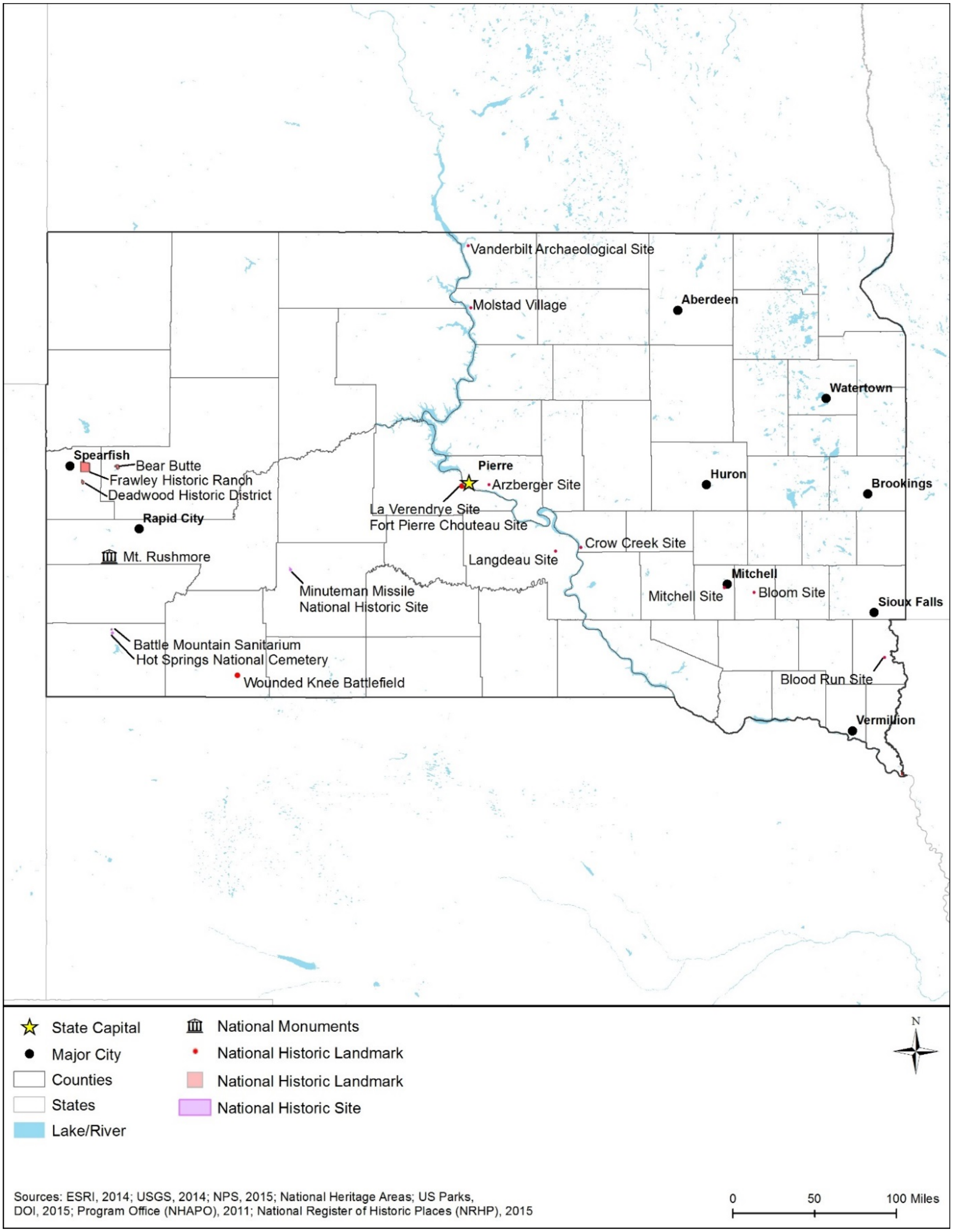

Figure 15.1.8-1: Representative Sample of Some Historic and Cultural Areas that May Be Visually Sensitive

The Secretary of the Interior's Standards for the Treatment of Historic Properties and the Guidelines for the Treatment of Cultural Landscape "provide a framework and guidance for decision-making about work or changes to a historic property" (NPS, 2016d), such as forests gardens, trails, structures, ponds, and farming areas. "The Standards require retention of the greatest amount of historic fabric, including the landscape's historic form, features, and details as they have evolved over time," which directly protects the historic properties and the visual resources therein" (Weeks, 1995). "The Guidelines have been prepared to assist in applying the Standards to all project work; consequently, they are not meant to give case-specific advice or address exceptions or rare instances. Therefore, it is recommended that the advice of qualified historic preservation professionals be obtained early in the planning stage of the project" (Weeks, 1995).

The BLM issued a 1997 Memorandum of Understanding with the Advisory Council on Historic Preservation and the National Conference of State Historic Preservation Officers regarding the manner in which BLM will meet its responsibilities under the National Historic Preservation Act (BLM, 2004). In addition, BLM is required to manage scenic resources under the Federal Land Policy and Management Act of 1976 (FLPMA) and Manuals 8100 and 8140 protecting cultural resources. The BLM conducts visual resource inventories for all of the public lands they manage during their land use planning process, every 10-15 years.

National Historic Landmarks

There are 16 NHLs in South Dakota, which include American Indian villages, sacred sites, and historic old west towns (Figure 15.1.8-1). The scenic and visual resources of these landmarks and surrounding areas are managed for consistency with the historic resource and aesthetics of the landscape (NPS, 2015j). NHLs are defined as "nationally significant historic places designated by the U.S. Secretary of the Interior because they possess exceptional value or quality in illustrating or interpreting the heritage of the U.S." (NPS, 2015b). NHLs may include "historic buildings, sites, structures, objects, and districts" (NPS, 2016). In South Dakota, NHLs are comprised of villages, towns, ranches, historic or cultural sites, and natural areas. The importance of NHL-designated properties can be attributed to scenic or aesthetic qualities, among other attributes, that may be considered visual resources or visually sensitive at these sites. The NHLs in South Dakota are:

- Arzberger Site,
- Fort Thompson Mounds,
- Battle Mountain Sanitarium, National Home for Disabled Volunteer Soldiers,
- Frawley Ranch,
- Bear Butte Langdeau Site,
- Blood Run Site,
- Mitchell Site,
- Bloom Site,

- Molstad Village,
- Crow Creek Site,
- Vanderbilt Archaeological Site,
- Deadwood Historic District,
- Verendrye Site,
- Fort Pierre Chouteau Site, and
- Wounded Knee.

The scenic and visual resources of these landmarks and surrounding areas are managed for consistency with the historic resource and aesthetics of the landscape (NPS, 2015j).

National Memorial

Mount Rushmore National Memorial is in the scenic Black Hills of western South Dakota (Figure 15.1.8-1). The carved faces of four presidents of the U.S. are the main visual resource of the park, but the surrounding mountains and forests also provide many scenic vistas (Figure 15.1.8-2).

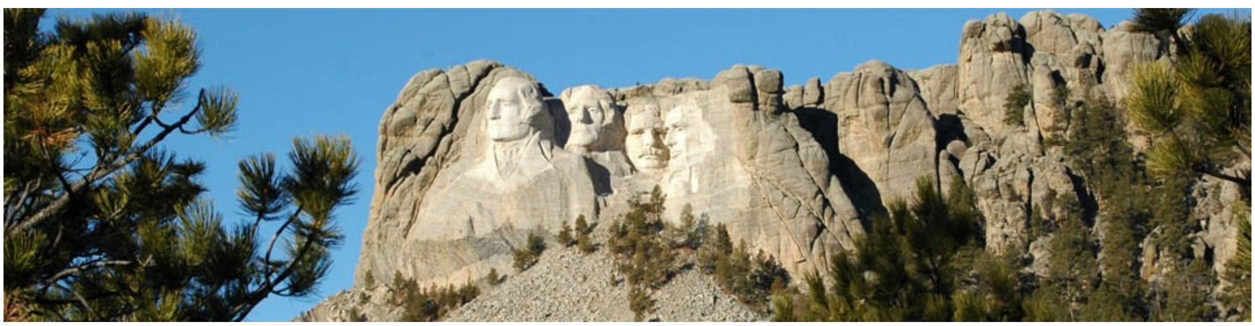

Figure 15.1.8-2: Mount Rushmore National Memorial

Source: (NPS, 2015d)

National Historic Trails

Designated under Section 5 of the National Trails System Act (16 U.S.C. 1241-1251, as amended), National Trails are defined as extended trails that "provide for maximum outdoor recreation potential and for the conservation and enjoyment of the nationally significant scenic, historic, natural, or cultural qualities of the areas though which they pass" (NPS, 2012c).

There is one National Historic Trail in South Dakota (Figure 15.1.8-1). The Lewis and Clark National Historic Trail follows the Missouri River through South Dakota. There are several state parks along the trail route in South Dakota, and visual resources encompass riparian forests, plains and prairies, and the majestic Missouri River. (NPS, 2015e)

National Historic Sites

Minuteman Missile National Historic Site is found within the Great Plains of South Dakota, with views of Badlands National Park in the distance (Figure 15.1.8-1). While the park is focused on the history of the missile program and the cold war, the surrounding scenic resources add to the unique historic site. (NPS, 2015f).

State Historic Parks

There is one historic state park, Fort Sisseton; however, many other state parks contain historic resources. Fort Sisseton Historic State Park has hilltop vistas, lakes, forest, and historic structures and sites. (South Dakota Department of Tourism, 2015b)

15.1.8.5. Parks and Recreation Areas

Parks and recreation areas include National Parks, National Monuments, BLM, Forest Service, or other public lands; state parks, forests, or trails; and other protected areas used for recreational activities. Public lands under federal ownership are subject to NEPA, and visual and aesthetic resources are considered in their NEPA analysis. Public lands, parks and recreation areas often contain scenic resources and are visited because of their associated visual or aesthetic qualities. Figure 15.1.8-4 identifies parks and recreational resources that may be visually sensitive in South Dakota.[92] For additional information about recreation areas, including national and state parks, see Section 15.1.7, Land Use, Recreation, and Airspace.

National Park Service

National Parks are managed by the NPS, and contain natural, historic, cultural, visual, ecological, and recreational resources of significance to the nation and are maintained for the public's use. In South Dakota, there are six[93] officially designated NPS units. There are 2 National Parks, 1 National Monument, 1 National Historic Trail, 1 National Historic Site, 1 National Recreation Area, and 1 National Memorial, including Badlands National Park, Wind Cave National Park, and Jewel Cave National Monument (Figure 15.1.8-4) (NPS, 2015k). Badlands covers 244,000 acres in southwestern South Dakota (Figure 15.1.8-3). This park contains colorful geologic deposits rich with fossils, eroded hills, and buttes. Other scenic resources at Badlands include vast grassy prairie, hilltop vistas, and expansive views. (NPS, 2015a)

[92] The natural areas data were retrieved from the Protected Areas Database of the United States (PAD-US), produced by USGS (http://gapanalysis.usgs.gov/padus/). This dataset categorizes lands across the U.S. by conservation, land management, planning, recreation, and ownership, as well as other uses. It is an extensive data set that contains large quantities of information relevant to the Proposed Action. The data was queried and further combined by the Primary Designation Type into classifications that fit the multiple types of land applicable for Natural Areas. For this map, recognizable symbols (e.g., varying shades of green for National Parks and Forests) were used as PAD-US does not have a standard symbolization for natural areas. The PADUS 1.3 geodatabase was downloaded in the summer of 2015, and used consistently throughout all these maps for each state and D.C.
[93] This count is based on the NPS website "by the numbers" current as of 9/30/2014(NPS, 2016b). Actual lists of parks and NPS affiliated areas may vary here depending on when areas are designated by Congress.

Figure 15.1.8-3: Badlands National Park

Source: (NPS, 2011)

Wind Cave National Park covers 28,295 acres of surface lands as well as protecting the subterranean cave features. Visual resources include prairie, forest, rolling hills, and herds of wildlife such as bison, pronghorn, and elk. (NPS, 2006)

Over 180 miles of cave passages are the main features of Jewel Cave National Monument (Figure 15.1.8-4). The scenic resources aboveground include 1,279 acres of hills, forest, and grassy meadows within the Black Hills (NPS, 2015h). For additional information regarding parks and recreation areas, see Section 15.1.7, Land Use, Recreation, and Airspace.

Bureau of Land Management

The BLM manages 274,000 surface acres in South Dakota (Figure 15.1.8-4) (BLM, 2015d). These lands are managed under a multiple use mandate (FLPMA) meaning that BLM must allow many uses of the lands, from recreation, to livestock grazing, forestry, wildlife habitat, and energy development (BLM, 2015c). The BLM uses their visual resources management system to "identify and evaluate scenic values to determine the appropriate levels of management." Lands classified with high scenic values are assigned management that prevents or reduces impacts to the visual resources, protecting the scenic landscape (BLM, 2012). BLM lands with high scenic values are less likely to be developed or have the visual resources disturbed. Management varies among uses and resources, some areas, like lands adjacent to National Historic Trails, will be managed for high quality visual resources. Other areas, such as where energy development is occurring, may be managed for lower quality visual resources.

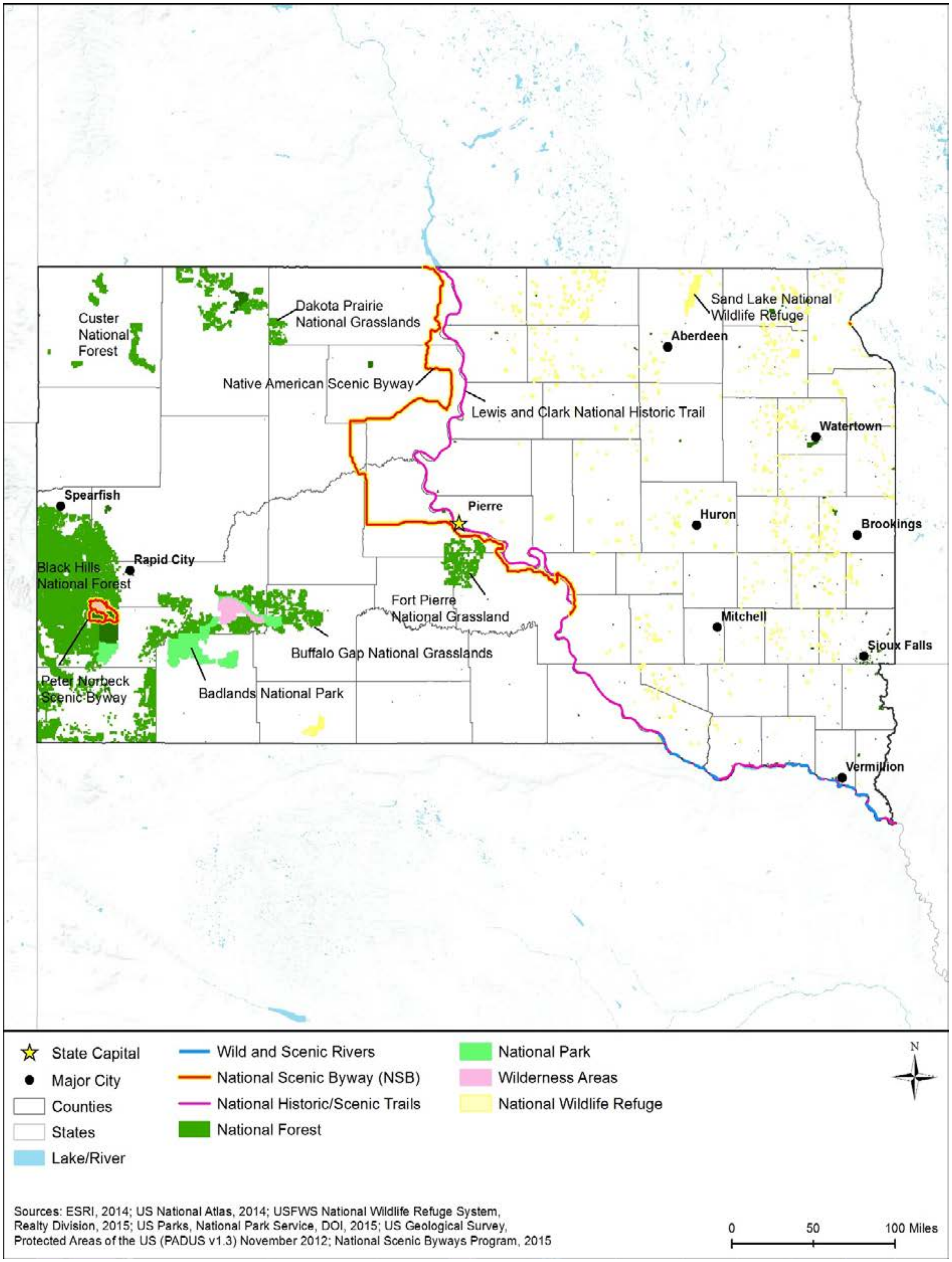

Figure 15.1.8-4: Natural Areas that May be Visually Significant

U.S. Forest Service

There is one National Forest in South Dakota (USFS, 2015f) (Figure 15.1.8-4). The Black Hills National Forest spans between western South Dakota and eastern Wyoming covering 1.2 million acres with 450 miles of hiking trails. The scenic resources of the Black Hills include mountains, rolling hills, ponderosa pine forest, meadows, streams, lakes, and views of the grasslands to the east (USFS, 2015b). The USFS conducts inventories of forestlands and assigns scenic resource categories from which they manage for scenic and visual resources (USFS, 1995). The scenic inventories are used to manage the forest landscape and to protect areas of high scenic integrity (USFS, 1995).

Army Corps of Engineers Recreation Areas

There are 24 USACE recreation areas, facilities, and flood risk management areas within the state (Figure 15.1.8-4) (Recreation.gov, 2015a). These areas are specifically managed by the USACE for scenic and aesthetic qualities in their planning guidance in addition to managing risks for floods (USACE, 1997).

Bureau of Reclamation

The Bureau of Reclamation manages six reservoirs and recreation areas in South Dakota, most often in partnership with state and federal agencies (Figure 15.1.8-4) (Recreation.gov, 2015b). The areas are primarily for water storage and secondary recreation use. The managing agencies that consider visual resources in their planning processes may apply management to protect scenic resources within these areas. (Bureau of Reclamation, 2015)

South Dakota Recreation Trails

There are 16 trails in South Dakota that are elements of the National Recreation Trails (NRT) Program (Figure 15.1.8-4) (National Recreation Trails, 2015a). The National Trail System Act of 1968 (Public Law 90-543) authorizes NRT system, which is composed of National Recreation Trails, National Scenic Trails, and National Historic Trails. Although “National Scenic Trails and National Historic Trails may only be designated by an act of Congress, National Recreation Trails may be designated by the Secretary of Interior or the Secretary of Agriculture to recognize exemplary trails of local and regional significance in response to an application from the trail's managing agency or organization” (National Recreation Trails, 2015b). Table 15.1.8-2 identifies the trails and managing agency with trail length in miles.

The 111 mile Centennial Trail within the Black Hills passes through Bear Butte (Figure 15.1.8-5) and Custer State Parks, Ft. Meade National Recreation Area (managed by the BLM), Black Hills National Forest, and Wind Cave National Park. The trail’s scenic resources include unique geology, mountains, valleys, meadows, prairie, lakes, creeks, and mountaintop vistas. (USFS, 2015d)

Table 15.1.8-2: National Recreation Trails in South Dakota

Name and Managing Agency	Miles
Bear Butte Summit Trail (SDGFP) (Figure 15.1.8-5)	3.50
Centennial Trail (USFS)	111.00
Cottonwood Trail (USACE)	1.50
Farm Island System Trail (SDGFP)	4.10
Flume Trail (USFS)	11.00
Fossil Exhibit (NPS)	0.30
George S. Mickelson Trail (SDGFP)	114.00
La Framboise Island (USACE)	7.00
Lewis and Clark Bicentennial Trail (PEDCO)	30.00
Lost Cabin (USFS)	6.20
Prairie Winds Trail (USFWS)	0.75
Rankin Ridge (NPS)	1.00
Spirit Mound Summit Trail (SDGFP)	0.75
Sunday Gulch (SDGFP)	3.50
Trail of the Spirits (SDGFP)	0.50
Woodland Trail (SDGFP)	1.30
Total	**296.40**

Source: (National Recreation Trails, 2015a)

Figure 15.1.8-5: Bear Butte State Park and National Natural Landmark

Source: (NPS, 2012a)

State Parks

There are 56 sites within South Dakota's State Park System, including parks, recreation areas, and nature areas (Figure 15.1.8-5 and Figure 15.1.8-6). Scenic resources include lakes, rivers, mountains, forest, unique geology, open grassland, and hilltop vistas. (South Dakota Department of Tourism, 2015b)

15.1.8.6. Natural Areas

The abundance of natural areas varies by state depending on the amount of public or state lands managed within each state. Although many natural areas may not be managed specifically for visual resources, these areas are allowed protection for their natural resources and the resulting management protects these scenic resources. Figure 15.1.8-4 identifies natural areas that may have sensitive visual resources.

Rivers Designated as National or State Wild, Scenic or Recreational

South Dakota has 93 miles of river designated as recreational on the Missouri River which are classified as a NPS unit along the South Dakota and Nebraska state line (Figure 15.1.8-4) (National Wild and Scenic Rivers System, 2015a; NPS, 2015i). National wild, scenic, or recreational rivers are those rivers designated by Congress or the Secretary of the Interior in accordance with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. 1271-1287). The scenic resources of these rivers are protected by the federal designations.

National Wildlife Refuges and State Wildlife Management Areas

There are six National Wildlife Refuges and seven Wetland Management Districts[94] in South Dakota (Figure 15.1.8-4):

- Bear Butte National Wildlife Refuge,
- Lake Andes Wetland Management District,
- Brookings Wetland Management District,
- Madison Wetland Management District,
- Huron Wetland Management District,
- Sand Lake National Wildlife Refuge,
- Karl E. Mundt National Wildlife Refuge,
- Sand Lake Wetland Management District,
- Lacreek National Wildlife Refuge,
- Waubay National Wildlife Refuge,
- Lacreek Wetland Management District,

[94] A Wetland Management District is an administrative organization that manages all the waterfowl production areas in a multi-county area (USFWS, 2015z).

- Waubay Wetland Management District, and
- Lake Andes National Wildlife Refuge.

Many of the refuges encompass lakes, rivers, or wetlands and surrounding prairie habitat. These refuges protect over a 100,000 acres of habitat and the visual resources within and surrounding the refuges. (USFWS, 2015)

The state manages about 730 game production areas within about 281,000 acres for hunting and the benefit of all wildlife (SDGFP, 2015h). These areas contain protected habitat for plants and animals without disturbance from development and habitat loss.

National Natural Landmarks

There are 13 National Natural Landmarks (NNL) in South Dakota (Figure 15.1.8-4). NNLs are sites designated by the U.S. Secretary of the Interior that "contain outstanding biological and/or geological resources, regardless of land ownership, and are selected for their outstanding condition, illustrative value, rarity, diversity, and value to science and education" (NPS, 2014). These landmarks may be considered visual resources or visually sensitive. The NNLs in South Dakota cover over 125,000 acres and are owned by USFS and USFWS, along with tribes and private landowners.

Table 15.1.8-3 displays a list of NNLs, their size, and some of the scenic resources protected within these areas. (NPS, 2012a)

Table 15.1.8-3: National Natural Landmarks with Scenic Resources

National Natural Landmarks	Acres	Visual Resources
Ancient River Warren Channel	101,560	Unique geology, lakes, riparian forest
Bear Butte (Figure 15.1.8-5)	1,116	Geological feature, forest, grassland
Bijou Hills	299	Unique geology, prairie
Buffalo Slough	624	Prairie pothole, grassland
Cathedral Spires and Limber Pine Natural Area (Figure 15.1.8-6)	637	Unique geology, forest, mountains
Cottonwood Slough-Dry Run	6,424	Unique geology, lakes, potholes, streams, marsh
Fort Randall Eagle Roost	911	Riparian forest, river
Lake Thompson	8,682	Lake, marsh, wide-open vistas
Mammoth Site of Hot Springs	4	Fossil site
Red Lake	3,951	Prairie pothole lake, wide-open vistas
Sica Hollow	791	Forest, prairie, grassland, hills, pothole lakes
Snake Butte	4	Unique geology
The Castles	987	Unique geology, buttes, fossils
Total	**125,990**	

Source: (NPS, 2012a)

Figure 15.1.8-6: Cathedral Spires and Limber Pine Natural Area National Natural Landmark and Custer State Park

National Grasslands

There are three National Grasslands in South Dakota (Figure 15.1.8-4) (USFS, 2015f). Buffalo Gap National Grasslands are in southern South Dakota with wide-open vistas, prairie, rolling hills, and sagebrush scrub (USFS, 2015c). Dakota Prairie Grasslands encompasses 1,259,000 acres of prairie, forest, rocky hills, riparian forest, and river views (USFS, 2015e). Fort Pierre National Grassland is a smaller landscape of mixed grass prairie within 116,000 acres with no developed recreation sites. Scenic resources within the grassland are wide-open vistas, rolling hills, grassland, streams, and ponds (USFS, 2015g).

National Wilderness Areas

In 1964, Congress enacted the Wilderness Act of 1964 as “an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. A designation as a National Wilderness Area is the highest level of conservation protection given by Congress to federal lands. This Act defined wilderness as land untouched by man and primarily affected only by the “forces of nature” and as that which “may also contain ecological, geological, or other features of scientific, education, scenic, or historical value” (NPS, 2015m). Over 106 million acres of federal public lands have been designated as wilderness areas in the U.S.. Of these federal lands, 25 percent are within 47 NPS units (44 million acres) and are part of National Park System. These designated wilderness areas are managed by the USFS, BLM, and USFWS (NPS, 2015m). In South Dakota, there are two designated wilderness areas covering about 77,692 acres (Figure 15.1.8-4). The Badlands Wilderness is 64,144 acres and is managed by the NPS. This wilderness within Badlands National Park has colorful, eroded landscapes, prairie, buttes, cliffs, and hilltop vistas (Wilderness.net, 2015a). Black Elk Wilderness is 13,548 acres within the Black Hills National Forest. Granite spires, forest, mountaintop vistas, hills, streams, and meadows make up some of the many scenic resources within the wilderness. (Wilderness.net, 2015b)

State Scenic and Historic Byways

There are two National Scenic Byways in South Dakota (Figure 15.1.8-4) (FHWA, 2015a). National Scenic Byways are resources designated specifically for scenic or aesthetic areas or qualities which would be considered visual resources or visually sensitive. The National Scenic Byways Program is managed by the U.S. Department of Transportation, Federal Highway Administration (FHWA, 2015b).

The Native American Scenic Byway covers 350 miles in North and South Dakota and traces tribal lands, memorials, cultural sites, and the heritage of the tribes within the states (FHWA, 2015e). The Peter Norbeck Scenic Byway travels 68 miles in South Dakota through the Black Hills with views of granite pinnacles, mountains, forest, and meadows (FHWA, 2015f).

There are six state designated scenic byways in South Dakota (SDDOT, 2015d). Some of these state byways include the 30 mile Badlands Loop State Scenic Byway, the 18 mile Wildlife Loop State Scenic Byway, and the 20 mile Spearfish Canyon State Scenic Byway. These routes highlight unique and scenic landscapes including limestone cliffs, waterfalls, colorful pinnacles and buttes, mountains, forests, and meadows. (South Dakota Department of Tourism, 2015c; South Dakota Department of Tourism, 2015d; South Dakota Department of Tourism, 2015e; South Dakota Department of Tourism, 2015f)

15.1.9. Socioeconomics

15.1.9.1. Definition of the Resource

NEPA requires consideration of socioeconomics in NEPA analysis; specifically, Section 102(A) of NEPA requires federal agencies to "insure the integrated use of the natural and social sciences…in planning and in decision making" (42 U.S.C. § 4332(A)). Socioeconomics refers to a broad, social science-based approach to understanding a region's social and economic conditions. It typically includes population, demographic descriptors, economic activity indicators, housing characteristics, property values, and public revenues and expenditures. When applicable, it includes qualitative factors such as community cohesion. Socioeconomics provides important context for analysis of FirstNet projects, and in addition, FirstNet projects may affect the socioeconomic conditions of a region.

The choice of socioeconomic topics and depth of their treatment depends on the relevance of potential topics to the types of federal actions under consideration. FirstNet's mission is to provide public safety broadband and interoperable emergency communications coverage throughout the nation. Relevant socioeconomic topics include population density and growth, economic activity, housing, property values, and state and local taxes. The financial arrangements for deployment and operation of the FirstNet network may have socioeconomic implications. Section 1.1 frames some of the public expenditure and public revenue considerations specific to FirstNet; however, this is not intended to be either descriptive or prescriptive of FirstNet's financial model or anticipated total expenditures and revenues associated with the deployment of the Nationwide Public Safety Broadband Network (NPSBN). This socioeconomics section provides some additional, broad context, including data and discussion of state and local government revenue sources that FirstNet may affect.

Environmental justice is a related topic that specifically addresses the presence of minority populations (defined by race and Hispanic ethnicity) and low-income populations, in order to give special attention to potential impacts on those populations, per Executive Order 12898. This PEIS addresses environmental justice in a separate section (Section 15.1.10). This PEIS also addresses the following topics, sometimes included within socioeconomics, in separate sections: land use and recreation (Section 15.1.7, Land Use, Recreation, and Airspace), infrastructure (Section 15.1.1, Infrastructure), and aesthetic considerations (Section 15.1.8, Visual Resources).

Wherever possible, this section draws on nationwide datasets from federal sources such as the U.S. Census Bureau (Census Bureau) and U.S. Bureau of Labor Statistics (BLS). This ensures consistency of data and analyses across the states examined in this PEIS. In all cases, this section uses the most recent data available for each geography at the time of writing. At the county, state, region, and U.S. levels, the data are typically for 2013 or 2014. For smaller geographic areas, this section uses data from the Census Bureau's American Community Survey (ACS). The ACS is the Census Bureau's flagship demographic estimates program for years other than the decennial census years. This PEIS uses the 2009-2013 ACS, which are based on surveys (population samples) taken across that five-year period; thus, it is not appropriate to attribute its data values to a specific year. It is a valuable source because it provides the most accurate and consistent socioeconomic data across the nation at the sub-county level.

The remainder of this section addresses the following subjects: regulatory considerations specific to socioeconomics in the state, communities and populations, economic activity, housing, property values, and taxes.

15.1.9.2. Specific Regulatory Considerations

Research for this section did not identify any specific state, local, or tribal laws or regulations that are directly relevant to socioeconomics for this PEIS.

15.1.9.3. Communities and Populations

This section discusses the population and major communities of South Dakota and includes the following topics:

- Recent and projected statewide population growth;
- Current distribution of the estimated population across the state; and

- Identification of the largest estimated population concentrations in the state.

Statewide Population and Population Growth

Table 15.1.9-1 presents the 2014 estimated population and population density of South Dakota in comparison to the Central region[95] and the nation. The estimated population of South Dakota in 2014 was 853,175. The population density was 11 persons per square mile (sq. mi.), which was considerably lower than the population density of both the region (66 persons/sq. mi.) and the nation (90 persons/sq. mi.). In 2014, South Dakota was the 46th largest state by estimated population among the 50 states and the District of Columbia, 16th largest by land area, and had the 47th greatest population density (U.S. Census Bureau, 2015y; U.S. Census Bureau, 2015b).

Table 15.1.9-1: Land Area, Estimated Population, and Population Density of South Dakota

Geography	Land Area (sq. mi.)	Estimated Population 2014	Population Density 2014 (persons/sq. mi.)
South Dakota	75,811	853,175	11
Central Region	1,178,973	77,651,608	66
U.S.	3,531,905	318,857,056	90

Sources: (U.S. Census Bureau, 2015y; U.S. Census Bureau, 2015b)

Estimated population growth is an important subject for this PEIS given FirstNet's mission. Table 15.1.9-2 presents the population growth trends of South Dakota from 2000 to 2014 in comparison to the Central region and the nation. The state's annual growth rate increased considerably in the 2010 to 2014 period compared to 2000 to 2010, from 0.76 percent to 1.18 percent. The growth rate of South Dakota in the 2010 to 2014 period was more than double the growth rate of the region (0.45 percent) and was substantially higher than the nation's growth rate of 0.81 percent.

[95] The Central region includes the states of Colorado, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Montana, Nebraska, North Dakota, Ohio, South Dakota, Utah, Wisconsin, and Wyoming. Throughout the socioeconomics section, figures for the Central region represent the sum of the values for all states in the region, or an average for the region based on summing the component parameters. For instance, the population density of the Central region is the sum of the populations of all its states, divided by the sum of the land areas of all its states.

Table 15.1.9-2: Recent Population Growth of South Dakota

Geography	Estimated Population			Numerical Estimated Population Change		Rate of Estimated Population Change (AARC)[a]	
	2000	2010	2014	2000 to 2010	2010 to 2014	2000 to 2010	2010 to 2014
South Dakota	754,844	814,180	853,175	59,336	38,995	0.76%	1.18%
Central Region	72,323,183	76,273,123	77,651,608	3,949,940	1,378,485	0.53%	0.45%
U.S.	281,421,906	308,745,538	318,857,056	27,323,632	10,111,518	0.93%	0.81%

Sources: (U.S. Census Bureau, 2015c; U.S. Census Bureau, 2015y)

AARC = Average Annual Rate of Change (compound growth rate)

Demographers prepare future estimated population projections using various population growth modeling methodologies. For this nationwide PEIS, it is important to use estimated population projections that apply the same methodology across the nation. It is also useful to consider projections that use different methodologies, since no methodology is a perfect predictor of the future. The Census Bureau does not prepare population projections for the states. Therefore, Table 15.1.9-3 presents projections of the 2030 population from two sources that are national in scope and use different methodologies: the University of Virginia's Weldon Cooper Center for Public Service and ProximityOne, a private sector demographic and economic data and analysis service. The table provides figures for numerical change, percentage change, and annual growth rate based on averaging the projections from the two sources. The average projection indicates South Dakota's estimated population will increase by approximately 96,000 people, or 11.2 percent, from 2014 to 2030. This reflects an average annual projected growth rate of 0.67 percent, which is considerably lower than the historical growth rate from 2010 to 2014 of 1.18 percent, but consistent with the historical growth rate from 2000 to 2010 of 0.76 percent. The projected growth rate of the state is slightly higher than that of the region (0.60 percent) and slightly lower when compared to the rate of the nation (0.80 percent).

Table 15.1.9-3: Projected Estimated Population Growth of South Dakota

Geography	Estimated Population 2014	Projected 2030 Estimated Population			Change Based on Average Projection		
		UVA Weldon Cooper Center Projection	Proximity One Projection	Average Projection	Numerical Change 2014 to 2030	Percent Change 2014 to 2030	Rate of Change (AARC) 2014 to 2030
South Dakota	853,175	890,125	1,007,980	949,053	95,878	11.2%	0.67%
Central Region	77,651,608	83,545,838	87,372,952	85,459,395	7,807,787	10.1%	0.60%
U.S.	318,857,056	360,978,449	363,686,916	362,332,683	43,475,627	13.6%	0.80%

Sources: (U.S. Census Bureau, 2015y; ProximityOne, 2015; UVA Weldon Cooper Center, 2015)

AARC = Average Annual Rate of Change (compound growth rate)

Population Distribution and Communities

Figure 15.1.9-1 presents the distribution and relative density of the estimated population of South Dakota. Each brown dot represents 500 people, and massing of dots indicates areas of higher population density – therefore, areas that are solid in color are particularly high in population density. The map uses ACS estimates based on samples taken from 2009 to 2013 (U.S. Census Bureau, 2015d).

This map also presents the 10 largest population concentrations in the state, outlined in purple. These population concentrations reflect contiguous, densely developed areas as defined by the Census Bureau based on the 2010 census (U.S. Census Bureau, 2012a; U.S. Census Bureau, 2015e). These population concentrations often include multiple incorporated areas as well as some unincorporated areas.

Other groupings of brown dots on the map represent additional, but smaller, population concentrations. Dispersed dots indicate dispersed population across the less densely settled areas of the state. The map shows that most of South Dakota is very sparsely populated.

Table 15.1.9-4 provides the populations of the 10 largest population concentrations in South Dakota, based on the 2010 census. It also shows the changes in population for these areas between the 2000 and 2010 censuses.[96] In 2010, the largest population concentration was the Sioux Falls area, which had approximately 156,777 people. The state had no other population concentrations over 100,000 people. The smallest of these 10 population concentrations was the Spearfish area, with a 2010 population of 11,459. The fastest growing area, by average annual rate of change from 2000 to 2010, was the Sioux Falls area, with an annual growth rate of 2.35 percent. All of these areas experienced population growth during this period.

Table 15.1.9-4 also shows that the top 10 population concentrations in South Dakota accounted for over 46.1 percent of the state's population in 2010. Further, population growth in the 10 areas from 2000 to 2010 amounted to 97.5 percent of the entire state's growth.

[96] Census Bureau boundaries for these areas are not fixed. Area changes from 2000 to 2010 may include accretion of newly developed areas into the population concentration, Census Bureau classification of a subarea as no longer qualifying as a concentrated population due to population losses, and reclassification by the Census Bureau of a subarea into a different population concentration. Thus, population change from 2000 to 2010 reflects change within the constant area and change as the overall area boundary changes. Differences in boundaries in some cases introduce anomalies in comparing the 2000 and 2010 populations and in calculation of the growth rate presented in the table.

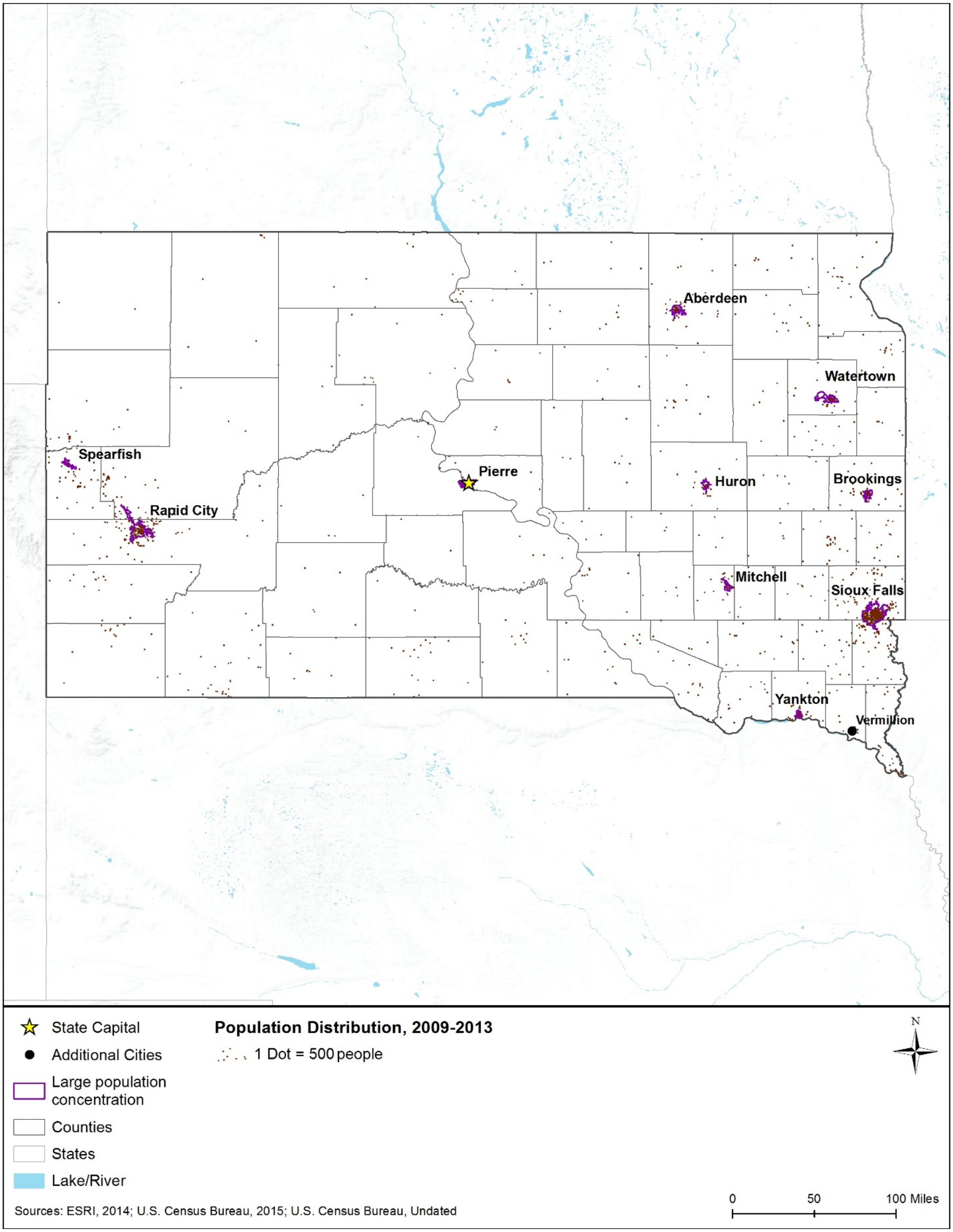

Figure 15.1.9-1: Estimated Population Distribution in South Dakota, 2009–2013

Table 15.1.9-4: Population of the 10 Largest Population Concentrations in South Dakota

Area	Population				Population Change 2000 to 2010	
	2000	2010	2009–2013	Rank in 2010	Numerical Change	Rate (AARC)
Aberdeen	24,872	25,977	26,518	3	1,105	0.44%
Brookings	18,563	22,482	22,976	4	3,919	1.93%
Huron	11,916	12,637	12,901	9	721	0.59%
Mitchell	14,525	14,955	15,150	6	430	0.29%
Pierre	13,982	14,425	14,327	8	443	0.31%
Rapid City	66,780	81,251	82,443	2	14,471	1.98%
Sioux Falls	124,269	156,777	160,242	1	32,508	2.35%
Spearfish	10,354	11,459	11,358	10	1,105	1.02%
Watertown	19,434	21,111	21,276	5	1,677	0.83%
Yankton	13,184	14,637	14,442	7	1,453	1.05%
Total for Top 10 Population Concentrations	317,879	375,711	381,633	NA	57,832	1.69%
South Dakota (statewide)	754,844	814,180	825,198	NA	59,336	0.76%
Top 10 Total as Percentage of State	42.1%	46.1%	46.2%	NA	97.5%	NA

Sources: (U.S. Census Bureau, 2012a; U.S. Census Bureau, 2015f; U.S. Census Bureau, 2015g)

AARC = Average Annual Rate of Change (compound growth rate)

15.1.9.4. Economic Activity, Housing, Property Values, and Government Revenues

This section addresses other socioeconomic topics that are potentially relevant to FirstNet. These topics include:

- Economic activity;
- Housing;
- Property values; and
- Government revenues.

Social institutions – educational, family, political, public service, military, and religious – are present throughout the state. The institutions most relevant to FirstNet projects are public services such as medical and emergency medical services and facilities. This PEIS addresses public services in Section 15.1.1, Infrastructure. Project-level NEPA analyses may need to examine other institutions, depending on specific locations and specific types of actions.

Economic Activity

Table 15.1.9-5 compares several economic indicators for South Dakota to the Central region and the nation. The table presents two indicators of income[97] – per capita and median household – as income is a good measure of general economic health of a region.

Per capita income is total income divided by the total population. As a mathematical average, the very high incomes of a relatively small number of people tend to bias per capita income figures upwards. Nonetheless, per capita income is useful as an indicator of the relative income level across two or more areas. As shown in Table 15.1.9-5, the per capita income in South Dakota in 2013 ($25,860) was $1,668 lower than that of the region ($27,528), and $2,324 lower than that of the nation ($28,184).

Household income is a useful measure, and often used instead of family income, because in modern society there are many single-person households and households composed of non-related individuals. Median household income (MHI) is the income at which half of all households have higher income, and half have lower income. Table 15.1.9-5 shows that in 2013, the MHI in South Dakota ($49,200) was $2,845 lower than that of the region ($52,045), and $3,050 lower than that of the nation ($52,250).

Employment status is a key socioeconomic parameter because employment is essential to the income of a large portion of the adult population. The federal government calculates the unemployment rate as the number of unemployed individuals who are looking for work divided by the total number of individuals in the labor force. Table 15.1.9-5 compares the unemployment rate in South Dakota to the Central region and the nation. In 2014, South Dakota's statewide unemployment rate of 3.4 percent was lower than both the rate for the region (5.7 percent) and the nation (6.2 percent).[98]

Table 15.1.9-5: Selected Economic Indicators for South Dakota

Geography	Per Capita Income 2013	Median Household Income 2013	Average Annual Unemployment Rate 2014
South Dakota	$25,860	$49,200	3.4%
Central Region	$27,528	$52,045	5.7%
U.S.	$28,184	$52,250	6.2%

Sources: (Bureau of Labor Statistics, 2015b; U.S. Census Bureau, 2015i; U.S. Census Bureau, 2015j; U.S. Census Bureau, 2015k)

[97] The Census Bureau defines income as follows: "'Total income' is the sum of the amounts reported separately for wage or salary income; net self-employment income; interest, dividends, or net rental or royalty income or income from estates and trusts; Social Security or Railroad Retirement income; Supplemental Security Income (SSI); public assistance or welfare payments; retirement, survivor, or disability pensions; and all other income. Receipts from the following sources are not included as income: capital gains, money received from the sale of property (unless the recipient was engaged in the business of selling such property); the value of income "in kind" from food stamps, public housing subsidies, medical care, employer contributions for individuals, etc.; withdrawal of bank deposits; money borrowed; tax refunds; exchange of money between relatives living in the same household; gifts and lump-sum inheritances, insurance payments, and other types of lump-sum receipts." (U.S. Census Bureau, 2015h)

[98] The timeframe for unemployment rates can change quarterly.

Figure 15.1.9-2 and Figure 15.1.9-3 show how MHI in 2013 (U.S. Census Bureau, 2015i) and unemployment in 2014 (Bureau of Labor Statistics, 2015b) varied by county across the state. These maps also incorporate the same population concentration data as Figure 15.1.9-1 (U.S. Census Bureau, 2012a; U.S. Census Bureau, 2015e). Following these two maps, Table 15.1.9-6 presents MHI and unemployment for the 10 largest population concentrations in the state. The table reflects survey data taken from 2009 to 2013. Thus, its figures are not directly comparable to those on the maps. Nonetheless, both the maps and the table help portray differences in income and unemployment across South Dakota.

Figure 15.1.9-2 shows that, in general, counties with a MHI above the national median were mainly in the southeastern portion of the state and the state capital area. Most of the remainder of the state had MHI levels below the national average. Table 15.1.9-6 is consistent with those observations. It shows that MHI in the Pierre and Sioux Falls areas was above the state average. MHI in all other population concentrations was below the state average. MHI was lowest in the Spearfish and Huron areas. These are the two smallest populations of the areas shown in the table.

Figure 15.1.9-3 presents variations in the 2014 unemployment rate across the state, by county. It shows that the vast majority of counties had unemployment rates below the national average (that is, better employment performance). Only four counties outside of the 10 largest population concentrations, had unemployment rates above the national average. When comparing unemployment in the population concentrations to the state average (Table 15.1.9-6), only the Spearfish and Rapid City areas had a 2009–2013 unemployment rate that was higher than the state average.

Detailed employment data provide useful insights into the nature of a local, state, or national economy. Table 15.1.9-7 provides figures on employment percentages by type of worker and by industry based on surveys conducted in 2013 by the Census Bureau. By class of worker (type of worker: private industry, government, self-employed, etc.), the percentage of private wage and salary workers was lower in South Dakota than in the Central region and the nation. The percentages of government workers and self-employed workers were higher in the state than in the region and nation.

By industry, South Dakota has a mixed economic base and some notable figures in the table are as follows. South Dakota in 2013 had a considerably lower percentage (more than two percentage points) of persons working in "professional, scientific, management, administrative, and waste management services" than did the region or the nation. It also had a considerably lower percentage in "manufacturing" than the region did. It had a considerably higher percentage of workers in "agriculture, forestry, fishing and hunting, and mining" than the region or nation. The rest of the values for South Dakota were within two percentage points of the region and nation.

Table 15.1.9-6: Selected Economic Indicators for the 10 Largest Population Concentrations in South Dakota, 2009–2013

Area	Median Household Income	Average Annual Unemployment Rate
Aberdeen	$48,084	3.4%
Brookings	$40,944	4.8%
Huron	$38,981	3.2%
Mitchell	$44,978	3.6%
Pierre	$51,903	2.7%
Rapid City	$48,562	6.6%
Sioux Falls	$52,253	4.5%
Spearfish	$36,400	5.8%
Watertown	$44,594	3.8%
Yankton	$42,373	4.4%
South Dakota (statewide)	$49,495	5.0%

Source: (U.S. Census Bureau, 2015l)

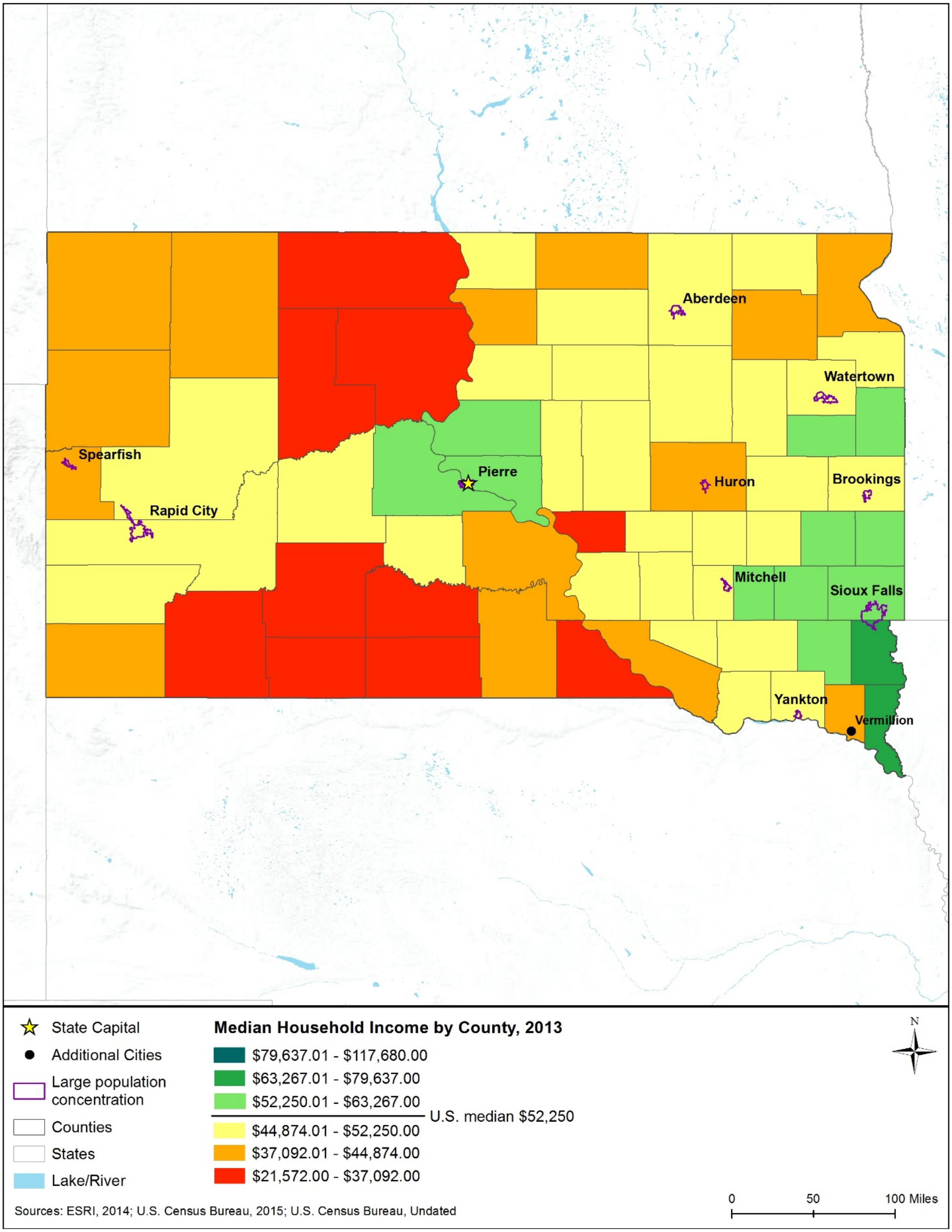

Figure 15.1.9-2: Median Household Income in South Dakota, by County, 2013

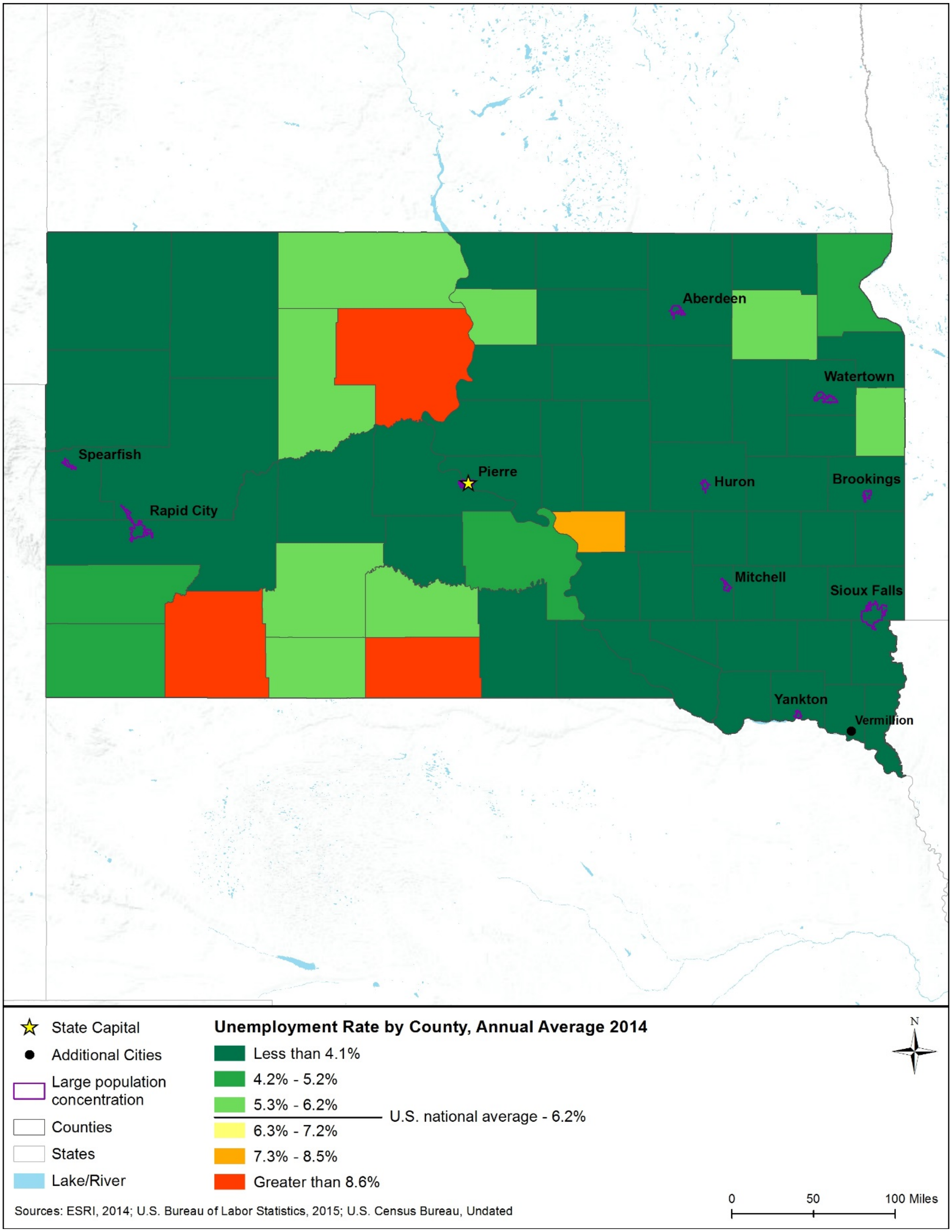

Figure 15.1.9-3: Unemployment Rates in South Dakota, by County, 2014

Table 15.1.9-7: Employment by Class of Worker and by Industry, 2013

Class of Worker and Industry	South Dakota	Central Region	U.S.
Civilian Employed Population 16 Years and Over	431,256	36,789,905	145,128,676
Percentage by Class of Worker			
Private wage and salary workers	75.6%	81.7%	79.7%
Government workers	15.5%	12.8%	14.1%
Self-employed in own not incorporated business workers	8.6%	5.3%	6.0%
Unpaid family workers	0.3%	0.2%	0.2%
Percentage by Industry			
Agriculture, forestry, fishing and hunting, and mining	6.8%	2.2%	2.0%
Construction	7.2%	5.6%	6.2%
Manufacturing	9.0%	14.0%	10.5%
Wholesale trade	2.8%	2.7%	2.7%
Retail trade	11.7%	11.5%	11.6%
Transportation and warehousing, and utilities	3.8%	4.9%	4.9%
Information	2.4%	1.9%	2.1%
Finance and insurance, and real estate and rental and leasing	7.7%	6.5%	6.6%
Professional, scientific, management, administrative, and waste management services	6.1%	9.7%	11.1%
Educational services, and health care and social assistance	22.9%	23.4%	23.0%
Arts, entertainment, and recreation, and accommodation and food services	9.4%	9.1%	9.7%
Other services, except public administration	4.7%	4.6%	5.0%
Public administration	5.5%	3.9%	4.7%

Source: (U.S. Census Bureau, 2015m)

Table 15.1.9-8 presents employment shares for selected industries for the 10 largest population concentrations in the state. The table reflects survey data taken by the Census Bureau from 2009 to 2013. Thus, its figures for the state are slightly different from those in Table 15.1.9-7 for 2013.

Table 15.1.9-8: Employment by Selected Industries for the 10 Largest Population Concentrations in South Dakota, 2009–2013

Area	Construction	Transportation and Warehousing, and Utilities	Information	Professional, Scientific, Management, Administrative and Waste Management Services
Aberdeen	5.5%	3.2%	2.0%	5.8%
Brookings	5.3%	1.7%	2.5%	6.3%
Huron	5.9%	5.0%	2.0%	4.3%
Mitchell	8.4%	2.2%	1.5%	7.2%
Pierre	6.9%	5.1%	2.9%	6.0%

Area	Construction	Transportation and Warehousing, and Utilities	Information	Professional, Scientific, Management, Administrative and Waste Management Services
Rapid City	6.8%	4.2%	2.5%	8.7%
Sioux Falls	5.0%	3.8%	2.3%	7.6%
Spearfish	6.8%	2.0%	3.3%	7.9%
Watertown	4.3%	3.8%	1.6%	5.2%
Yankton	6.0%	4.7%	0.7%	4.6%
South Dakota (statewide)	6.4%	4.3%	1.9%	6.1%

Source: (U.S. Census Bureau, 2015l)

Housing

The housing stock is an important socioeconomic component of communities. The type, availability, and cost of housing in an area reflect economic conditions and affect quality of life. Table 15.1.9-9 compares South Dakota to the Central region and nation on several common housing indicators.

As shown in Table 15.1.9-9 in 2013, South Dakota had a higher percentage of housing units that were occupied (89.5 percent) than the region (88.4 percent) or nation (87.6 percent). Of the occupied units, South Dakota had a slightly lower percentage of owner-occupied units (67.2 percent) than the region (67.6 percent) or nation (63.5 percent). The percentage of detached single-unit housing (also known as single-family homes) in South Dakota in 2013 (69.0 percent) is slightly higher than the region (67.7 percent) and nation (61.5 percent). The homeowner vacancy rate in South Dakota (1.6 percent) was slightly lower than the rate for the region (1.8 percent) and the nation (1.9 percent). This rate reflects “vacant units that are ‘for sale only’” (U.S. Census Bureau, 2015h). The vacancy rate among rental units was lower in South Dakota (4.2 percent) than in the region (6.0 percent) or nation (6.5 percent).

Table 15.1.9-9: Selected Housing Indicators for South Dakota, 2013

Geography	Total Housing Units	Housing Occupancy & Tenure				Units in Structure
		Occupied Housing	Owner-Occupied	Homeowner Vacancy Rate	Rental Vacancy Rate	1-Unit, Detached
South Dakota	370,207	89.5%	67.2%	1.6%	4.2%	69.0%
Central Region	33,580,411	88.4%	67.6%	1.8%	6.0%	67.7%
U.S.	132,808,137	87.6%	63.5%	1.9%	6.5%	61.5%

Source: (U.S. Census Bureau, 2015n)

Table 15.1.9-10 provides housing indicators for the largest population concentrations in the state. The table reflects survey data taken from 2009 to 2013. Thus, its figures are not directly comparable to the more recent data in the previous table. However, it does present variation in these indicators for population concentrations across the state and compared to the state average for the 2009 to 2013 period.

Table 15.1.9-10: Selected Housing Indicators for the 10 Largest Population Concentrations in South Dakota, 2009–2013

Area	Total Housing Units	Housing Occupancy & Tenure				Units in Structure
		Occupied Housing	Owner-Occupied	Homeowner Vacancy Rate	Rental Vacancy Rate	1-Unit, Detached
Aberdeen	12,103	93.3%	63.9%	0.9%	6.2%	61.7%
Brookings	9,056	91.4%	48.4%	0.8%	6.8%	44.0%
Huron	6,139	89.3%	60.3%	4.0%	7.8%	64.7%
Mitchell	7,011	95.4%	55.7%	0.0%	0.0%	64.1%
Pierre	6,640	91.4%	62.3%	3.4%	5.5%	56.5%
Rapid City	35,356	93.0%	62.5%	2.0%	5.0%	61.9%
Sioux Falls	68,173	93.4%	61.9%	2.5%	6.3%	59.2%
Spearfish	5,493	94.2%	49.3%	0.8%	4.6%	40.6%
Watertown	9,746	93.1%	64.8%	2.0%	1.3%	65.0%
Yankton	6,125	91.8%	64.5%	2.4%	5.6%	62.4%
South Dakota (statewide)	365,694	88.4%	68.0%	1.8%	6.0%	68.8%

Sources: (U.S. Census Bureau, 2015o)

Property Values

Property values have important relationships to both the wealth and affordability of communities.

Table 15.1.9-11 provides indicators of residential property values for South Dakota and compares these values to values for the Central region and nation. The figures on median value of owner-occupied units are from the Census Bureau's ACS, based on owner estimates of how much their property (housing unit and land) would sell for if it were for sale (U.S. Census Bureau, 2015h).

The table shows that the median value of owner-occupied units in South Dakota in 2013 ($138,400) was lower than the corresponding values for the Central region ($151,200) and the nation ($173,900).

Table 15.1.9-11: Residential Property Values in South Dakota, 2013

Geography	Median Value of Owner-Occupied Units
South Dakota	$138,400
Central Region	$151,200
U.S.	$173,900

Source: (U.S. Census Bureau, 2015n)

Table 15.1.9-12 presents residential property values for the largest population concentrations in the state. The table reflects survey data taken from 2009 to 2013. Thus, its figures are not directly comparable to the more recent data in the previous table. However, it does show variation in property values for population concentrations across the state and compared to the state average for the 2009 to 2013 period. The median property value for these 10 communities ranged from $80,900 in the Huron area to $163,100 in the Spearfish area; the state value was $132,400. It is interesting to note that both the lowest and highest property values were in the two areas – Huron and Spearfish – that had the lowest median household incomes (Table 15.1.9-6).

Table 15.1.9-12: Residential Property Values for the 10 Largest Population Concentrations in South Dakota, 2009–2013

Area	Median Value of Owner-Occupied Units
Aberdeen	$133,500
Brookings	$146,700
Huron	$80,900
Mitchell	$115,800
Pierre	$151,700
Rapid City	$151,000
Sioux Falls	$153,100
Spearfish	$163,100
Watertown	$135,600
Yankton	$125,500
South Dakota (statewide)	$132,400

Sources: (U.S. Census Bureau, 2015o)

Government Revenues

State and local governments obtain revenues from many sources. FirstNet projects may affect flows of revenue sources between different levels of government due to program financing and intergovernmental agreements for system development and operation. Public utility taxes[99] are a subcategory of selective sales taxes that includes taxes on providers of land and mobile telephone, telegraph, cable, and internet services (U.S. Census Bureau, 2006). These service providers may obtain new taxable revenues from operation of components of the public safety broadband network. These revenue streams are typically highly localized and therefore are best considered in the deployment phase of FirstNet.

Table 15.1.9-13 presents total and selected state and local government revenue sources as reported by the Census Bureau's 2012 Census of Governments. It provides both total dollar figures (in millions of dollars) and figures per capita (in dollars), based on total population for each geography. The per capita figures were particularly useful in comparing the importance of

[99] Public utility taxes are a subcategory of selective sales taxes that includes taxes on providers of land and mobile telephone, telegraph, cable, and internet services (U.S. Census Bureau, 2006).

certain revenue sources in the state relative to other states in the region and the nation. State and local governments may obtain some additional revenues related to telecommunications infrastructure. General and selective sales taxes may change, reflecting expenditures during system development and maintenance.

Table 15.1.9-13 shows that the state government in South Dakota received less total revenue in 2012 on a per capita basis than its counterpart governments in the region and nation. Local governments in South Dakota received more total revenue in 2012 on a per capita basis than their counterparts in the region and less than counterparts in the nation. Additionally, South Dakota state and local governments had higher or similar levels per capita of intergovernmental revenues from the federal government.[100] The South Dakota state government obtained no revenue from property taxes. Local governments in South Dakota obtained higher levels of property taxes per capita than local governments in the region and lower levels than local government in the nation. General sales taxes on a per capita basis were higher for South Dakota state and local governments than their counterparts in the region and nation. Selective sales taxes were roughly similar on a per capita basis for the South Dakota state government and its counterparts in the region and nation. Selective sales taxes on a per capita basis for South Dakota local governments were similar to those of their counterparts in the region, and lower than those of their counterparts in the nation. Public utility taxes were very low for state and local governments in South Dakota, compared to their regional and national counterparts. State and local governments in South Dakota reported no revenue from individual income taxes. Corporate income tax revenues were somewhat lower for the South Dakota state government than for its counterpart governments in the region and nation. Local governments in South Dakota reported no revenue from corporate income taxes.

Table 15.1.9-13: State and Local Government Revenues, Selected Sources, 2012

Type of Revenue		South Dakota		Region		U.S.	
		State Govt. Amount	Local Govt. Amount	State Govt. Amount	Local Govt. Amount	State Govt. Amount	Local Govt. Amount
Total Revenue	($M)	$4,351	$3,258	$463,192	$231,980	$1,907,027	$1,615,194
	Per capita	$5,221	$3,910	$6,020	$3,015	$6,075	$5,145
Intergovernmental from Federal	($M)	$1,630	$187	$125,394	$9,383	$514,139	$70,360
	Per capita	$1,956	$225	$1,630	$122	$1,638	$224
Intergovernmental from State	($M)	$0	$738	$0	$76,288	$0	$469,147
	Per capita	$0	$885	$0	$992	$0	$1,495
Intergovernmental from Local	($M)	$27	$0	$2,721	$0	$19,518	$0
	Per capita	$33	$0	$35	$0	$62	$0
Property Taxes	($M)	$0	$1,008	$3,626	$61,015	$13,111	$432,989
	Per capita	$0	$1,210	$47	$793	$42	$1,379

[100] Intergovernmental revenues are those revenues received by one level of government from another level of government, such as shared taxes, grants, or loans and advances (U.S. Census Bureau, 2006).

Type of Revenue		South Dakota		Region		U.S.	
		State Govt. Amount	Local Govt. Amount	State Govt. Amount	Local Govt. Amount	State Govt. Amount	Local Govt. Amount
General Sales Taxes	($M)	$838	$307	$58,236	$6,920	$245,446	$69,350
	Per capita	$1,006	$369	$757	$90	$782	$221
Selective Sales Taxes	($M)	$359	$27	$33,313	$2,191	$133,098	$28,553
	Per capita	$431	$32	$433	$28	$424	$91
Public Utilities Taxes	($M)	$4	$12	$3,627	$1,153	$14,564	$14,105
	Per capita	$4	$15	$47	$15	$46	$45
Individual Income Taxes	($M)	$0	$0	$72,545	$5,148	$280,693	$26,642
	Per capita	$0	$0	$943	$67	$894	$85
Corporate Income Taxes	($M)	$60	$0	$9,649	$310	$41,821	$7,210
	Per capita	$72	$0	$125	$4	$133	$23

Sources: (U.S. Census Bureau, 2015p; U.S. Census Bureau, 2015q)

Note: This table does not include all sources of government revenue. Summation of the specific source rows does not equal total revenue.

15.1.10. Environmental Justice

15.1.10.1. Definition of the Resource

Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, issued in 1994, sets out principles of environmental justice and requirements that federal agencies should follow to comply with the EO (see Section 1.8.11). The fundamental principle of environmental justice as stated in the EO is, "fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies" (Executive Office of the President, 1994). Under the EO, each federal agency must "make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations" (Executive Office of the President, 1994). In response to the EO, the Department of Commerce developed an Environmental Justice Strategy in 1995, and published an updated strategy in 2013 (U.S. Department of Commerce, 2013).

In 1997, the Council on Environmental Quality (CEQ) issued Environmental Justice: Guidance under the National Environmental Policy Act (NEPA) to assist federal agencies in meeting the requirements of the EO (CEQ, 1997). Additionally, the USEPA's Office of Environmental Justice (USEPA, 2015a) offers guidance on Environmental Justice issues and provides an "environmental justice screening and mapping tool," EJSCREEN (USEPA, 2015b).

The CEQ guidance provides several important definitions and clarifications that this PEIS utilizes:

- Minority populations consist of "Individual(s) who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic."
- Low-income populations consist of individuals living in poverty, as defined by the U.S. Census Bureau (Census Bureau).
- Environmental effects include social and economic effects. Specifically, "Such effects may include ecological, cultural, human health, economic, or social impacts on minority communities, low-income communities, or Indian tribes when those impacts are interrelated to impacts on the natural or physical environment" (CEQ, 1997).

15.1.10.2. Specific Regulatory Considerations

Research for this section did not identify any specific state, local, or tribal laws or regulations that are directly relevant to environmental justice for this PEIS.

15.1.10.3. Environmental Setting: Minority and Low-Income Populations

Table 15.1.10-1 presents 2013 data on the composition of South Dakota's estimated population by race and by Hispanic origin. The state's estimated population has considerably lower percentages of individuals who identify as Black / African American (1.5 percent), Asian (1.1 percent), or Some Other Race (0.8 percent) than the estimated populations of the Central region and the nation. (Those percentages are, for Black / African American, 9.3 percent for the Central region and 12.6 percent for the nation; for Asian, 2.8 percent and 5.1 percent respectively; and for Some Other Race, 2.4 percent and 4.7 percent respectively.) South Dakota's percentage of individuals who identify as American Indian/ Alaska Native is considerably higher than those percentages for the region and nation; the figures are 8.5 percent, 0.7 percent, and 0.8 percent, respectively. The state's estimated population of persons identifying as White (85.1 percent) is larger than that of the Central region (82.2 percent) or the nation (73.7 percent).

The percentage of the estimated population in South Dakota that identifies as Hispanic (3.2 percent) is considerably smaller than in the Central region (8.5 percent), and the nation (17.1 percent). Hispanic origin is a different category than race; persons of any race may identify as also being of Hispanic origin.

The category All Minorities consists of all persons who consider themselves Hispanic or of any race other than White. South Dakota's All Minorities estimated population percentage (16.6 percent) is considerably lower than that of the Central region (23.3 percent) or the nation (37.6 percent).

Table 15.1.10-2 presents the percentage of the estimated population living in poverty in 2013, for the state, region, and nation. The figure for South Dakota (14.2 percent) is lower than that for the Central region (14.7 percent) and for the nation (15.8 percent).

Table 15.1.10-1: Estimated Population by Race and Hispanic Status, 2013

Geography	Total Estimated Population	Race							Hispanic	All Minorities[a]
		White	Black/ African Am	Am. Indian / Alaska Native	Asian	Native Hawaiian /Pacific Islander	Some Other Race	Two or More Races		
South Dakota	844,877	85.1%	1.5%	8.5%	1.1%	0.0%	0.8%	2.9%	3.2%	16.6%
Central Region	77,314,952	82.2%	9.3%	0.7%	2.8%	0.1%	2.4%	2.5%	8.5%	23.3%
U.S.	316,128,839	73.7%	12.6%	0.8%	5.1%	0.2%	4.7%	3.0%	17.1%	37.6%

Source: (U.S. Census Bureau, 2015r)

[a] "All Minorities" is defined as all persons who consider themselves Hispanic or of any race other than White. Because some Hispanics identify as both Hispanic and of a non-White race, "All Minorities" is less than the sum of Hispanics and non-White races.

Table 15.1.10-2: Percentage of Estimated Population (Individuals) in Poverty, 2013

Geography	Percent Below Poverty Level
South Dakota	14.2%
Central Region	14.7%
U.S.	15.8%

Source: (U.S. Census Bureau, 2015s)

15.1.10.4. Environmental Justice Screening Results

Analysis of environmental justice in a NEPA document typically begins by identifying potential environmental justice populations in the project area. Appendix D, Environmental Justice Methodology, presents the methodology used in this PEIS to screen each state for the presence of potential environmental justice populations. The methodology builds on CEQ guidance and best practices used for environmental justice analysis. It uses data at the census-block group level; block groups are the smallest geographic units for which regularly updated socioeconomic data are readily available at the time of writing.

Figure 15.1.10-1 visually portrays the results of the environmental justice population screening analysis for South Dakota. The analysis used block group data from the Census Bureau's American Community Survey 2009-2013 5-Year Estimates (U.S. Census Bureau, 2015d; U.S. Census Bureau, 2015t; U.S. Census Bureau, 2015u; U.S. Census Bureau, 2015v) and Census Bureau urban classification data (U.S. Census Bureau, 2012a; U.S. Census Bureau, 2015e).

Figure 15.1.10-1 shows that South Dakota has many areas with high potential for environmental justice populations. These high potential areas occur across the state, and occur both within and outside of the 10 largest population concentrations. A large portion of the area between Rapid City and Pierre is classified as having high potential. Areas with moderate potential for environmental justice populations also occur across the state.

It is important to understand how the data behind Figure 15.1.10-1 affect the visual impact of this map. Block groups have similar populations (hundreds to a few thousand individuals) regardless of population density. In sparsely populated areas, a single block group may cover tens or even hundreds of square miles, while in densely populated areas, block groups each cover much less than a single square mile. Thus, while large portions of the state outside the areas defined as large population concentrations show moderate or high potential for environmental justice populations, these low density areas reflect modest numbers of minority or low-income individuals compared to the potential environmental justice populations within densely populated areas. The overall effect of this relative density phenomenon is that the map visually shows large areas of the state having environmental justice potential, but this over-represents the presence of environmental justice populations.

It is also very important to note that Figure 15.1.10-1 does not definitively identify environmental justice populations. It indicates *degrees of likelihood of the presence* of populations of potential concern from an environmental justice perspective. Two caveats are important. First, environmental justice communities are often highly localized. Block group data may under- or over-represent the presence of these localized communities. For instance, in the large block groups in sparsely populated regions of the state, the data may represent dispersed individuals of minority or low-income status rather than discrete, place-based communities. Second, the definition of the moderate potential category draws a wide net for potential environmental justice populations. As discussed in Appendix D, the definition includes some commonly used thresholds for environmental justice screening that tend to over-identify environmental justice potential. Before FirstNet deploys projects, additional site-specific analyses to identify specific, localized environmental justice populations may be warranted. Such analyses could tier off the methodology of this PEIS.

This map also does not indicate whether FirstNet projects would have actual impacts on environmental justice populations. An environmental justice effect on minority or low-income populations only occurs if the effect is harmful, significant (according to NEPA criteria), and "appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group" (CEQ, 1997). The Environmental Consequences section (Section 15.2) addresses the potential for disproportionately high and adverse environmental or human health impacts on environmental justice populations.

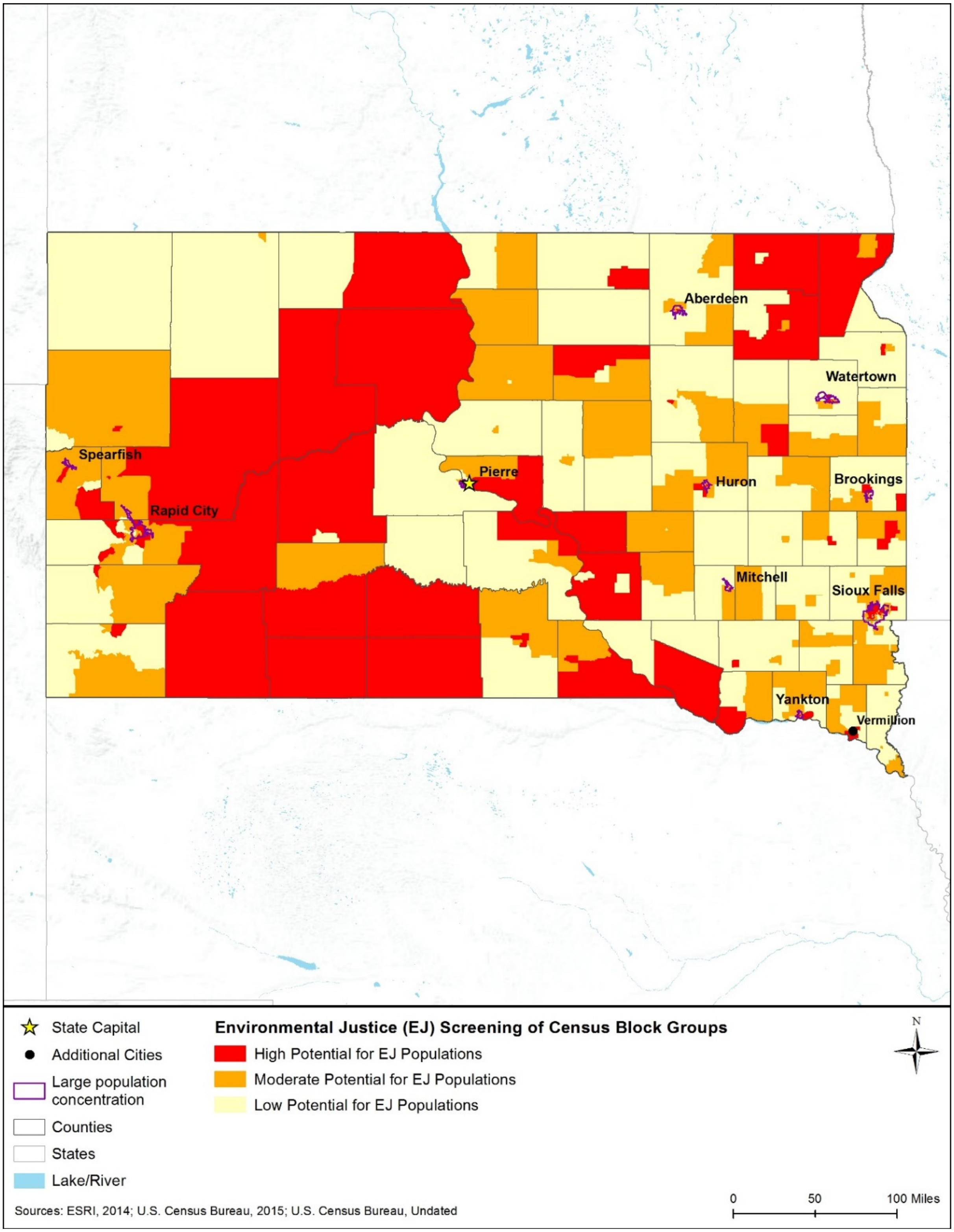

Figure 15.1.10-1: Potential for Environmental Justice Populations in South Dakota, 2009–2013

15.1.11. Cultural Resources

15.1.11.1. Definition of Resource

For the purposes of this PEIS, cultural resources are defined as:

- Natural or manmade structures, objects, features, locations with scientific, historic, and cultural value, including those with traditional religious or cultural importance and any prehistoric or historic district, site, or building included in, or eligible for inclusion in, the National Register of Historic Places (NRHP).

This definition is consistent with the how cultural resources are defined in the:

- Statutory language and implementing regulations for Section 156 of the National Historic Preservation Act of 1966, as amended (NHPA), formerly 16 U.S.C. 470a(d)(6)(A) (now 54 U.S.C. 306131(b)) and 36 CFR 800.16(l)(1);
- Statutory language and Implementing regulations for the Archaeological Resources Protection Act of 1979 (ARPA), 16 U.S.C. 470cc(c) and 43 CFR 7.3(a);
- Statutory language and implementing regulations for the Native American Graves Protection and Repatriation Act (NAGPRA), 25 U.S.C. 3001(3)(D) and 43 CFR 10.2(d);
- NPS program support of public and private efforts to identify, evaluate, and protect America's historic and archeological resources (NPS, 2015); and
- Advisory Council on Historic Preservation's (ACHP) guidance for protection and preservation of sites and artifacts with traditional religious and cultural importance to Indian tribes or Native Hawaiian organizations (Advisory Council on Historic Preservation, 2004).

15.1.11.2. Specific Regulatory Considerations

Applicable federal laws and regulations that apply to Cultural Resources, such as the NHPA (detailed in Section 1.8), the American Indian Religious Freedom Act (AIRFA), ARPA, and NAGPRA. Appendix C summarizes these pertinent federal laws.

South Dakota has state regulations that parallel both NEPA and the NHPA. While federal agencies may take into account compatible state laws and regulations, their actions that are subject to federal environmental review under NEPA and NHPA are not subject to compliance with such state laws and regulations. Table 15.1.11-1 presents state and local laws and regulations that relate to cultural resources.

Table 15.1.11-1: Relevant South Dakota Cultural Resources Laws and Regulations

State Law / Regulation	Regulatory Agency	Applicability
1-19-A Preservation of Historic Sites	State Historical Society	Provides for the protection of historical, architectural, archaeological, paleontological, and cultural sites.

15.1.11.3. Cultural and Natural Setting

Through the examination of cultural artifacts, archaeologists have determined that human beings have occupied the South Dakota region for at least 12,500 years, beginning in the Pleistocene Epoch. Modern understanding of South Dakota's prehistory comes from archaeological excavations, ethnographic research, and oral traditions, with some historical documents from the westward expansion and fur trade adding additional insights into indigenous lifeways. Archaeologists divide the prehistory of South Dakota into sequences, with some geographic differences existing in different parts of the state. Generally, South Dakota prehistory follows a theme of communal bison hunting with increasing complexity and broadening of the subsistence base.

Human habitation, culture development, and the artifacts that remain were greatly influenced by the physiographic characteristics of the area. South Dakota is in the Interior Plains physiographic region, which is divided into the Central Lowland Province in the western two-thirds of the state and the Great Plains Province in the eastern one third (Figure 15.1.3-1). Archaeological sites are found in mountains, valleys, grasslands, deserts, caves, and canyons. Most archaeological evidence is found within the top three meters of the surface, although there is considerable variability throughout the state. Many of South Dakota's archaeological sites have been disturbed by agriculture and development; remaining undiscovered sites may now be in shallower or deeper levels of soil than expected. In addition to the thousands of archaeological sites listed in the state's inventory, there are more than 200 sites listed on the NRHP (NPS, 2014c).

The following sections provide additional detail about South Dakota's prehistoric periods (9500 B.C. to A.D. 1750) and the historic period since European contact in the 1700s. There is some overlap between the prehistoric period and the historic period, as American Indians continued to carry on their traditional way of life in parts of South Dakota after European contact. Section 15.1.11.4 presents an overview of the initial human habitation in South Dakota and the cultural development that occurred before European contact. Section 15.1.11.5 discusses the federally recognized American Indian tribes with a cultural affiliation to the state. Section 15.1.11.6 provides a current list of significant archaeological sites in South Dakota and tools that the state has developed to ensure their preservation. Section 15.1.11.7 documents the historic context of the state since European contact, and Section 15.1.11.8 summarizes the architectural context of the state during the historic period.

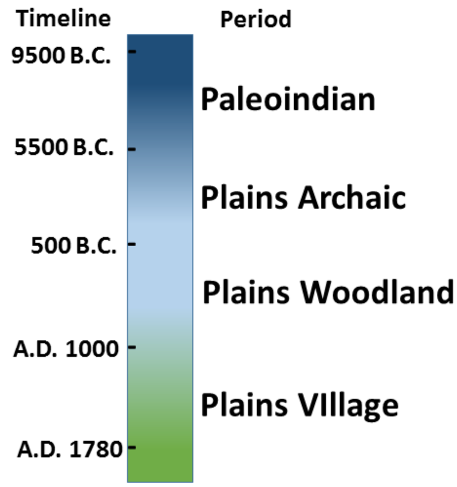

Figure 15.1.11-1: Timeline of Prehistoric Human Occupation

Sources: (Institute of Maritime History, 2015)

Paleoindian Period (9500 - 5500 B.C.)

The Paleoindian Period is defined as the initial occupation of the region by nomadic and seminomadic groups. Aboriginal people are believed to have crossed the Bering Land Bridge during the last ice age as they followed migrations of mammoth, bison, and other large game (Potter, B. et al, 2011). The archaeological record of South Dakota shows that both the “Clovis” and “Folsom” cultures were present during the Paleoindian Period and were adept at hunting late Pleistocene large game, such as now-extinct species of bison and mammoth. Archaeological sites from the Paleoindian Period include kill sites, butchery sites, campsites, hearths, and quarries. These sites typically contain the iconic Clovis points which are large, chipped stone projectile points that were manufactured to hunt large game during the Pleistocene. Later in the Paleoindian Period, more complex Folsom tool assemblages appear, suggesting that more diverse food resources were being exploited. The adaptation to plant processing may mark the beginning of what can loosely be called the “true Northwestern Plains cultural pattern” which persisted up to the Protohistoric Period (Sundstrom, 2008).

One well-preserved mammoth kill site is the Lange-Ferguson site, in the White River Badlands on the Pine Ridge Indian Reservation in South Dakota. This Clovis site contains two mammoths, one juvenile and one adult, which were killed around 12,000 years ago when the area was a marsh or a bog (Artz, 1995). Two complete fluted Clovis points were found on the site, as well as a flaked bone cleaver that was probably used to butcher the mammoth. Throughout the rest of the state, points of the Folsom, Goshen, and Plano traditions are associated with bison kills as well (Artz, 1995).

Plains Archaic Period (5500 - 500 B.C.)

The Plains Archaic Period, from 5500 to 500 B.C., is defined by nomadic and seminomadic groups living during more arid climatic conditions than the Paleoindian Period. As the environmental conditions changed, so did cultural adaptations to the South Dakota environment. Many of the Paleoindian communities moved with the bison to areas that could still sustain them, practicing communal bison hunting (Frison, 1998). The changing climate coincided with a dramatic drop in Pleistocene megafauna, inspiring a "nomadic, broad spectrum foraging adaptation to the Plains, believed to be a readjustment of Paleoindian lifeways to a changing Plains environment as the Pleistocene gave way to the Holocene… requiring an apparently radical shift in subsistence practices" (Ahler, S.; Toom, D., 1989). The reduction of large game throughout the region led societies to shift their attention to other natural resources.

During the early Plains Archaic Period, new types of tools were developed to exploit the changed environment. Ground stone axes, bone awls, needles, fish spears, fishhooks, milling stones, and complex hearths were added to a tool assemblage that was previously dominated by spears. Antelope, deer, bison, birds, reptiles, and freshwater mussels were protein sources that became increasingly important during the early Plains Archaic Period. Even with this broadening of their subsistence strategy, most societies were mostly nomadic. Finds of a variety of lithic assemblages, burial practices, and habitation types suggest increasing cultural diversity as the Archaic Period progressed towards the Plains Woodland Period. (Gregg, 1987)

Plains Woodland Period (500 B.C. – A.D. 1000)

The Plains Woodland Period, from 500 B.C. to A.D. 1000, continued to be defined by nomadic and seminomadic groups. Communal bison hunting remained important, even as early forms of agriculture were being developed, particularly maize production in the southern areas of present day South Dakota. The emergence of pottery and ceramics, which supported food storage and cooking, is a definitive archaeological marker of the Plains Woodland Period. In the eastern part of the state, burial mounds and incipient horticulture also emerged during this period. (Gregg, M.; Picha, P.; Swenson, F.; Bleier, A., 2008)

There were several distinct cultures in the South Dakota region during the Plains Woodland Period, most notably the Pelican Lake and Besant. Both of these had a bison-hunting subsistence base, with the culture in the southern part of the state characterized by a mixed bison-hunting and foraging subsistence base. A type of communal bison-hunting culture characterized the Besant culture.

Plains Village Period (A.D. 1000 - 1780)

The Plains Village Period, from A.D. 1000 to 1780, contained three overlapping cultural expressions:

- Communal bison hunting pattern -- prevalent in the Paleoindian through the Plains Woodland Periods,
- Mixed hunting and foraging subsistence strategy -- in the Plains Archaic Period, and
- Hunter-gatherer-horticultural semi-sedentary village pattern -- typical of the Missouri River and Central Plains, which began to emerge in the eastern part of the state during the Plains Woodland Period. (Toom, 2004)

Structures of the Plains Village Period include semi-sedentary earthen lodge settlements clustered around rivers and water sources. The main subsistence strategy was maize horticulture combined with seasonal bison hunting, with both subsistence activities reinforced by food preservation technologies in underground pits. There is also definitive evidence of sophisticated bison traps, which were used to capture and kill large numbers of bison simultaneously, and hide tipi rings that were used during communal hunts. (Wood, 1974)

Protohistoric Period and Early Historic Period (A.D. 1780 - 1880)

The influence of European-American culture and technology in the 18th and 19th centuries on prehistoric Northwestern Plains culture cannot be understated. The introduction of the horse and gun, in addition to the rising fur trade throughout the country, led to profound transformations in indigenous communities in South Dakota. Social stratification based on access to trade goods created fissures within indigenous society that were exponential – access to horses and guns gave individuals both economic and physical power within their communities. Armed riders could efficiently pursue and kill large numbers of bison. Mounted hunters also had military dominance over pedestrian fighters. This cultural phenomenon came to be known as the “Plains Indian warrior complex” and was a highly structured system of recognizing individual accomplishments in battle and in society as a whole. This complex came to pervade every aspect of indigenous society in South Dakota and led to popular iconic imaginings of American Indians that persist to this day. (Sundstrom, 2008)

Rock art in the southern Black Hills by Crow, Ponca, Comanche, Kiowa, and Kiowa Apache tribes depicts trade items of Euro-American origin, including guns and horses. The regions west of the Black Hills were controlled by the Shoshone tribe. In the Late Protohistoric Period, the Crow and Kiowa were forced out of the Dakotas by the Cheyenne, Arapaho, and Lakota groups. (Peterson L.; Deaver, S., 2001)

15.1.11.4. Federally Recognized Tribes of South Dakota

According to the Bureau of Indian Affairs and the National Conference of State Legislators, South Dakota has nine federally recognized tribes (refer to Table 15.11.1-2) (National Conference of State Legislators, 2015; U.S. Government Publishing Office, 2015).

Table 15.1.11-2: Federally Recognized Tribes of South Dakota

Cheyenne River Sioux Tribe of the Cheyenne River Reservation	Lower Brule Sioux Tribe of the Lower Brule Reservation
Flandreau Santee Sioux Tribe of South Dakota	Rosebud Sioux Tribe of the Rosebud Indian Reservation
Oglala Sioux Tribe of the Pine Ridge Reservation	Standing Rock Sioux Tribe (North Dakota and South Dakota)
Sisseton-Wahpeton Oyate of the Lake Traverse Reservation	Turtle Mountain Band of Chippewa Indians
Yankton Sioux Tribe of South Dakota	Northern Cheyenne Tribe
Crow Creek Sioux Tribe of the Crow Creek Reservation	

The general location of the tribes are shown in Figure 15.1.11-2. There are several other tribes depicted in the figure below that once lived in South Dakota, but do not retain federal reservation or trust lands here any longer.

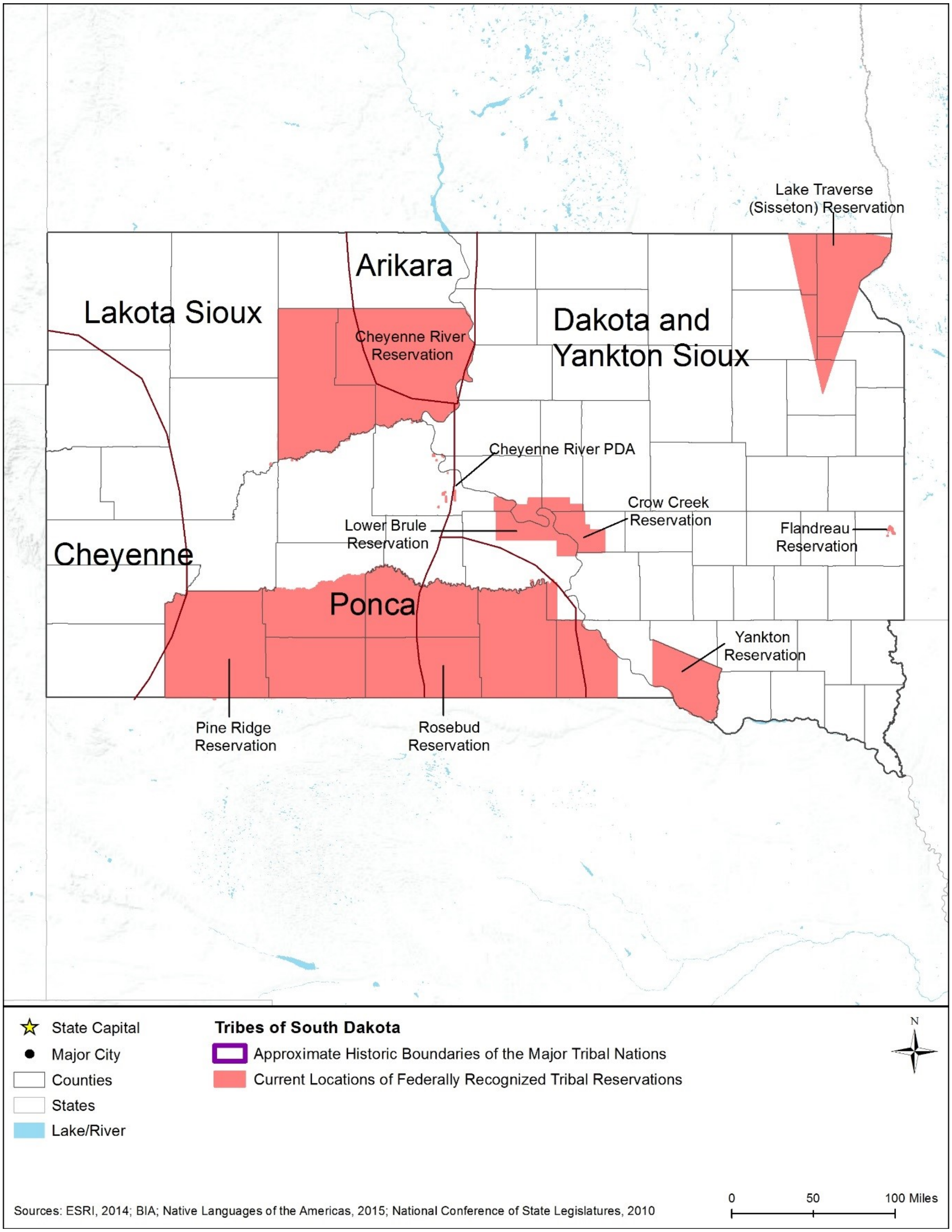

Figure 15.1.11-2: Approximate Historic Boundaries of Tribes in South Dakota

15.1.11.5. Significant Archaeological Sites of South Dakota

As previously mentioned in Section 15.1.11.3, there more than 200 archaeological sites in South Dakota listed on the NRHP. Table 15.1.11-3 lists the names of the sites, the city they are closest to, and type of site. The list includes both prehistoric and historic archaeological sites. The number of archaeological sites may increase with the discovery of new sites. A current list of NRHP sites are listed on the NPS NRHP website at http://www.nps.gov/nr/ (NPS, 2014c).

South Dakota State Cultural Resources Database and Tools

The State Historic Preservation Office (SHPO)

The State Historic Preservation Office (SHPO), part of the South Dakota State Historical Society, overseas the NRHP program of the National Park Service in South Dakota. The SHPO surveys, documents, and registers cultural resources. The SHPO also provides advice on mitigation and preservation methods for cultural resources, oversees state monitoring standards for state, federal, and local government activities, and manages the State Archives. Information regarding access to the SHPOs services and the State Archives is available through the SPHO website, http://history.sd.gov (South Dakota State Historical Society, 2015a).

Archaeological Research Center, South Dakota State Historical Society

The South Dakota State Historical Society, under the direction of the South Dakota State Archaeologist, manages the Archaeological Research Center (ARC). This research center maintains a database of more than 23,000 archaeological sites and 12,000 projects, including thousands of archaeological reports and documents, photos, site maps, slides, and other materials. Information about the capabilities and services offered by ARC is available through the SHPO's website, http://history.sd.gov (South Dakota State Historical Society, 2015a).

South Dakota Archaeological Society (SDAS)

The SDAS is composed of archaeologists who specialize in South Dakota prehistory and archaeology, identify important cultural resource sites, provide education services, and, offer training of interested individuals in cultural resource management. Information about the capabilities and services offered by SDAS is available through the SHPO's website at http://history.sd.gov/aboutus/organizations/sdarch.aspx (South Dakota State Historical Society, 2015a).

Table 15.1.11-3: Archaeological Sites on the National Register of Historic Places in South Dakota

Closest City	Site Name	Type of Site
Ashton	Site 39SP12	Prehistoric
Bison	Frozenman Stage Station	Historic
Bison	Stomprude Trail Ruts	Historic
Bloom	Bloom Site	Prehistoric
Brandon	Brandon Village	Prehistoric
Bridgewater	Archeological Site No. 39MK12	Prehistoric
Canning	Archeological Site 39HU66	Prehistoric
Chamberlain	Crow Creek Site	Prehistoric
City Restricted	Site No. 39 Cu 510	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 Cu 511	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 Cu 512	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 Cu 513	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 Cu 514	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 Cu 515	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 Cu 516	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 Cu 91	Historic - Aboriginal
City Restricted	Site No. 39 FA 277	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 FA 389	Historic - Aboriginal
City Restricted	Site No. 39 FA 554	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 FA 58	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 FA 676	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 FA 677	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 FA 681	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 FA 684	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 FA 685	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 FA 687	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 FA 7	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 FA 75	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 FA 79	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 FA 91	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 FA 94	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 PN 108	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 PN 438	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 PN 439	Historic - Aboriginal, Prehistoric
City Restricted	Site No. 39 PN 57	Historic - Aboriginal, Prehistoric
Clayton	Site 39HT27	Prehistoric
Clayton	Site 39HT29	Prehistoric
Clayton	Sites 39HT30 and 39HT202	Prehistoric
Crandon	Site 39SP37	Prehistoric

Closest City	Site Name	Type of Site
Crandon	Site 39SP46	Prehistoric
Custer	Archeological site no. 39CU1619	Prehistoric
Custer	Archeological Site No. 39CU70	Prehistoric
Custer	Archeological Site No. 39PN376	Prehistoric
Danforth	Archeological Site 39HD22	Prehistoric
Edgemont	Archeological 39FA1638	Historic - Aboriginal, Prehistoric
Edgemont	Archeological Site 39FA1336	Historic - Aboriginal, Prehistoric
Edgemont	Archeological Site 39FA1337	Historic - Aboriginal, Prehistoric
Edgemont	Archeological Site No. 39FA1046	Prehistoric
Edgemont	Archeological Site No. 39FA1190	Prehistoric
Edgemont	Archeological Site No. 39FA1201	Prehistoric
Edgemont	Archeological Site No. 39FA243	Prehistoric
Edgemont	Archeological Site No. 39FA244	Prehistoric
Edgemont	Archeological Site No. 39FA316	Prehistoric
Edgemont	Archeological Site No. 39FA321	Prehistoric
Edgemont	Archeological Site No. 39FA395	Prehistoric
Edgemont	Archeological Site No. 39FA446	Prehistoric
Edgemont	Archeological Site No. 39FA447	Prehistoric
Edgemont	Archeological Site No. 39FA448	Prehistoric
Edgemont	Archeological Site No. 39FA542	Prehistoric
Edgemont	Archeological Site No. 39FA678	Prehistoric
Edgemont	Archeological Site No. 39FA679	Prehistoric
Edgemont	Archeological Site No. 39FA680	Prehistoric
Edgemont	Archeological Site No. 39FA682	Prehistoric
Edgemont	Archeological Site No. 39FA683	Prehistoric
Edgemont	Archeological Site No. 39FA686	Prehistoric
Edgemont	Archeological Site No. 39FA688	Prehistoric
Edgemont	Archeological Site No. 39FA690	Prehistoric
Edgemont	Archeological Site No. 39FA691	Prehistoric
Edgemont	Archeological Site No. 39FA767	Prehistoric
Edgemont	Archeological Site No. 39FA788	Prehistoric
Edgemont	Archeological Site No. 39FA819	Prehistoric
Edgemont	Archeological Site No. 39FA86	Prehistoric
Edgemont	Archeological Site No. 39FA88	Prehistoric
Edgemont	Archeological Site No. 39FA89	Prehistoric
Edgemont	Archeological Site No. 39FA99	Prehistoric
Edgemont	Flint Hill Aboriginal Quartzite Quarry	Prehistoric
Edgemont	Lord's Ranch Rockshelter	Historic - Aboriginal, Prehistoric
Edgemont	Site 39FA1303	Historic - Aboriginal, Prehistoric
Edgemont	Site 39FA1639	Historic - Aboriginal, Prehistoric
Forestburg	Site 39SB18	Prehistoric
Forestburg	Site 39SB31	Prehistoric

Closest City	Site Name	Type of Site
Fort Pierre	Lower Antelope Creek Site	Historic - Aboriginal
Fort Pierre	Antelope Creek Site (39ST55)	Prehistoric
Fort Pierre	Bloody Hand Site (39ST230)	Prehistoric
Fort Pierre	Breeden Village	Prehistoric
Fort Pierre	Fort Pierre Chouteau Site	Historic, Military
Fort Pierre	La Verendrye Site	Prehistoric
Fort Thompson	Fort Thompson Archeological District	Aboriginal, Prehistoric, Historic, Military
Fort Thompson	Fort Thompson Mounds	Prehistoric
Fort Thompson	Talking Crow Archeological Site	Prehistoric
Frankfort	Site 39SP2	Prehistoric
Frederick	Campbell, Colin, Post	Historic
Freeman	Archeological Site 39TU5	Prehistoric
Ft. Pierre	Ft. Pierre II (39ST217)	Historic
Gann Valley	Archeological Site 39JE11	Prehistoric
Gettysburg	Archeological Site No. 39PO205	Prehistoric
Gettysburg	Archeological Site No. 39PO63	Prehistoric
Hermosa	Archeological Site No. 39CU890	Prehistoric
Holabird	Archeological Site No. 39HE331	Prehistoric
Hot Springs	Archeological Site No. 39FA1010	Prehistoric
Hot Springs	Archeological Site No. 39FA1013	Prehistoric
Hot Springs	Archeological Site No. 39FA1049	Prehistoric
Hot Springs	Archeological Site No. 39FA1093	Prehistoric
Hot Springs	Archeological Site No. 39FA1152	Prehistoric
Hot Springs	Archeological Site No. 39FA1154	Prehistoric
Hot Springs	Archeological Site No. 39FA1155	Prehistoric
Hot Springs	Archeological Site No. 39FA1204	Prehistoric
Hot Springs	Archeological Site No. 39FA806	Prehistoric
Hot Springs	Archeological Site No. 39FA90	Prehistoric
Huron	Site 39BE14	Prehistoric
Huron	Site 39BE15	Prehistoric
Huron	Site 39BE23	Prehistoric
Huron	Site 39BE46	Prehistoric
Huron	Site 39BE48	Prehistoric
Long Lake	Archeological Site No. 39MP3	Prehistoric
Lower Brule	Medicine Creek Archeological District	Aboriginal, Prehistoric, Historic, Military
Lower Brule	Burnt Prairie Site (39LM207)	Prehistoric
Lower Brule	Jiggs Thompson Site (39LM208)	Prehistoric
Lower Brule	Langdeau Site	Prehistoric
Ludlow	Archeological Site No. 39HN1	Prehistoric
Ludlow	Archeological Site No. 39HN121	Prehistoric
Ludlow	Archeological Site No. 39HN150	Prehistoric
Ludlow	Archeological Site No. 39HN155	Prehistoric

Closest City	Site Name	Type of Site
Ludlow	Archeological Site No. 39HN159	Prehistoric
Ludlow	Archeological Site No. 39HN160	Prehistoric
Ludlow	Archeological Site No. 39HN162	Prehistoric
Ludlow	Archeological Site No. 39HN165	Prehistoric
Ludlow	Archeological Site No. 39HN167	Prehistoric
Ludlow	Archeological Site No. 39HN168	Prehistoric
Ludlow	Archeological Site No. 39HN17	Prehistoric
Ludlow	Archeological Site No. 39HN171	Prehistoric
Ludlow	Archeological Site No. 39HN174	Prehistoric
Ludlow	Archeological Site No. 39HN177	Prehistoric
Ludlow	Archeological Site No. 39HN18	Prehistoric
Ludlow	Archeological Site No. 39HN198	Prehistoric
Ludlow	Archeological Site No. 39HN199	Prehistoric
Ludlow	Archeological Site No. 39HN205	Prehistoric
Ludlow	Archeological Site No. 39HN207	Prehistoric
Ludlow	Archeological Site No. 39HN208	Prehistoric
Ludlow	Archeological Site No. 39HN209	Prehistoric
Ludlow	Archeological Site No. 39HN21	Prehistoric
Ludlow	Archeological Site No. 39HN210	Prehistoric
Ludlow	Archeological Site No. 39HN213	Prehistoric
Ludlow	Archeological Site No. 39HN217	Prehistoric
Ludlow	Archeological Site No. 39HN218	Prehistoric
Ludlow	Archeological Site No. 39HN219	Prehistoric
Ludlow	Archeological Site No. 39HN22	Prehistoric
Ludlow	Archeological Site No. 39HN227	Prehistoric
Ludlow	Archeological Site No. 39HN228	Prehistoric
Ludlow	Archeological Site No. 39HN232	Prehistoric
Ludlow	Archeological Site No. 39HN234	Prehistoric
Ludlow	Archeological Site No. 39HN26	Prehistoric
Ludlow	Archeological Site No. 39HN30	Prehistoric
Ludlow	Archeological Site No. 39HN484	Prehistoric
Ludlow	Archeological Site No. 39HN485	Prehistoric
Ludlow	Archeological Site No. 39HN486	Prehistoric
Ludlow	Archeological Site No. 39HN487	Prehistoric
Ludlow	Archeological Site No. 39HN5	Prehistoric
Ludlow	Archeological Site No. 39HN50	Prehistoric
Ludlow	Archeological Site No. 39HN53	Prehistoric
Ludlow	Archeological Site No. 39HN54	Prehistoric
Ludlow	Lightning Spring (39HN204)	Prehistoric
Macs Corner	Archeological Site 39HU189	Prehistoric
Mahto	Archeological Site No. 39CO39	Prehistoric
McIntosh	Fort Manuel	Historic

Closest City	Site Name	Type of Site
Mitchell	Mitchell Site	Prehistoric
Mitchell	Site 39DV24	Prehistoric
Mitchell	Reese, Sheldon, Site (39HS23)	Prehistoric
Mitchell	Site 39HS3	Prehistoric
Mitchell	Site 39SB15	Prehistoric
Mobridge	Molstad Village	Prehistoric
Mobridge	Gravel Pit Site (39WW203)	Prehistoric
Morristown	Antelope Creek Stage Station	Historic
Morristown	Grand River Stage Station	Historic
Oacoma	Dinehart Village Archeological Site	Prehistoric
Oacoma	Fort Lookout IV	Historic, Historic - Aboriginal
Oacoma	King Archeological Site	Prehistoric
Olivet	Site 39HT14	Prehistoric
Onida	Cooper Village Archeological Site	Prehistoric
Pierre	Archeological Site 39HU201	Prehistoric
Pierre	Arzberger Site	Prehistoric
Pierre	Cedar Islands Archeological District	Historic, Prehistoric
Pierre	Fort George Creek Archeological District	Historic, Historic - Aboriginal, Prehistoric
Pierre	McClure Site (39HU7)	Prehistoric
Pierre	Old Fort Sully Site (39HU52)	Historic
Polock	Vanderbilt Archeological Site	Prehistoric
Pringle	Beaver Creek Rockshelter	Prehistoric
Riverside	Site 39DV9	Prehistoric
Rosedale Colony	Fort James (39HS48)	Historic
Sisseton	Brown's Post	Historic
Sisseton	Site 39RO71	Historic - Aboriginal, Prehistoric
Spink Colony	Site 39SP19	Prehistoric
Sturgis	Archeological Site No. 39MD81	Prehistoric
Sturgis	Archeological Site No. 39MD82	Prehistoric
Tilford	Archeological Site No. 39MD20	Prehistoric
Tulare	Site 39SP4	Prehistoric
Wanblee	Lip's Camp	Historic - Aboriginal
Wessington Springs	Site 39BE2	Prehistoric
Wessington Springs	Archeological Site 39JE10	Prehistoric
Wilmot	Robar Trading Post	Historic
Wolsey	Archeological Site No. 39BE3	Prehistoric
Yale	Site 39BE57	Prehistoric
Yale	Site 39BE64	Prehistoric

Source: (NPS, 2015k)

15.1.11.6. Historic Context

The earliest known European exploration of the area that is now South Dakota began with French Canadian brothers, Francois and Louis-Joseph de la Verendrye, coming in 1742-1743 in search of a water route to the Pacific (NPS, 2016a). While exploration continued through the establishment of the Dakota Territory in 1861, the first organized exploration by Americans was the Lewis and Clark Expedition following the Louisiana Purchase in 1803. U.S. Government presence in the area remained sparse until the American Fur Company created a western branch in 1822, and established a network of trading posts in the Dakotas (NPS, 1988). Military outposts were built in the region in 1856, and permanent settlers began to move into the South Dakota area in the late 1850s (South Dakota State Historical Society, 2011).

European immigrants began to settle in South Dakota in the 1860s with the arrival of the first Czechs in the southeastern part of the state. Subsequent waves of immigrants to settle in the state included Western, Central, and Eastern Europeans, and a Chinese enclave was established in Lawrence County during the Black Hills gold rush. The immigrants were heavily involved in agriculture (South Dakota State Historical Society, 2011).

The Black Hills gold rush in the mid-1870s lead to the beginnings of the mining industry in the state, the development of which was facilitated by the arrival of the railroad in South Dakota in the 1870s (South Dakota State Historical Society, 2011). The Dakota Territory (including more than present-day South Dakota) was established in 1861, and on November 2, 1889, South Dakota became the 40th state to join the Union.

Starting in the 1890s and continuing on into the first few decades of the 20th century, economic fluctuations lead to a shift in demographics, as small "boom" towns would rise and then quickly decline, and more farmers moved to urban areas (South Dakota State Historical Society, 2011). The larger communities in the state continued to grow during this period, a pattern that was curtailed by the collapse of the stock market in 1929 and the start of the Great Depression. The Great Depression led to widespread farm foreclosures and business failures. Despite the assistance of the Federal government in the form of New Deal assistance programs, the economy of the state did not begin to recover until World War II (WWII) and the post-war period, when the state benefited from "a massive government investment in in the military and civilian infrastructure" (South Dakota State Historical Society, 2011) (NPS, 1999).

South Dakota has 1,294 NRHP-listed sites, as well as 16 National Historic Landmarks (NHL) (NPS, 2015k). South Dakota does not contain a National Heritage Area (NHA) (NPS, 2015l). Figure 15.1.11-3 shows the location of NRHP sites within South Dakota.

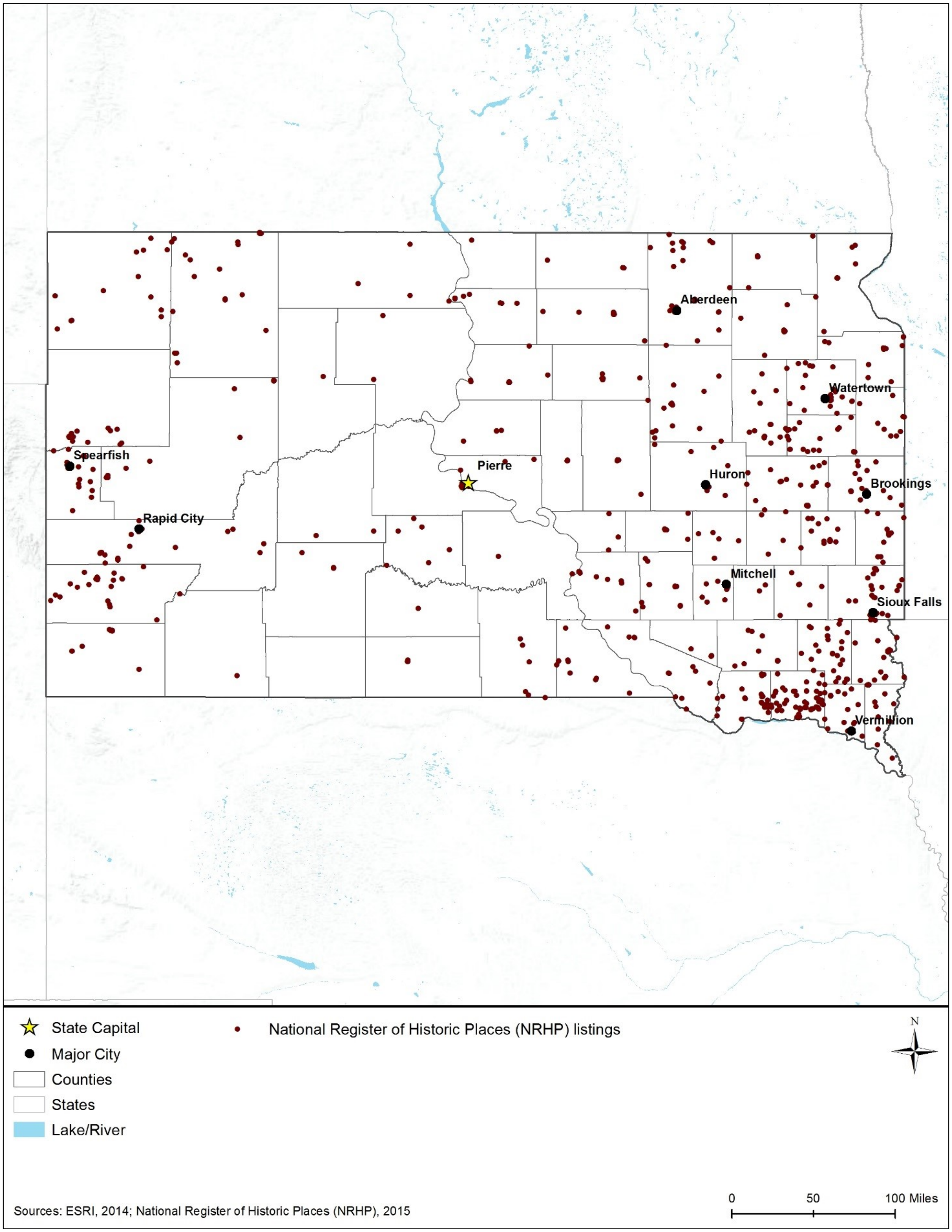

Figure 15.1.11-3: National Register of Historic Places (NRHP) Sites in South Dakota

15.1.11.7. Architectural Context

The fur trade grew quickly in South Dakota following the Lewis and Clark Expedition, leading to the establishment of trading posts in the 1820s. These stockade posts contained functional log structures, and temporary (single season) posts were often no more than a shack (NPS, 1988). The first buildings associated with permanent European exploration and settlements in South Dakota were generally utilitarian, meant to protect settlers from the harsh environment. Modest dugouts, log structures, or sod houses were common; earthen or log buildings were sometimes covered with wood siding as materials became more available with the arrival of the railroad in 1872 (NPS, 1998).

As settlement progressed, buildings were constructed with a greater degree of architectural detailing, although vernacular buildings dominated the first half of the 19th century. It is noteworthy that several early American styles (including Georgian, Federal, and Greek Revival) are not found in South Dakota (Rogers, S.; Schwan, L. , 2000). Victorian architectural styles, including Italianate, Queen Anne, and the less elaborate Folk Victorian, began to spread in the state during the 1870s. Later Revival styles, including Neoclassical Revival and Tudor Revival, became popular in the first part of the 20th century (Rogers, S.; Schwan, L. , 2000). Central and Eastern European settlers contributed their own unique architectural styles. German-Russian settlers built folk structures in the late 19th century using puddled clay (a watertight clay and water mixture) (NPS, 1984). Czech immigrants built folk structures evocative of their native architecture during the same period (NPS, 1987). Popular vernacular house types of the 20th century included Foursquare and Bungalow (Rogers, S.; Schwan, L. , 2000).

The economic devastation of the Great Depression led to an influx of Federal Relief Program construction activity from 1929 through 1941. Buildings were constructed by workers employed by a variety of New Deal Programs such as the Works Progress Administration (WPA) in early modern styles. In rural recreational areas, Civilian Conservation Corps (CCC) and WPA laborers built rustic attractions, with fieldstone construction being common (NPS, 1999). The evolution of the construction of the historic county courthouses of South Dakota culminated in the Public Works Administration (PWA) buildings of the 1930s and 40s – simple wood-framed vernacular, 19th century eclecticism, 20th century classicism, and Art Deco and “PWA Moderne” (NPS, 1992).

Figure 15.1.11-4: Representative Architectural Styles of South Dakota

- Top Left – Farm (Murdo, SD) – (Highsmith, C., 2009)
- Top Right – South Dakota State House (Pierre, SD) – (McNeil, 1913)
- Bottom Left – Sod House (Pennington County, SD) – (Rothstein, A., 1936)
- Bottom Middle – University Hall, University of South Dakota (Vermillion, SD) – (Historic American Buildings Survey, 1933)
- Bottom Right – Community Hall (Rockham, SD) – (Vachon, J., 1942)

15.1.12. Air Quality

15.1.12.1. Definition of the Resource

Air Quality in a geographic area is determined by the type and amount of pollutants emitted into the atmosphere, the size, and topography[101] of the area, and the prevailing weather and climate conditions. The levels of pollutants and pollutant concentrations in the atmosphere are typically expressed in units of parts per million (ppm)[102] or micrograms per cubic meter ($\mu g/m^3$) determined over various periods of time (averaging time).[103] This section discusses the existing air quality in South Dakota. The USEPA designates areas within the U.S. as attainment,[104] nonattainment,[105] maintenance,[106] or unclassifiable[107] depending on the concentration of air pollution relative to ambient air quality standards. Information is presented regarding national and state ambient air quality standards and nonattainment areas that would be potentially more sensitive to impacts from implementation of the Proposed Action or Alternatives.

15.1.12.2. Specific Regulatory Considerations

National and State Ambient Air Quality Standards

The Clean Air Act (CAA) establishes National Ambient Air Quality Standards (NAAQS) for six criteria pollutants: Carbon monoxide (CO), lead, oxides of nitrogen (NO_X), particulate matter ($PM_{2.5}$ and PM_{10}), ozone (O_3), and oxides of sulfur (SO_X). The NAAQS establish various standards, either primary[108] or secondary,[109] for each pollutant with varying averaging times. Standards with short averaging times (e.g., 1-hour, 8-hour, and 24-hour) were developed to prevent the acute health effects from short-term exposure at high concentrations. Longer averaging periods (e.g., 3 months or annual) are intended to prevent chronic health effects from long-term exposure. A description of the NAAQS is presented in Appendix E. SD DENR adopted the NAAQS and does not maintain any state-only standards. South Dakota's Administrative Rule 74:36:02:02 (Ambient Air Quality Standards) requires the entire state to follow the NAAQs and states that no person may cause an exceedance to any of the standards (South Dakota Legislature 2015a).

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[101] Topography: The unique features and shapes of the land (e.g., valleys and mountains).

[102] Equivalent to 1 milligram per liter (mg/L).

[103] Averaging Time: "The period over which data are averaged and used to verify proper operation of the pollution control approach or compliance with the emissions limitation or standard." (USEPA, 2015c)

[104] Attainment areas: Any area that meets the national primary or secondary ambient air quality standard for the pollutant. (USEPA, 2015r)

[105] Nonattainment areas: Any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant (USEPA, 2015r).

[106] Maintenance areas: An area that was previously nonattainment, but has met the national primary or secondary ambient air quality standards for the pollutant, and has been designated as attainment. (USEPA, 2015r)

[107] Unclassifiable areas: Any area that cannot be classified on the basis of available information as meeting the national primary or secondary air quality standard for a pollutant. (USEPA, 2015r)

[108] Primary standard: The primary standard is set to provide public health protection, including protecting the health of sensitive populations such as asthmatics, children, and the elderly.

[109] Secondary standards: The secondary standard is set to provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

In addition to the NAAQS, there are standards for hazardous air pollutants (HAP), which are those typically associated with specific industrial processes such as chromium electroplating (hexavalent chromium), dry cleaning (perchloroethylene), and solvent degreasing (halogenated solvents) (USEPA, 2011). HAPs can have severe adverse impacts on human health and the environment, including increased risk of cancer, reproductive issues, or birth defects. HAPs are federally regulated under the CAA via the National Emission Standards for Hazardous Air Pollutants (NESHAPs). The USEPA developed the NESHAPs for sources and source categories emitting HAPs that pose a risk to human health. Appendix E presents a list of federally regulated HAPs.

Title V Operating Permits/State Operating Permits

South Dakota has authorization to issue CAA Title V operating permits on behalf of the USEPA, as outlined in 40 CFR 70. The Title V program refers to Title V of the CAA that governs permitting requirements for major industrial air pollution sources and consolidates all CAA requirements for the facility into one permit (USEPA, 2015d). The overall goal of the Title V program is to "reduce violations of air pollution laws and improve enforcement of those laws" (USEPA, 2015d). South Dakota's Administrative Rule 74:36:05:01 (Applicability) describes the applicability of Title V operating permits (South Dakota Legislature, 2015a). South Dakota requires Title V operating permits for any major source if it emits or has the potential to emit pollutants in excess of the major source thresholds (see Table 15.1.12-1). The permit issued to a facility contains both state and federal portions and incorporates a reporting schedule (USEPA, 2014b).

Table 15.1.12-1: Major Air Pollutant Source Thresholds

Pollutant	TPY
Any Criteria Pollutant[a]	100
Single HAP	10
Total/Cumulative HAPs	25

Source: (USEPA, 2014b)

[a] Sources in nonattainment areas will have lower thresholds for some criteria pollutants depending on the classification of the nonattainment area.

In addition to Title V operating permits, SD DENR issues operating permits for minor sources under Administrative Rule 74:36:04 (Operating Permits for Minor Sources). Administrative Rule 74:36:04:02 states "A person may not operate any source or unit likely to cause the emission of air pollutants into the ambient air or any equipment that prevents or controls the emission of air pollutants into the ambient air until a construction permit or minor source operating permit has been issued by the board or the secretary." (South Dakota Legislature, 2015b)

Exempt Activities

Select activities, as defined by South Dakota Administrative Rule 74:36:05:04 (Sources exempt from obtaining a Part 70 operating permit) and Administrative Rule 74:36:05:04.01

(Insignificant Activities), are exempt from the registration and permitting provisions of Administrative Rule 74:36:05:02 (Part 70 operating permit required) for South Dakota operating permits. The following activities are exempt from operating permitting requirements:

- "A mobile internal combustion engine, including engines in autos, trucks, tractors, airplanes, locomotives, and boats…;
- A unit that has a heat input capability of not more than 3,500,000 British thermal units per hour, except for units fueled with wood or coal…; and
- A unit that has the potential to emit two tons or less per year of any criteria pollutant before the application of control equipment..." (South Dakota Legislature, 2015c) (South Dakota Legislature, 2015d) (South Dakota Legislature, 2015e)

Temporary Emissions Sources Permits

SD DENR does not issue permits for temporary source emissions and any source that moves to a new location is required to apply for a new, or revise an existing operating permit. However, the SD DENR allows an owner/operator of an emergency generator that emits below 25 TPY for total emissions to operate the unit without an operating permit (Berg, 2015a).

State Preconstruction Permits

SD DENR requires construction permits under Administrative Rule 74:36:20:02 (Construction Permit Required) for the construction or modification of any source or unit that may emit air pollutants into the ambient air or interfere with the attainment or maintenance of the NAAQs (South Dakota Department of Tourism, 2015f).

General Conformity

Established under Section 176(c)(4) of the CAA, "the General Conformity Rule ensures that the actions taken by federal agencies in nonattainment and maintenance areas do not interfere with a state's plans to meet national standards for air quality" outlined in the state implementation plan (SIP) (USEPA, 2013a). An action in designated nonattainment and maintenance areas would be evaluated for the emission of those particular pollutants under the General Conformity Rule through an applicability analysis. Pursuant to Title 40 CFR 93.153(d)(2) and (e), federal actions "in response to emergencies which are typically commenced on the order of hours or days after the emergency" and actions "which are part of part of a continuing response to emergency or disaster" that are taken up to 6 months after beginning response activities, will be exempt from any conformity determinations (U.S. Government Publishing Office, 2010).

The estimated pollutant emissions are compared to *de minimis* levels.[110] These values are the minimum thresholds for which a conformity determination must be performed (see Table 15.1.12-2). As a result, lower *de minimis* thresholds for VOCs and NO_X could apply depending on the attainment status of a county.

[110] De Minimis Levels: "the minimum threshold for which a conformity determination must be performed, for various criteria pollutants in various areas." (USEPA, 2016a)

Table 15.1.12-2: De Minimis Levels

Pollutant	Area Type	TPY
Ozone (VOC or NO_X)	Serious Nonattainment	50
	Severe Nonattainment	25
	Extreme Nonattainment	10
	Other areas outside an OTR	100
Ozone (NO_X)	Maintenance	100
Ozone (VOC)	Maintenance outside an OTR	100
CO, SO_2, NO_2	All Nonattainment and Maintenance	100
PM_{10}	Serious Nonattainment	70
	Moderate Nonattainment and Maintenance	100
$PM_{2.5}$ (Direct Emissions) (SO_2) (NO_X (unless determined not to be a significant precursor)) (VOC or ammonia (if determined to be significant precursors))	All Nonattainment and Maintenance	100
Lead	All Nonattainment and Maintenance	25

Source: (U.S. Government Publishing Office, 2010)

If an action does not result in an emissions increase above the *de minimis* levels in Table 15.1.12-2, then a conformity determination is not required. If the applicability analysis shows that the total direct and indirect emissions are above the *de minimis* levels in Table 15.1.12-2, then the action must undergo a conformity determination. The federal agency must first show that the action would meet all SIP control requirements and that any new emissions would not cause a new violation of the NAAQS. To demonstrate conformity,[111] the agency would have to fulfill one or more of the following:

- Show any emissions increase is specifically identified and accounted for in the respective state's SIP;
- Receive acknowledgement from the state that any increase in emissions would not exceed the SIP emission budget;
- Receive acknowledgement from the state to revise the SIP and include emissions from the action;
- Show the emissions would be fully offset by implementing reductions from another source in the same area; and
- Conduct air quality modeling that demonstrates the emissions would not cause or contribute to new violations of the NAAQS, or increase the frequency or severity of any existing violations of the NAAQS (USEPA, 2010).

[111] Conformity: Compliance with the State Implementation Plan.

State Implementation Plan Requirements

South Dakota is in attainment for all the six criteria pollutants; none of its counties exceed the NAAQS. South Dakota does have a SIP for regional haze. A copy of the regional haze SIP can be found on the SD DENR website.

15.1.12.3. Environmental Setting: Ambient Air Quality

Nonattainment Areas

The USEPA classifies areas as attainment, nonattainment, maintenance, or unclassifiable for six criteria pollutants. When evaluating an area's air quality against regulatory thresholds (i.e., permitting and general conformity), maintenance areas are often combined with nonattainment, while unclassifiable areas are combined with attainment areas. Currently, South Dakota is in attainment for all criteria pollutants.

Figure 15.1.12-1 shows that no maintenance, or unclassifiable areas exist in South Dakota as of January 30, 2015.

Air Quality Monitoring and Reporting

SD DENR measures air pollutants at 10 sites across the state as part of the National Air Monitoring Stations Network and the State and Local Air Monitoring Stations Network (SD DENR, 2015c). Annual South Dakota State Ambient Air Quality Reports are prepared, containing pollutant data summarized by region (SD DENR, 2015c). South Dakota reports real-time pollution levels of ground-level NO_2, O_3, SO_2, PM and CO on their website. Throughout 2014, there were no exceedances of any monitored pollutant in South Dakota (SD DENR, 2015b).

Air Quality Control Regions

The USEPA classified all land in the U.S. as a Class I, Class II, or Class III Federal Air Quality Control Region (AQCR) (42 U.S.C. 7470). Class I areas include international parks, national wilderness areas which exceed 5,000 acres in size, national memorial parks which exceed 5,000 acres in size, and national parks which exceed 6,000 acres in size. Class I areas cannot be re-designated as Class II or Class III and are intended to maintain pristine air quality. Although the USEPA developed the standards for a Class III AQCR, to date they have not actually classified any area as Class III. Therefore, any area that is not classified as a Class I area is, by default, automatically designated as a Class II AQCR (42 U.S.C. 7470).

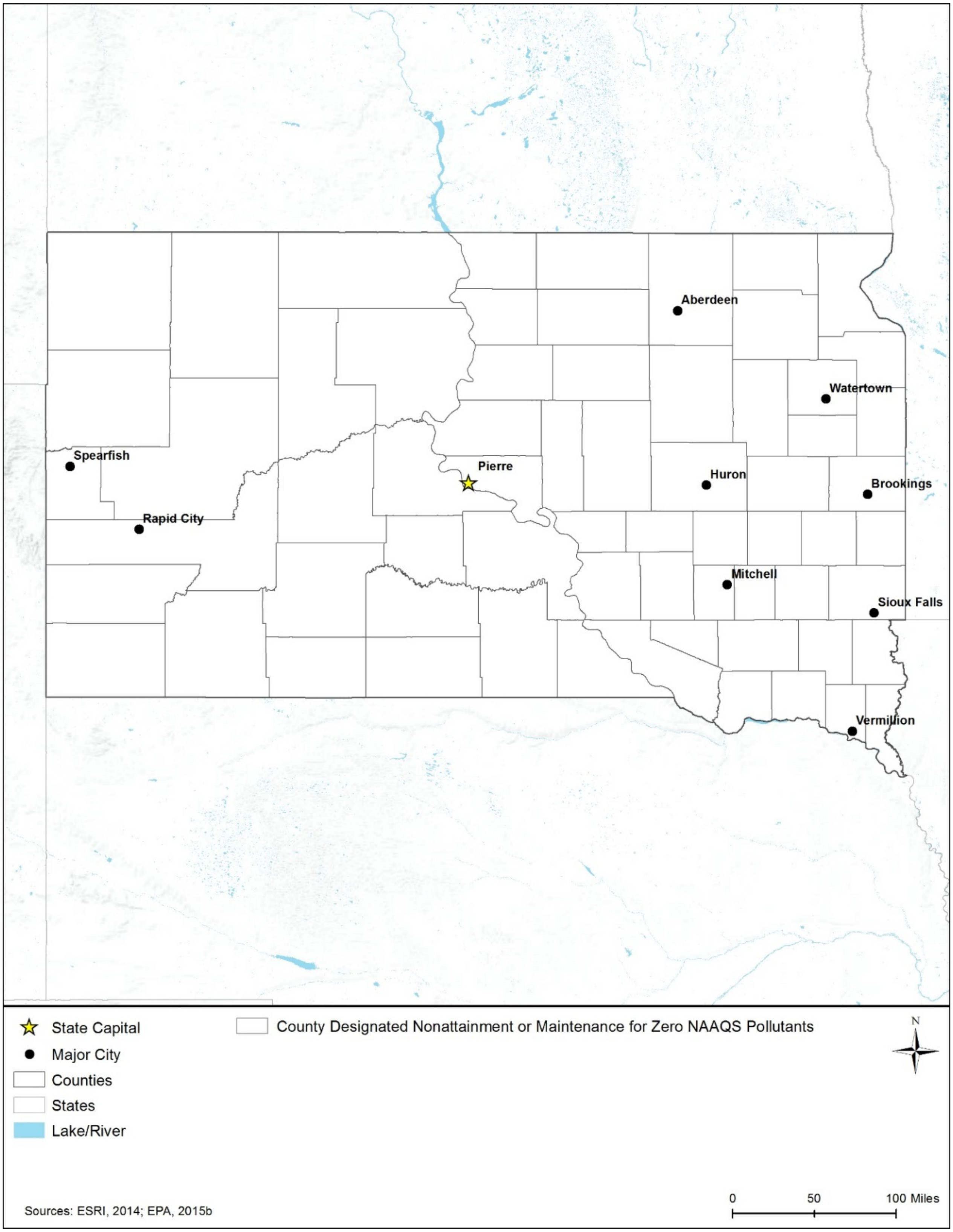

Figure 15.1.12-1: Nonattainment and Maintenance Counties in South Dakota

In a 1979 USEPA memorandum, the Assistant Administrator for Air, Noise, and Radiation (USEPA, 1979) advised USEPA Regional Offices to provide notice to the Federal Land Manager (FLM) of any facility subject to the Prevention of Significant Deterioration (PSD) permit requirements and within 100 kilometers[112] of a Class I area (Seitz, 1992). "The [US]EPA's policy is that FLMs should be notified by the Regional Office about any project that is within 100 kilometers of a Class I area. For sources having the capability to affect air quality at greater distances, notification should also be considered for Class I areas beyond 100 kilometers" (Page, 2012). The 2005 USEPA guidelines for air quality modeling do not provide a precise modeling range for Class I areas.

PSD applies to new major sources or major modifications at existing sources for pollutants where the source is in an attainment or unclassifiable area. An air quality analysis is required for sources subject to PSD requirements and generally consists of using a dispersion model to evaluate emission impacts to the area. "Historically, the [US]EPA guidance for modeling air quality impacts under the PSD program has tended to focus more on the requirements for a Class II modeling analysis. Such guidance has provided that applicants need not model beyond the point of significant impact or the source or 50 kilometers[113] (the normal useful range of USEPA-approved Gaussian plume models" (USEPA, 1992).South Dakota contains two Class I areas, the Wind Cave National Park and Badlands/Sage Creek Wilderness Area. Any PSD-applicable action within these counties would require FLMs notification from the appropriate Regional Office. Figure 15.1.12-2 provides a map of South Dakota highlighting all relevant Class I areas and all areas within the 100-kilometer radiuses. The numbers next to each of the highlighted Class I areas in Figure 15.1.12-2 correspond to the numbers and Class I areas listed in Table 15.1.12-3.

Table 15.1.12-3: Relevant Federal Class I Areas

#[a]	Area	Acreage	State
1	Badlands/Sage Creek Wilderness Area	64,250	SD
2	Wind Cave National Park	28,060	SD

Source: (Seitz, 1992)

[a] The numbers correspond to the shaded regions in Figure 15.1.12-2.

[112] The memorandum and associated guidance use kilometers. 100 kilometers is equal to about 62 miles.
[113] The memorandum and associated guidance use kilometers. 50 kilometers is equal to about 31 miles.

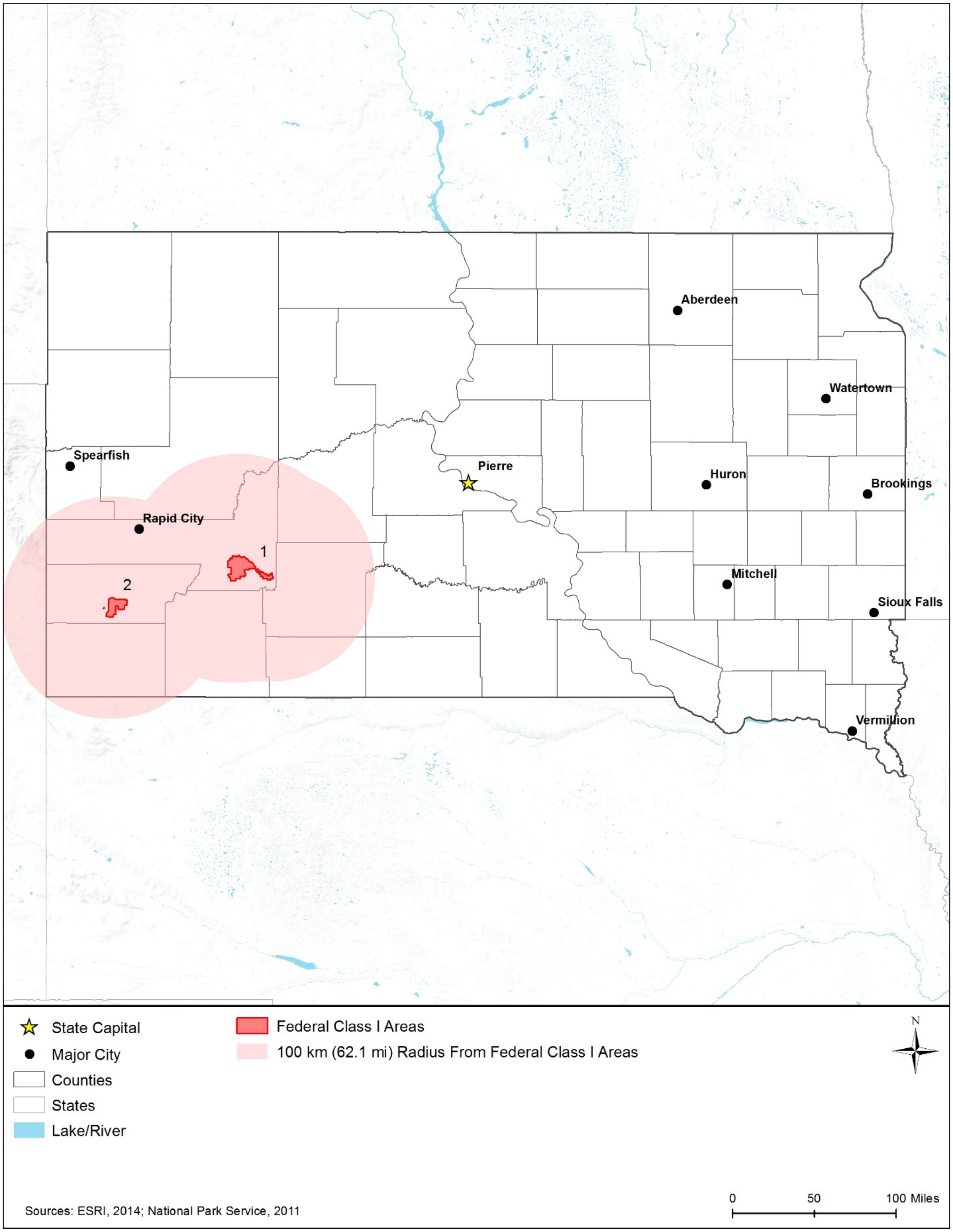

Figure 15.1.12-2: Federal Class I Areas with Implications for South Dakota

15.1.13. Noise

This section presents a discussion of a basic understanding of environmental noise, background/ambient noise levels, noise standards, and guidelines.

15.1.13.1. Definition of the Resource

Noise is a form of sound caused by pressure variations that the human ear can detect and is often defined as unwanted sound (USEPA, 2012). Noise is one of the most common environmental issues that interferes with normal human activities and otherwise diminishes the quality of the human environment. Typical sources of noise that result in this type of interference in urban and suburban surroundings includes interstate and local roadway traffic, rail traffic, industrial activities, aircraft, and neighborhood sources like lawn mowers, leaf blowers, etc.

The effects of noise can be classified into three categories:

- Noise events that result in annoyance and nuisance;
- Interference with speech, sleep, and learning; and
- Physiological effects such as hearing loss and anxiety.

Fundamentals of Noise

For environmental noise analyses, a noise metric refers to the unit that quantitatively measures the effect of noise on the environment. The unit used to describe the intensity of sound is the decibel (dB). Audible sounds range from 0 dB ("threshold of hearing") to about 140 dB ("threshold of pain") (OSHA 2016). The vibration frequency characteristics of the sound, measured as sound wave cycles per second [Hertz (Hz)], determines the pitch of the sound (Federal Transit Authority, 2006). The normal audible frequency range is approximately 20 Hz to 20 kHz (FAA, 2015g). The A-weighted scale, denoted as dBA, approximates the range of human hearing by filtering out lower frequency noises, which are not as damaging as the higher frequencies. The dBA scale is used in most noise ordinances and standards (OSHA 2016).

Measurements and descriptions of noise (i.e., sounds) are based on various combinations of the following factors (Federal Transit Authority, 2006):

- The total sound energy radiated by a source, usually reported as a sound power level.
- The actual air pressure changes experienced at a particular location, usually measured as a sound pressure level (SPL) (the frequency characteristics and SPL combine to determine the loudness of a sound at a particular location).
- The duration of a sound.
- The changes in frequency characteristics or pressure levels through time.

Figure 15.1.13-1 presents the sound levels of typical events that occur on a daily basis in the environment. For example, conversational speech is measured at about 55 to 60 dBA, whereas a band playing loud music may be as high as 120 dBA.

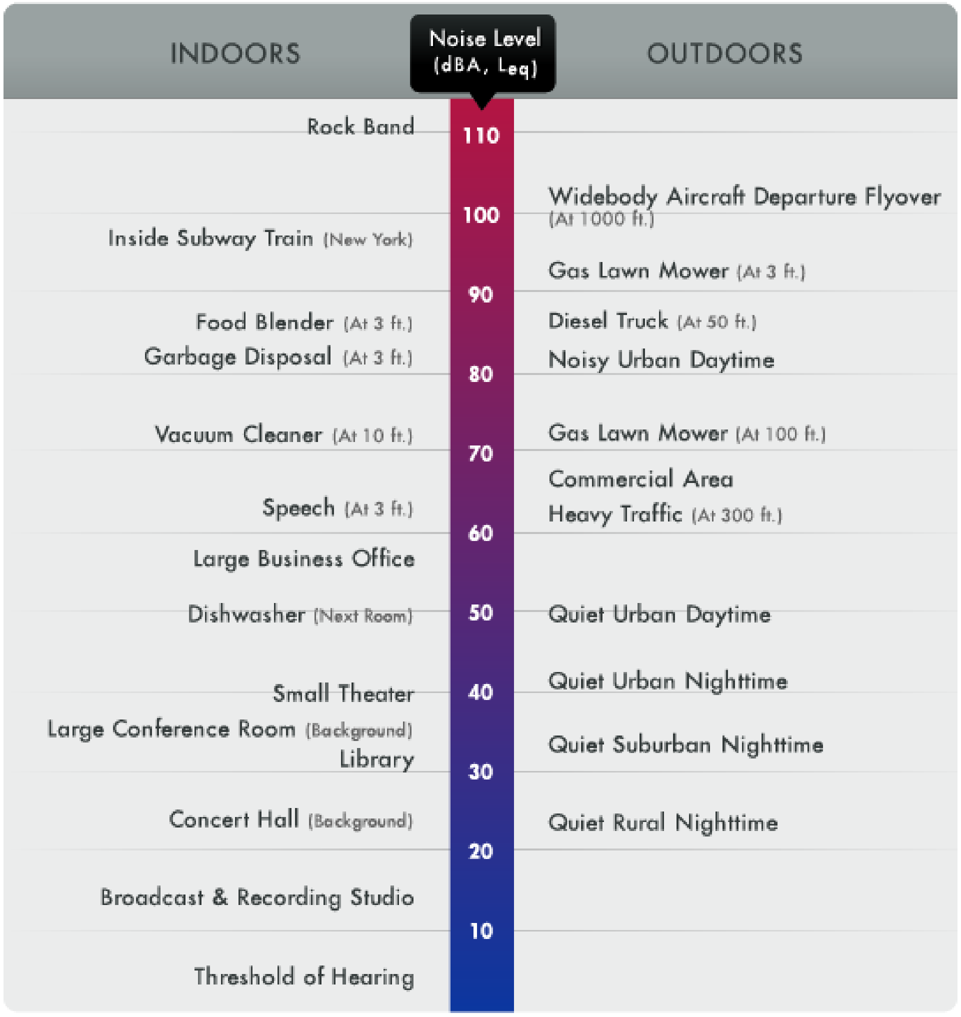

Figure 15.1.13-1: Sound Levels of Typical Sounds

Source: (Sacramento County Airport System, 2015)
Prepared by Booz Allen Hamilton
Leq: Equivalent Continuous Sound Level

Because of the logarithmic unit of measurement, sound levels cannot be added or subtracted linearly. However, several methods of estimating sound levels can be useful in determining approximate sound levels. First, if two sounds of the same level are added, the sound level increases by approximately three dB (for example: 60 dB + 60 dB = 63 dB). Secondly, the sum of two sounds of a different level is slightly higher than the louder level (for example: 60 dB + 70 dB = 70.4 dB).

The changes in human response to changes in dB levels is categorized as follows (Federal Transit Authority, 2006):

- A 3-dB change in sound level is considered a barely noticeable difference;
- A 5-dB change in sound level will typically result in a noticeable community response; and

- A 10-dB change, which is generally considered a doubling of the sound level, almost certainly causes an adverse community response.

In general, ambient noise levels are higher during the day than at night and typically this difference is about 10 dB (USEPA, 1973). Ambient noise levels can differ considerably depending on whether the environment is urban, suburban, or rural.

15.1.13.2. Specific Regulatory Considerations

As identified in Appendix C, the Noise Control Act of 1972, along with its subsequent amendments (e.g., Quiet Communities Act of 1978 [42 U.S.C. Parts 4901−4918]), delegates authority to the states to regulate environmental noise and directs government agencies to comply with local community noise statutes and regulations. Although no federal noise regulations exist, the USEPA has promulgated noise guidelines (USEPA, 1974). Similarly, most states have no quantitative noise-limit regulations.

South Dakota has limited statewide noise regulations written into its codified laws. They mainly apply to motor vehicle functions. Table 15.1.13-1 provides a brief summary of these regulations.

Table 15.1.13-1: Relevant South Dakota Noise Laws and Regulations

State Law/ Regulation	Regulatory Agency	Applicability
SDCL 32-15-10 and 32-15-11	South Dakota	Regulates the use of sirens and horns on vehicles.
SDCL 32-15-17	South Dakota	Requires motor vehicles on highways to operate with a muffler.

Source: (South Dakota Legislature, 2015f)

Many cities and towns may have additional, local noise ordinances to manage community noise levels. The noise limits specified in such ordinances are typically applied to define noise sources and specify a maximum permissible noise level. Larger cities and towns, such as Sioux Falls and Rapid City, are likely to have different regulations than rural or suburban communities largely due to the population density and difference in ambient noise levels (FHWA, 2011).

15.1.13.3. Environmental Setting: Ambient Noise

The range and level of ambient noise in South Dakota varies widely based on the area and environment of the area. The population of South Dakota can choose to live and interact in areas that are large cities, rural or suburban communities, small towns, and national and state parks. Figure 15.1.13-1 illustrates noise values for typical community settings and events that are representative of what the population of South Dakota may experience on a day-to-day basis. These noise levels represent a wide range and are not specific to South Dakota. As such, this section describes the areas where the population of South Dakota can potentially be exposed to higher than average noise levels.

- **Urban Environments:** Urban areas are likely to have higher noise levels on a daily basis due to highway traffic (70 to 90 dBA), construction noise (90 to 120 dBA), and outdoor conversations (e.g., small/large groups of people) (60 to 90 dBA) (U.S. Department of Interior, 2008). As the most densely populated areas in the state, Sioux Falls and Rapid City, are likely to have the highest ambient noise levels in the state.
- **Airports:** Areas surrounding airports tend to have higher noise levels due to aircraft operations that occur throughout the day. A jet engine aircraft can produce between 130 to 160 dBA in its direct proximity (FAA, 2007). However, commercial aircraft are most likely to emit noise levels between 50 to 100 dBA depending of the type of aircraft and associated engine (FAA, 2012a). This noise will be perceived differently based on the altitude of the aircraft and its distance to the point of measurement. Airport operations are primarily arrivals and departures of commercial aircraft but, based on the type of airport, can include touch-and-go operations that are typical of general aviation airports and military airfields. The location of most commercial airports is in proximity to urban communities resulting in noise exposures from aircraft operations (arrivals/departures) to surrounding areas at higher levels and with the potential for increased noise levels during peak operation times (early morning and evenings), when there is an increase in air traffic. The noise levels in areas surrounding commercial airports can have significantly higher ambient noise levels than in other areas. In South Dakota, Sioux Falls Regional Airport (FSD) and Rapid City Regional Airport (RAP) have combined annual operations of more than 110,000 flights (FAA, 2015d). These operations result in increased ambient noise levels in the surrounding communities. See Section 15.1.7, Land Use, Recreation, and Airspace and Figure 15.1.7-6 for more information about airports in the state.
- **Highways:** Communities near major highways also experience higher than average noise levels when compared to areas that are not in close proximity to a highway (FHWA, 2015d). There are a number of major highways within the state that may contribute to higher ambient noise levels for residents living near those traffic corridors. The major highways in the state tend to have higher than average ambient noise levels on nearby receptors, ranging from 52 to 75 dBA (FHWA, 2015d). See Section 15.1.1, Infrastructure and Figure 15.1.1-1 for more information about the major highways in the state.
- **Railways:** Like highways, railways tend to have higher than average ambient noise levels for residents living in close proximity (Federal Transit Authority, 2006). Railroad operations can produce noise ranging from 70 dBA for an idling locomotive to 115 dBA when the locomotive engineer rings the horn while approaching a crossing (USDOT, 2015a). South Dakota does not have any passenger rail service. However, there is freight rail traffic that runs primarily through Aberdeen, Rapid City, Mitchell, and Sioux Falls (SDDOT, 2014b). See Section 15.1.1, Infrastructure and Figure 15.1.1-1 for more information about rail corridors in the state.
- **National and State Parks:** The majority of national and state parks are likely to have lower than average ambient noise levels given their size and location in wilderness areas. National and state parks, historic areas, and monuments are protected areas to preserve these areas in

their natural environment. These areas typically have lower noise levels, as low as 30 to 40 dBA (NPS, 2014b). South Dakota has 2 National Parks and 13 NNLs (NPS, 2015k). Visitors to these areas expect lower ambient noise conditions than the surrounding urban areas. See Section 15.1.8, Visual Resources for more information about national and state parks for South Dakota.

15.1.13.4. Sensitive Noise Receptors

Noise-sensitive receptors include residences, schools, medical facilities, places of worship, libraries, churches, nursing homes, concert halls, playgrounds, and parks. Sensitive noise receptors are typically areas where the intrusion of noise can disrupt the use of the environment. A quiet urban area usually has a typical noise level in the daytime of 50 dBA, and 40 dBA during the evening. Noise levels in remote wilderness and rural nighttime areas are usually 30 dBA (BLM, 2014). Most cities and towns in South Dakota have at least one school, church, or park, in addition to likely having other noise-sensitive receptors. There are most likely thousands of sensitive receptors throughout the state of South Dakota.

15.1.14. Climate Change

15.1.14.1. Definition of the Resource

Climate change, according to the Intergovernmental Panel on Climate Change (IPCC), is defined as "…a change in the state of the climate that can be identified (e.g., using statistical tests) by changes in the mean and / or the variability of its properties, and that persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or human activity." (IPCC, 2007)

Accelerated rates of climate change are linked to an increase in atmospheric concentrations of greenhouse gas (GHG) caused by emissions from human activities such as burning fossil fuels to generate electricity (USEPA, 2012). The IPCC is now 95 percent certain that humans are the main cause of current global warming (IPCC, 2013). Human activities result in emissions of four main GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and halocarbons (a group of gases containing fluorine, chlorine, or bromine) (IPCC, 2007). The common unit of measurement for GHGs is metric tons of CO_2-equivalent[114] (MT CO_2e), which equalizes for the different global warming potential of each type of GHG. Where this document references emissions of CO_2 only, the units are in million metric tons (MMT) CO_2. Where the document references emissions of multiple GHGs, the units are in MMT CO_2e.

The IPCC reports that "global concentrations of these four GHGs have increased significantly since 1750" (IPCC, 2007). "Atmospheric concentrations of CO_2 increased from 280 parts per million (ppm) of carbon in 1750 to 379 ppm of carbon in 2005" (IPCC, 2007). The atmospheric

[114] CO_2e refers to Carbon Dioxide Equivalent, "A metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP). Carbon dioxide equivalents are commonly expressed as million metric tons of carbon dioxide equivalents (MMT CO_2e). The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated GWP. MMT CO_2e = (million metric tons of a gas) * (GWP of the gas)" (USEPA, 2015t)

concentration of CH_4 and N_2O have increased from pre-industrial values of about 715 and 270 parts per billion (ppb) to 1774 and 319 ppb, respectively, in 2005 (IPCC, 2007). In addition, the IPCC reports that human activities are causing an increase in various hydrocarbons from near-zero pre-industrial concentrations (IPCC, 2007).

Both the GHG emissions effects of the Proposed Action and Alternatives, and the relationships of climate change effects to the Proposed Action and Alternatives, are considered in this PEIS (see Section 15.2.14, Environmental Consequences). Existing climate conditions in the project area are described first by state and sub-region, where appropriate, and then by future projected climate scenarios. The discussion focuses on the following climate change impacts: 1) temperature; 2) precipitation; and 3) severe weather events (including severe hail and tornadoes).

15.1.14.2. Specific Regulatory Considerations

The pertinent federal laws relevant to the protection and management of climate change are summarized in Appendix C. South Dakota has not established and goals or regulations to reduce GHG emissions to combat climate change.

15.1.14.3. South Dakota Greenhouse Gas Emissions

Estimates of South Dakota's total GHG emissions vary. The Department of Energy's (DOE) Energy Information Agency (EIA) collects and disseminates national-level emissions data on other GHGs such as CH4 and NOx, but not at the state level (EIA, 2011). The USEPA also collects and disseminates national-level GHG emissions data, but by economic sector, not by state (USEPA, 2015). Individual states have developed their own GHG inventories, which are updated with different frequencies and trace GHGs in a variety of ways.

For the purposes of this PEIS, the EIA data on CO2 emissions are used as the baseline metric to ensure consistency and comparability across the 50 states. However, if additional data sources on GHG emissions are available for a given state, including other GHGs such as CH4, they are described and cited.

According to the EIA, South Dakota emitted a total of 15.2 MMT of CO2 in 2013 from fossil fuels, with petroleum products used in the transportation sector as the largest source of CO2 emissions at 38 percent (Table 15.1.14-1) (EIA, 2015f). Annual emissions between 1980 and 2013 are presented in Figure 15.1.14-1 (EIA, 2015f). Between 1980 and 2012, South Dakota's CO2 emissions increased by 22 percent or 3.2 MMT, during which time emissions from natural gas almost doubled. Emissions from the electric power sector would be higher, but South Dakota obtains most of its electric power from hydroelectric sources (EIA, 2014b). South Dakota ranked 46th in total CO2 emissions among the 50 states and the District of Columbia in 2013, and ranked 22nd in per capita emissions (EIA, 2015c).

Table 15.1.14-1: South Dakota CO_2 Emissions from Fossil Fuels by Fuel Type and Source, 2012

Fuel Type (MMT)		Source (MMT)	
Coal	3.2	Residential	1.1
Petroleum Products	7.4	Commercial	0.8
Natural Gas	4.5	Industrial	3.9
		Transportation	6.5
		Electric Power	3.2
TOTAL	**15.2**	**TOTAL**	**15.2**

Source: (EIA, 2015f)

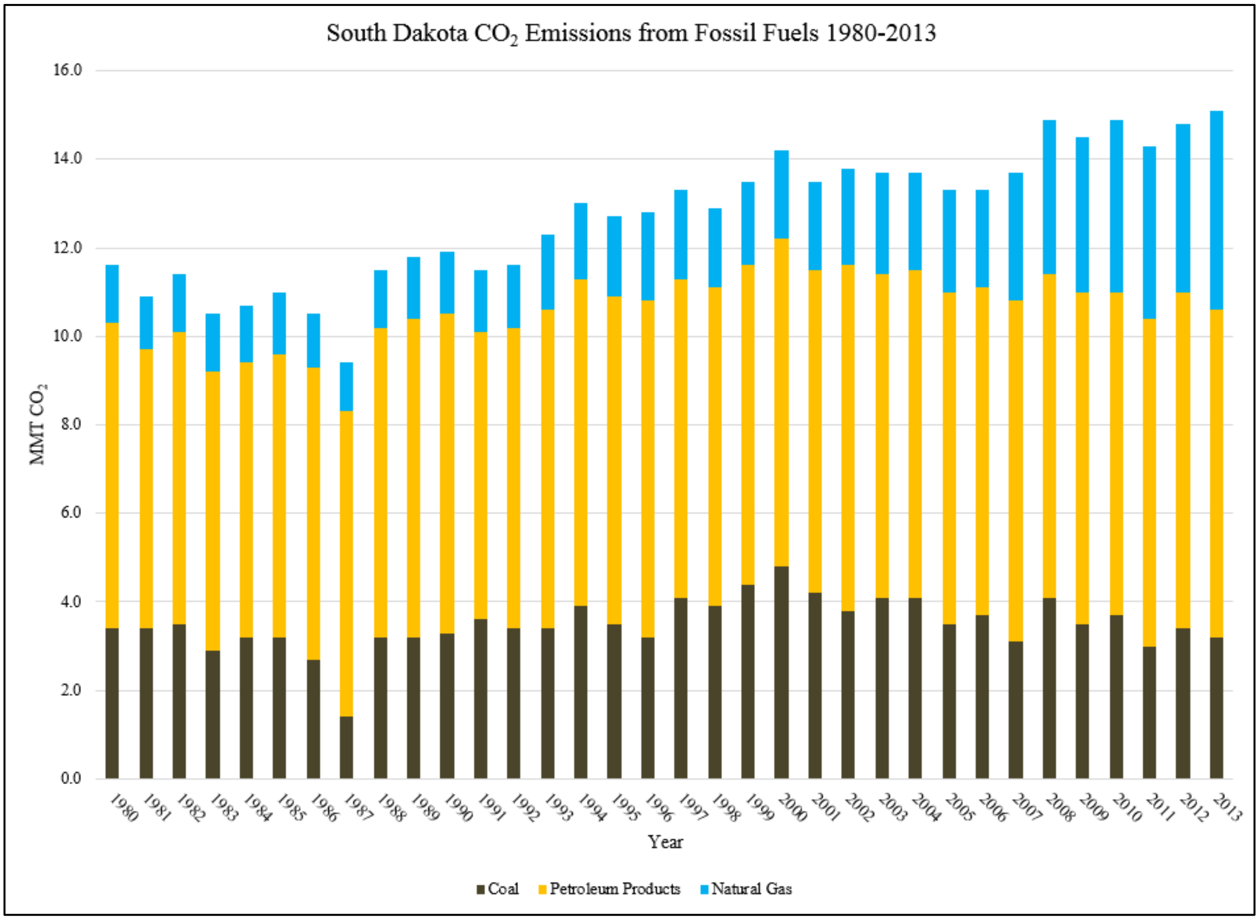

Figure 15.1.14-1: South Dakota CO_2 Emissions from Fossil Fuels by Fuel Type 1980-2013

Source: (EIA, 2015f)

In 2007, SD DENR published a 1990 – 2020 greenhouse gas inventory and reference case projection. The 1990 baseline emissions were estimated to be 26.7 MMT CO_2e, increasing to 36.5 MMT CO_2e in 2005, and then projected to be 39.1 MMT CO_2e in 2010 and 46.6 MMT

CO_2e in by 2020, 74 percent above the 1990 baseline (SD DENR, 2007). For comparison, total U.S. GHGs were 6,673 MMT CO_2 (14.7 trillion pounds) in 2013 (USEPA, 2015).

The bulk of the increases were attributed to the growth of emissions from the agricultural sector, estimated at 12.5 MMT CO_2e in 1990. Overall, gross emissions in South Dakota are rising faster than the U.S.. During the same time period, per capita emissions in the state increased 48 MT CO_2e, much higher than the nation's 25 MT CO_2e rise (SD DENR, 2007). This is attributed to increases in the agricultural industry, electricity and the transportation sectors, but the bulk of the increase will be in agriculture. Agricultural emissions are projected to increase to 22.6 MMT CO_2e by 2020. This growth is attributed to soils management: the accelerating application of nitrogen fertilizers and manure to agricultural lands, resulting in increased emissions of NO_x and CH_4 which are forecasted to continue into the future (SD DENR, 2007).

The transportation sector continues to have a significant impact on statewide GHG emissions. Between 1990 and 2002, transportation fuel use increased by 1.7 percent annually. In 2002, on road vehicle emissions accounted for 64 percent while diesel vehicles accounted for 28 percent. Air travel, rail and marine sources accounted for the remaining 8 percent of GHG emissions in South Dakota's transportation sector. "South Dakota's population and economic growth… [caused] an increase in total vehicle miles traveled (VMT) during the 1990s, on road gasoline use grew 13 percent between 1990 and 2002." On road diesel rose 93 percent and aviation declined 73 percent (SD DENR, 2007). GHG emissions are likely to continue to rise in South Dakota however, new emission regulations and vehicle energy standards will help slow down emissions levels from this sector (EIA, 2014b), (SD DENR, 2007).

South Dakota only produces small amounts of petroleum and natural gas and as a result, emissions are low. Wind, dams, net imports from other states and small amounts from natural gas and coal generate a majority of electricity generation in South Dakota. Because hydroelectric generation and other renewable resources are continuing to advance, it is hard to predict the state's future emissions from electricity generation (EIA, 2014b), (SD DENR, 2007).

15.1.14.4. Environmental Setting: Existing Climate

The National Weather Service defines climate as the "reoccurring average weather found in any particular place" (NWS, 2011a). The widely accepted division of the world into major climate categories is referred to as the Köppen-Geiger climate classification system. Climates within this system are classified based "upon general temperature profiles related to latitude" (NWS, 2011a). The first letter in each climate classification details the climate group. The Köppen-Geiger system further divides climates into smaller sub-categories based on precipitation and temperature patterns. The secondary level of classification details the seasonal precipitation, degree of aridity, and presence or absence of ice. The tertiary levels distinguish different monthly characteristics (NWS, 2011a).

The eastern half, as well as central areas of South Dakota, fall into climate group (D). Climates classified as (D) are "moist continental mid-latitudinal climates," with "warm to cool summers and cold winters" (NWS, 2011a). In (D) climates, the "average temperature of the warmest month is greater than 50 degrees Fahrenheit (^oF), while the coldest month is less than negative 22

°F" (NWS, 2011a). Winter months in (D) climate zones are cold and severe with "snowstorms, strong winds, and bitter cold from Continental Polar or Arctic air masses" (NWS, 2011a). Western areas of the state fall into climate group (B). Climates classified as (B) are dry climates, "in large continental regions of the mid-latitudes often surrounded by mountains" (NWS, 2011a). "The most obvious climatic feature of this climate is that potential evaporation and transpiration exceed precipitation" (NWS, 2011a). South Dakota has four sub-climate categories (as shown in Figure 15.1.14-2), which are described in the following paragraphs.

Bsk **–** The Köppen-Geiger climate classification system classifies areas of western, northwestern, and southwestern South Dakota as Bsk. Climates classified as Bsk are mid-latitude and dry. "Evaporation exceeds precipitation on average but is less than potential evaporation" (NWS, 2011a). Average temperatures in Bsk climate zones are less than 64 ºF. (NWS, 2011a)

Dfa **–** The Köppen-Geiger climate classification system classifies a majority of South Dakota, including central, north, eastern, and southern regions, as Dfa. Climates classified as Dfa are characterized by warm and humid temperatures, with hot summers and precipitation occurring regularly throughout the year. In this climate classification zone, the secondary classification indicates substantial precipitation during all seasons. In this climate classification zone, the tertiary classification indicates hot summer months, with warmer temperatures averaging above 71.6 °F. (NWS, 2011a)

Dfb **–** The Köppen-Geiger climate classification system classifies areas of northern and northwestern South Dakota as Dfb. Climates classified as Dfb are characterized as humid, with warm summers and snowy winters. In this climate classification zone, the secondary classification indicates substantial precipitation during all seasons. In this climate classification zone, the tertiary classification indicates that at least four months out of the year average above 50 °F. (NWS, 2011a)

Dsc **–** The Köppen-Geiger climate classification system classifies a small area of southern South Dakota, along the Nebraskan border, as Dsc. Climates classified as Dsc are characterized by dry snowy winters and cool summers. (GLOBE, 2011)

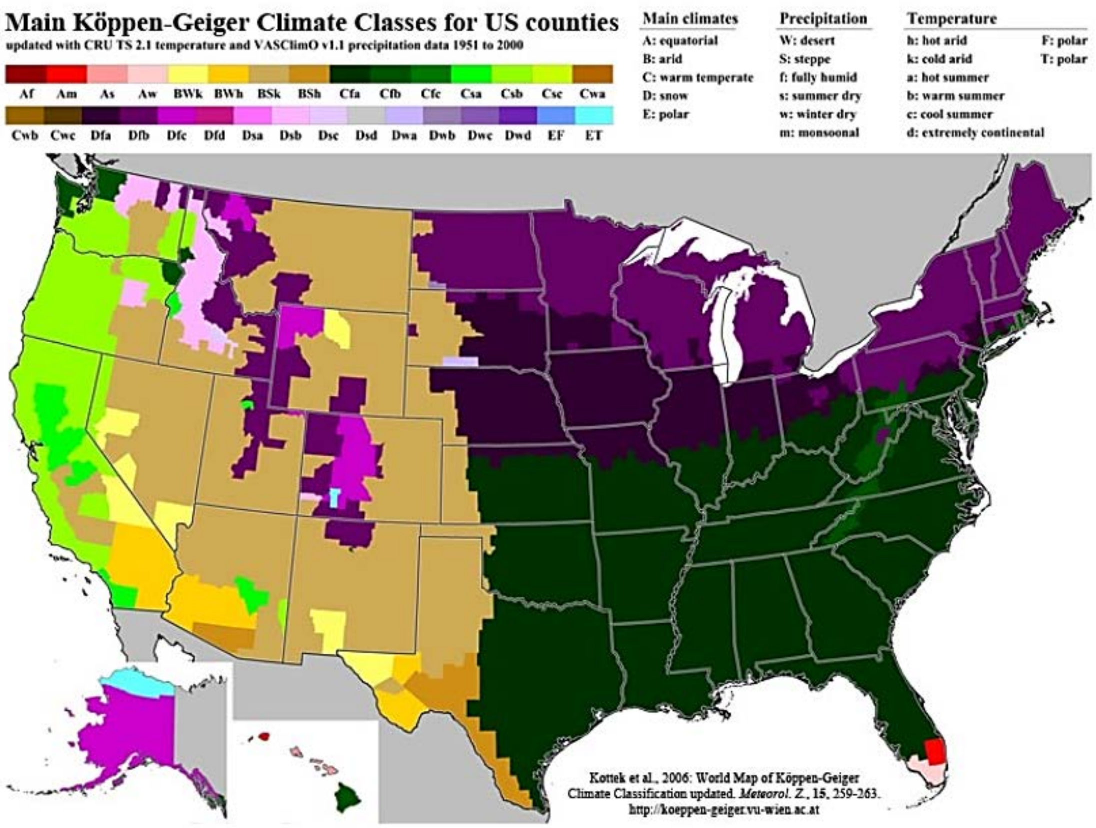

Figure 15.1.14-2: Köppen-Geiger Climate Classes for U.S. Counties

Source: (Kottek, World Map of the Köppen-Geiger Climate Classification, 2006).

This section discusses the current state of South Dakota's climate with regard to air temperature, precipitation, and extreme weather events (e.g., tornadoes, severe flooding, hail, and thunderstorms) in the state's four climate regions: Bsk, Dfa, Dfb, and Dsc.

Air Temperature

South Dakota is in the northern High Plains, with temperature extremes ranging from highs of 120 °F to lows of negative 58 °F. Average temperatures in South Dakota range from the high 80s to the low 90s during summer months and from single digits to below zero during winter months. Average annual temperatures along the southern half of the state range from approximately 46 °F to 52 °F. Average temperatures along the northern half of the state range from approximately 40 °F to 46°F. (PRISM Climate Group, 2012) (Todey, 2015)

South Dakota is also well known for dramatic temperature and climate shifts. For example, the town of Spearfish, in western South Dakota, experienced the greatest temperature change ever recorded in North America. "On January 22, 1943, the temperature at 7:30 a.m. was negative 4 °F. Two minutes later, the temperature shot up to 45 °F. By 8:45 a.m., the temperature reached 55 °F before plummeting back to 0 °F forty-five minutes later" (Todey, 2015).

The highest temperature to occur in the state was on July 5, 1936 and July 15, 2006 with a record high of 120 °F in Gann Valley and Fort Pierre respectively. The lowest temperature to occur in the state was on February 17, 1936 with a record low of negative 58 °F in McIntosh. (SCEC, 2015)

The following paragraphs describe annual temperatures as they occur within South Dakota's various climate classification zones:

Bsk – Rapid City, in western South Dakota, is within the climate classification zone Bsk. The average annual temperature in Rapid City is approximately 48 °F; 27.5 °F during winter months; 70.0 °F during summer months; 45.4 °F during spring months; and 48.7 °F during autumn months (NOAA, 2015b).

Dfa – Sioux Falls, in eastern South Dakota, is within the climate classification zone Dfa. The average annual temperature in Sioux Falls is approximately 45.8 °F; 19.0 °F during winter months; 70.5 °F during summer months; 45.8 °F during spring months; and 47.2 °F during autumn months (NOAA, 2015b).

Dfb – Sisseton, in far northeastern South Dakota, is within the climate classification zone Dfb. The average annual temperature in Sisseton is approximately 43.7 °F; 16.0 °F during winter months; 68.8 °F during summer months; 43.9 °F during spring months; and 45.6 °F during autumn months (NOAA, 2015b).

Dsc – Martin, in southern South Dakota, is within the climate classification zone Dsc. The average annual temperature in Martin is approximately 47.4 °F; 25.1 °F during winter months; 70.3 °F during summer months; 46.0 °F during spring months; and 47.8 °F during autumn months (NOAA, 2015b).

Precipitation

Statewide, precipitation "ranges from an average of 26" in the southeast to the 14" in the northwest with an anomaly over the Black Hills, the average wettest area of the state" (Todey, 2015). Average annual precipitation in areas of northeast to southeast South Dakota range from 20 to 28 inches. Average annual precipitation in areas of north, central, and southern South Dakota range from approximately 18 to 22 inches. Lastly, average annual precipitation in nearly the entire western half of South Dakota can average anywhere from under 16 inches to 18 inches. In western South Dakota, over the Black Hills National Forest, precipitation averages are substantially greater, with average annual precipitation ranging from 18 to 34 inches. (PRISM Climate Group, 1997)

The greatest 24-hour precipitation accumulation to occur was on May 6, 2007 with a total of 8.74 inches in Groton (SCEC, 2015). The greatest 24-hour snowfall accumulation to occur was on March 14, 1973 with a total of 52 inches in Lead. (SCEC, 2015)

The following paragraphs describe annual precipitation accumulation as it occurs within South Dakota's various climate classification zones:

Bsk – Rapid City, in western South Dakota, is within the climate classification zone Bsk. The average annual precipitation accumulation in Rapid City is approximately 19.79 inches; 1.09 inches during winter months; 7.63 inches during summer months; 7.28 inches during spring months; and 3.79 inches during autumn months (NOAA, 2015b).

Dfa – Sioux Falls, in eastern South Dakota, is within the climate classification zone Dfa. The average annual precipitation accumulation in Sioux Falls is approximately 26.38 inches; 1.85 inches during winter months; 10.06 inches during summer months; 8.17 inches during spring months; and 6.30 inches during autumn months (NOAA, 2015b).

Dfb – Sisseton, in far northeastern South Dakota, is within the climate classification zone Dfb. The average annual precipitation accumulation in Sisseton is approximately 22.33 inches; 1.25 inches during winter months; 9.76 inches during summer months; 6.12 inches during spring months; and 5.20 inches during autumn months (NOAA, 2015b).

Dsc – Martin, in southern South Dakota, is within the climate classification zone Dsc. The average annual precipitation accumulation in Martine is approximately 19.54 inches; 1.41 inches during winter months; 7.52 inches during summer months; 6.71 inches during spring months; and 3.90 inches during autumn months (NOAA, 2015b).

Severe Weather Events

South Dakota is along the north end of Tornado Alley and therefore, experiences tornadoes commonly throughout the year. During one particularly severe event, 67 tornadoes touched down during a 6-hour period on June 24, 2003, tying the Hurricane Beulah tornado outbreak in Texas for the greatest number of tornadoes to touch down in a single-state on a single day. The strongest tornado to occur during this storm was an F-4. (Todey, 2015)

South Dakota also experiences extreme precipitation, particularly over the Black Hills National Forest. On June 9, 1972 approximately 10 to 15 inches of rain fell during a 6-hour period, "leading to the failure of the Canyon Lake Dam in western Rapid City" (Todey, 2015). As a result, dozens of homes were swept away, 238 people were killed, and over three-thousand were injured (Todey, 2015).

South Dakota is also home to the country's "heaviest and largest diameter hailstone" (Todey, 2015). "The Vivian hail stone from July 23, 2010 weighed in at 1 lb. 15 oz. and was 8" in diameter" (Todey, 2015). During this storm, several hundreds of vehicles were damaged along I-90. In addition, many homes and roofs were severely damaged. (Todey, 2015).

15.1.15. Human Health and Safety

15.1.15.1. Definition of the Resource

The existing environment for health and safety is defined by occupational and environmental hazards likely to be encountered during the construction, operation, and maintenance of towers, antennas, cables, utilities, and other equipment and infrastructure at existing and potential FirstNet telecommunication sites. There are two human populations of interest within the existing environment of health and safety, (1) telecommunication occupational workers and (2) the public near telecommunication sites. Each of these populations could experience different degrees of exposure to hazards because of their relative access to FirstNet telecommunication sites and their function throughout the implementation of the FirstNet telecommunication network infrastructure.

The health and safety issues reviewed in this section include occupational safety for telecommunications workers, contaminated sites, and manmade or natural disaster sites. This section does not evaluate the health and safety risks associated with radio frequency (RF) radiation or vehicle traffic. Vehicle traffic is evaluated in Section 15.1.1, Infrastructure.

15.1.15.2. Specific Regulatory Considerations

Federal organizations, such as the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), USEPA, the U.S. Department of Health and Human Services, and others protect human health and the environment. In South Dakota, the South Dakota Department of Labor and Regulation (SDDLR), and the SD DENR regulate this resource area. Federal OSH regulations apply to workers through either OSHA, or stricter state-specific plans that must be approved by OSHA. South Dakota does not have an OSHA-approved “State Plan,” therefore, private and OSHA enforces public sector occupational safety and health programs in South Dakota. The South Dakota Department of Health (SDDOH) regulates public health.

Federal laws relevant to protecting occupational and public health and safety are summarized in Appendix C. Table 15.1.15-1 below summarizes the major South Dakota laws relevant to the state’s occupational health and safety, hazardous materials, and hazardous waste management programs.

Table 15.1.15-1: Relevant South Dakota Human Health and Safety Laws and Regulations

State Law and Regulation	Regulatory Agency	Applicability
Administrative Rules of South Dakota: Article 74:05:12	SD DENR	Establishes the state's Brownfields Revitalization and Economic Development Program to cleanup underutilized contaminated sites.
Administrative Rules of South Dakota: Article 74:34:01	SD DENR	Describes regulations for the discharge and reporting of regulated substances to the environment.
Administrative Rules of South Dakota: Article 74:34:01	SD DENR	Outlines permit application guidelines and mined land reclamation standards.

15.1.15.3. Environmental Setting: Existing Telecommunication Sites

There are many inherent health and safety hazards at telecommunication sites. Telecommunication site work is performed indoors, below ground level, on building roofs, over waterbodies, and on communication towers. Tasks may also be performed at dangerous heights, in confined spaces, while operating heavy equipment, on energized equipment near underground and overhead utilities, and while using hazardous materials, such as flammable gases and liquids. Because telecommunication workers are often required to perform work outside, heat and cold exposure, precipitation, and lightning strikes also present hazard and risks depending on the task, occupational competency, and work-site monitoring. A summary description of the health and safety hazards present in the telecommunication occupational work environment is listed below.

Working from height, overhead work, and slips, trips, or falls – At tower and building-mount sites, workers regularly climb structures using fixed ladders or step bolts up to heights exceeding 2,000 feet above the ground's surface (OSHA, 2015). In addition to tower climbing hazards, telecommunication workers have restricted workspace on rooftops or work from bucket trucks parked on uneven ground. Cumulatively, these conditions present fall and injury hazards to telecommunication workers, and the public who may be observing the work or transiting the area.

Trenches and confined spaces – In rare cases, FirstNet deployment, operation, and maintenance activities may involve work in trenches or confined spaces. Installation and maintenance of underground utilities in urban areas or utility manholes[115] are examples of when trenching or confined space work could occur. Installation of telecommunications activities involves laying conduit and limited trenching (generally 6 to 12 inches in width) would occur. Confined space work can involve poor atmospheric conditions, requiring ventilation and rescue equipment. Additionally, when inside a confined space, worker movement is restricted and may prevent a rapid escape or interfere with proper work posture and ergonomics.

Heavy equipment and machinery – New and replacement facility deployment and maintenance can involve the use of heavy equipment and machinery. During the lifecycle of a telecommunication site, heavy equipment such as bulldozers, backhoes, dump trucks, cement trucks, and cranes are used to prepare the ground, transport materials and soil, and raise large sections of towers and antennas. Telecommunications workers may be exposed to the additional site traffic and often work near heavy equipment to direct the equipment drivers and to accomplish work objectives. Accessory machinery such as motorized pulley systems, hydraulic metal shears, and air driven tools present additional health and safety risks as telecommunication work sites. These pieces of machinery can potentially sever skin and bone, or cause other significant musculoskeletal injuries to the operator.

Energized equipment and existing utilities – Electrical shock from energized equipment and utilities is an elevated risk at telecommunication sites due to the amount of electrical energy required for powering communication equipment and broadcasting towers. Telecommunication cables are often co-located with underground and overhead utilities, which can further increase occupational risk during earth-breaking and aerial work.

Optical fiber safety – Optical fiber cable installation and repair presents additional risks to telecommunications workers, including potential eye or tissue damage, through ingestion, inhalation, or other contact with glass fiber shards. The shards are generated during termination and splicing activities, and can penetrate exposed skin (International Finance Corporation, 2007). Additionally, fusion splicing (to join optical fibers) in confined spaces or other environments

[115] Manholes may be used for telecommunications activities, especially in cities and urban areas, depending on the location of other utilities. In cities, power, water, and telecommunication lines are often co-located; if access is through a manhole in the street, that access will be used.

with the potential for flammable gas accumulation presents risk of fire or explosion (Fiber Optic Association, 2010).

Noise – Sources of excess noise at telecommunication sites include heavy equipment operation, electrical power generators and other small engine equipment, air compressors, electrical and pneumatic power tools, and road vehicles, such a diesel engine work trucks. The cumulative noise environment has the potential to exceed the OSHA acceptable level of 85 dB per 8-hour time weighted average (see Section 15.1.13, Noise) (OSHA, 2002). Fugitive noise may emanate beyond the telecommunication work site and impact the public living in the vicinity, observing the work, or transiting through the area.

Hazardous materials and hazardous waste – Work at telecommunication sites may require the storage and use of hazardous materials such as fuel sources for backup power generators and compressed gases used for welding and metal cutting (new towers only). In some cases, telecommunication sites require use of potentially hazardous products (e.g., herbicides). Secondary hazardous materials (e.g., exhaust fumes) may be a greater health risk than the primary hazardous material (e.g., diesel fuel). Furthermore, the use of hazardous materials creates down-stream potential to generate hazardous waste. While it is unlikely that any FirstNet activities would involve the generation or storage of hazardous waste, older existing telecommunication structures and sites could have hazardous materials present, such as lead-based (exterior and interior) paint at outdoor structures or asbestos tiles and insulation in equipment sheds. The public are typically shielded from hazardous materials and hazardous wastes that are components of telecommunication site work, unless a site allows unrestricted access.

Aquatic environments – Installation of telecommunication lines may include laying, burying, or boring lines under wetlands and waterways, including lakes, rivers, ponds, and streams. Workers responsible for these activities operate heavy equipment from soft shorelines, boats, barges, and other unstable surfaces. There is potential for equipment and personnel falls, as well as drowning in waterbodies. Wet work conditions also increase risks of electric shock and hypothermia.

Outdoor elements – Weather conditions have the potential to quickly and drastically reduce safety, and increase hazards at telecommunication work sites. Excessive heat and cold conditions impact judgement, motor skills, hydration, and in extreme cases may lead to hyper- or hypothermia. Precipitation, such as rain, ice, and snow, create slippery climbing conditions and wet or muddy ground conditions. Lightning strikes are risks to telecommunication workers climbing towers or working on top of buildings.

Telecommunication Worker Occupational Health and Safety

The U.S. Department of Labor, Bureau of Labor Statistics (BLS) uses established industry and occupational codes to classify telecommunications workers. For industry classifications, BLS uses the North American Industry Classification System (NAICS) codes, which identify the telecommunications industry (NAICS code 517XX) as being within the information industry (NAICS code 51). For occupational classifications, BLS uses the Standard Occupational

Classification (SOC) system to identify workers as belonging to one of 840 occupations. Telecommunications occupations are identified as both telecommunication equipment installers and repairers, except line installers (SOC code 49-2022), or telecommunication line installers and repairers (SOC code 49-9052). Both occupations are reported under the installation, maintenance and repair occupations (SOC code 49-0000).

As of May 2014, there were 510 telecommunication equipment installers and repairers, and 610 telecommunication line installers and repairers (Figure 15.1.15-1) working in South Dakota (Bureau of Labor Statistics, 2015c). BLS data related to nonfatal occupational injuries or illnesses are not available for South Dakota (Bureau of Labor Statistics, 2015d). Nationwide, there were 1.9 nonfatal occupational injury cases in both 2012 and 2013 per 100 full-time workers in the telecommunications industry (Bureau of Labor Statistics, 2012) (Bureau of Labor Statistics, 2013a).

In 2013, there were 18 fatalities reported nationwide across the telecommunications industry (5 due to violence and other injuries by persons or animals; 3 due to transportation incidents; 7 due to slips, trips, or falls; and 3 due to unknown causes), with an hours-based fatal injury rate of 7.9 per 100,000 full-time equivalent workers (Bureau of Labor Statistics, 2013b). This represents 45 percent of the broader information industry fatalities (40 total), and less than 1 percent of occupational fatalities (4,585 total). South Dakota has not had any fatalities in the telecommunications industry or telecommunications occupations since 2003, when data are first available. By comparison, South Dakota had three fatalities[116] in 2014, within the broader installation, maintenance, and repair occupations (SOC code 49-0000) (Bureau of Labor Statistics, 2015f).

Public Health and Safety

The public is unlikely to encounter occupational hazards at telecommunication sites due to limited access. Environmental and public health data are reported at the federal level through the Center for Disease Control and Prevention Wide-ranging Online Data for Epidemiologic Research (WONDER). While the WONDER database cannot be searched for cases specific to telecommunication sites, many available injury categories are consistent with risks present at telecommunication sites. For example, in South Dakota, between 1999 and 2013, there were 25 fatalities due to a fall from, out of, or through a building or structure; 11 fatalities due to being caught, crushed, jammed or pinched in or between objects; and 0 fatalities due to exposure to electric transmission lines (Center for Disease Control and Prevention, 2015). Among the public, trespassers entering telecommunication sites would be at the greatest risk for exposure to health and safety hazards.

[116] BLS Census of Fatal Occupational Injuries data for 2014 is for preliminary reporting only. Final data are expected to be released in spring 2016 (Bureau of Labor Statistics, 2015h).

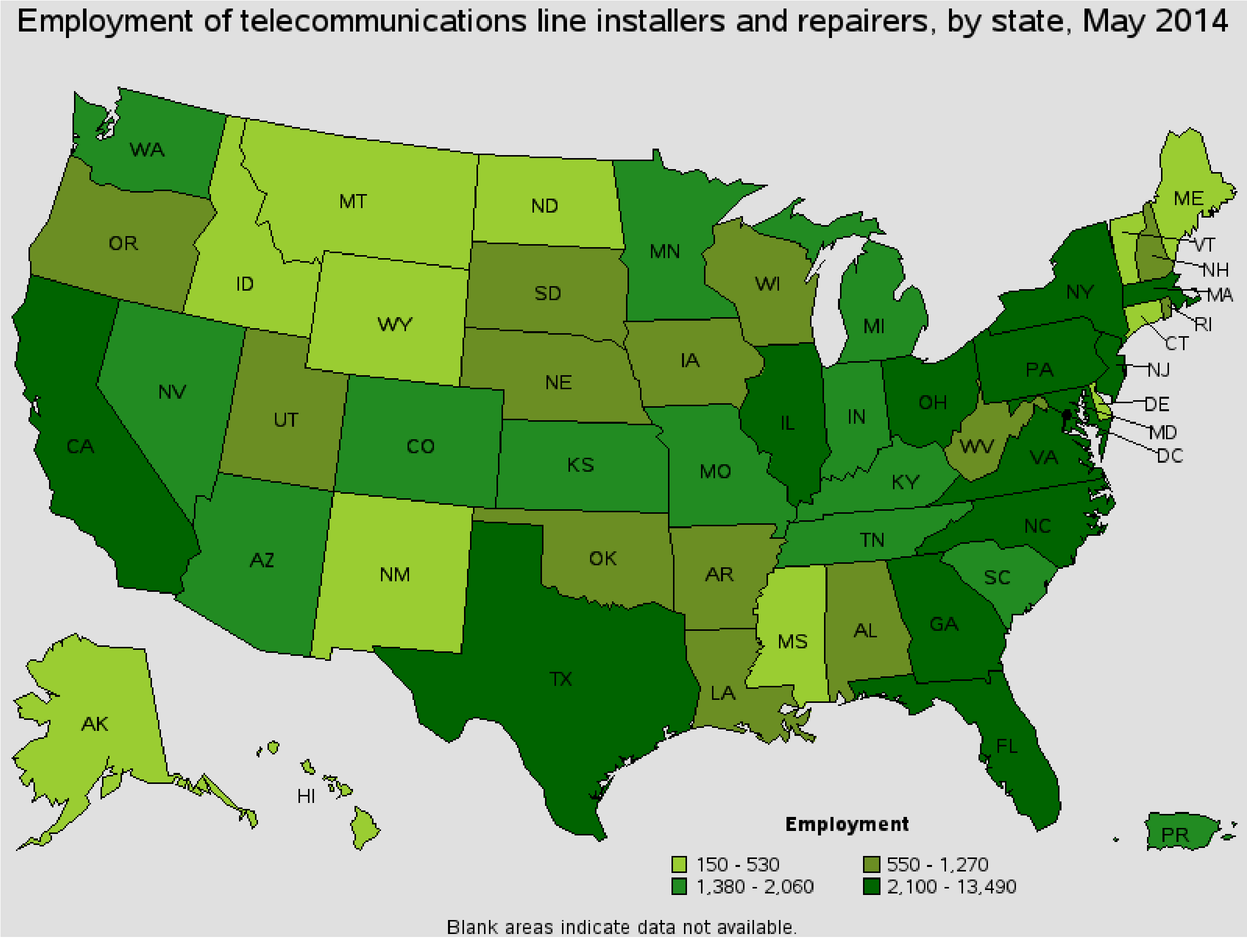

Figure 15.1.15-1: Number of Telecommunication Line Installers and Repairers Employed per State, May 2014

Source: (Bureau of Labor Statistics, 2015e)

15.1.15.4. Environmental Setting: Contaminated Properties at or near Telecommunication Sites

Existing and surrounding land uses, including landfills or redeveloped brownfields, near telecommunication sites have the potential to impact human health and safety. Furthermore, undocumented environmental practices of telecommunication site occupants, including practices before current environmental laws, could result in environmental contamination, affecting the quality of soil, sediments, groundwater, surface water, and air.

Contaminated property is typically classified by the federal environmental remediation or cleanup programs that govern them, such as sites administered through the Superfund Program[117] or listed on the National Priorities List (NPL), as well as the Resource Conservation and Recovery Act (RCRA) Corrective Action sites and Brownfields. These regulated cleanup sites

[117] The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) enacted in 1980, commonly referred to as the Superfund Program, governs abandoned hazardous waste sites, and collects a tax on chemical and petroleum industries. CERCLA was amended by the Superfund Amendments and Reauthorization Act (SARA) in 1986; see Appendix C (USEPA, 2011a).

are known to contain environmental contaminants at concentrations exceeding acceptable human health exposure thresholds. Contact with high concentrations of contaminated media can result in adverse health effects, such as dermatitis, pulmonary and cardiovascular events, organ disease, central nervous system disruption, birth defects, and cancer. It generally requires extended periods of exposure over a lifetime for the most severe health effects to occur.

South Dakota's Ground Water Quality Program oversees federal superfund sites, and is managed under SD DENR (SD DENR, 2015a). As of December 2015, South Dakota had 1 RCRA Corrective Action site,[118] 179 brownfield sites, and 2 proposed or final Superfund/NPL sites (USEPA, 2015j). Based on a December 2015 search of USEPA's Cleanups in My Community (CIMC) database, there are no Superfund sites (USEPA, 2015b) and no RCRA Corrective Action sites (USEPA, 2015d) in South Dakota where contamination has been detected at an unsafe level, or a reasonable human exposure risk still exists.

Brownfield sites in South Dakota may be enrolled in the state Brownfields Revitalization and Economic Development Program (SD DENR, 2015d). One example of a brownfield site is the Former Manufactured Gas Plant site in Watertown, SD. The site includes a 0.64-acre parcel of land, which was formerly used by Watertown Gas Company for manufacturing gas from coal and oil. During the operation of the gas plant, an estimated 56,000 gallons of byproduct coal tar was generated, some of which was disposed onsite. Redevelopment of the site includes a planned excavation of coal tar-impacted soils. (SD DENR, 2015e).

In addition to contaminated properties, certain industrial facilities are permitted to release toxic chemicals into the air, water, or land. One such program is the Toxics Release Inventory (TRI), administered by the USEPA under the Emergency Planning and Community Right to Know Act (EPCRA) of 1986. The Toxic Release Inventory database is a measure of the industrial nature of an area and the over-all chemical use, and can be used to track trends in releases over time. The "releases" do not necessarily equate to chemical exposure by humans or necessarily constitute to quantifiable health risks because the releases include all wastes generated by a facility – the majority of which are disposed of via managed, regulated processes that minimize human exposure and related health risks (e.g., in properly permitted landfills or through recycling facilities). As of December 2015, South Dakota had 95 TRI reporting facilities. The identification of a TRI facility does not necessarily indicate that the facility is actively releasing to the environment; the majority of TRI reports involve permitted disposal facilities. According to the USEPA, in 2013, the most recent data available, South Dakota released 6.6 million pounds of toxic chemicals through onsite and offsite disposal, transfer, or other releases, largely from the food/beverages/tobacco, metal mining, and electric utilities industries. This accounted for 0.16 percent of nationwide TRI releases, ranking South Dakota 51 of 56 states and territories based on total releases per square mile. (USEPA, 2015e)

Another USEPA program is the NPDES, which regulates the quality of stormwater and sewer discharge from industrial and manufacturing facilities. Permitted discharge facilities are

[118] Data gathered using USEPA's CIMC search on December 3, 2015, for all sites in South Dakota, where cleanup type equals 'RCRA Hazardous Waste – Corrective Action,' and excludes sites where cleanup phase equals 'Construction Complete' (i.e., no longer active) (USEPA, 2015k).

potential sources of toxic constituents that are harmful to human health or the environment. As of November 12, 2015, South Dakota had 29 permitted major discharge facilities registered with the USEPA Integrated Compliance Information System (USEPA, 2015f).

The National Institute of Health, U.S. National Library of Medicine, provides an online mapping tool called TOXMAP, which allows users to "visually explore data from the USEPA's TRI and Superfund Program" (National Institute of Health, 2015a). Figure 15.1.15-2 provides an overview of potentially hazardous sites in South Dakota.

Telecommunication Worker Occupational Health and Safety

Telecommunications sites may be on or near contaminated land, industrial discharge facilities, or sites presenting additional hazards. Occupational exposure to contaminated environmental media can occur during activities like soil excavating, trenching, other earthwork, and working over waterbodies. Indoor air quality may also be impacted from vapor intrusion infiltrating indoors from contaminated soil or groundwater that are present beneath a building's foundation. As of December 2015, there is one USEPA-regulated telecommunications site in South Dakota (Qwest near Sioux Falls, SD) (USEPA, 2015g). Sites such as this are regulated under one or more environmental programs including NPDES compliance, Superfund/NPL status, and TRI releases.

According to BLS data, South Dakota has not had any occupational fatalities since 2003 specific to telecommunications, or within the broader installation, maintenance, and repair occupations (SOC code 49-0000) from exposure to "harmful substances or environments" (Bureau of Labor Statistics, 2015f). By comparison, the BLS reported three fatalities in 2011 and three fatalities in 2014 nationwide within the telecommunications industry (NAICS code 517), due to exposure to harmful substances or environments (Bureau of Labor Statistics, 2015g). In 2014, BLS also reported four fatalities within the telecommunications line installers and repairers occupation (SOC code 49-9052), and no fatalities within the telecommunications equipment installers and repairers occupation (SOC code 49-2022) due to exposure to harmful substances or environments (Bureau of Labor Statistics, 2014).

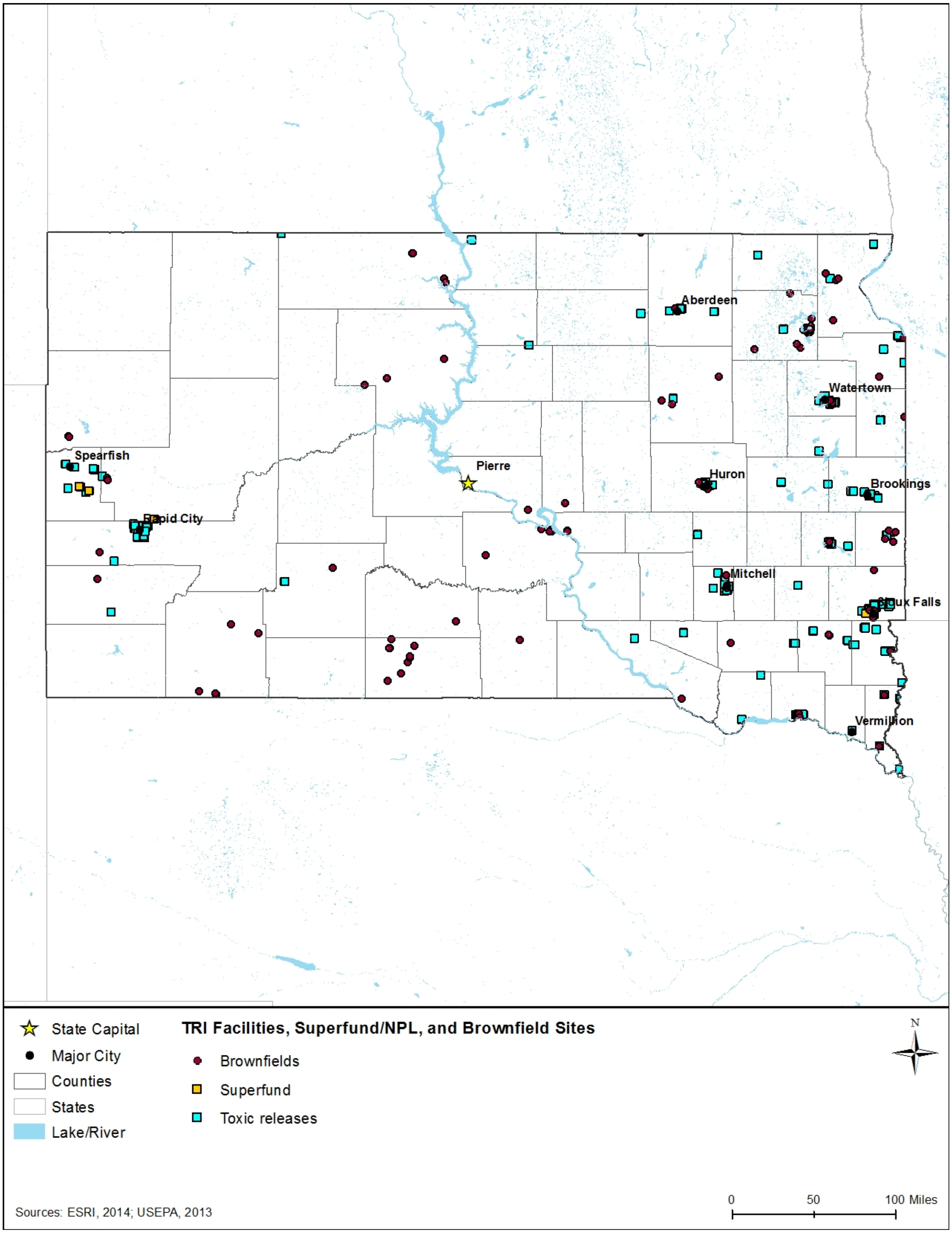

Figure 15.1.15-2: TOXMAP Superfund/NPL and TRI Facilities in South Dakota (2013)

Spotlight on South Dakota Superfund Sites: Gilt Edge Mine

The Gilt Edge mine is a 260-acre open-pit mine (Figure 15.1.15-3), 5 miles east of Lead, SD, that was abandoned in 1998. The area has been mined for gold, copper, and tungsten since the 1870s. Between 1988 and 1992, Brohm Mining Corporation operated the Gilt Edge mine, and developed open pits, a cyanide leaching pad, and a mine tailings pile. (SD DENR, 2015n)

In 1993, acidic drainage was discovered coming from the onsite tailings pile, but BMC abandoned the property in 1998 before the discharge was resolved. The SD DENR began emergency treatment of the acidic discharge, and the governor of South Dakota proposed the site to the NPL in February 2000. (SD DENR, 2015n)

In December 2000, the USEPA added the site to the NPL and began planning cleanup activities. The USEPA identified millions of tons of waste rock at the site and 150 million gallons of acidic, metal-contaminated water among the three open pits. Remedial actions by USEPA contractors included consolidating and capping mine waste and treating acid mine drainage. Exposure pathways which could potentially impact human health or the environment are currently under control. (USEPA, 2015h)

Figure 15.1.15-3: Aerial View of the Gilt Edge Mine

Source: (USEPA, 2015i)

Public Health and Safety

As described earlier, access to telecommunications sites is nearly always restricted to occupational workers. Although site access control is one of the major reasons telecommunications sites present an inherent low risk to non-occupational workers, the public could be potentially exposed to contaminants and other hazards in a variety of ways. One example would be if occupational workers disturb contaminated soil while digging, causing hazardous chemicals to mix with an underlying groundwater drinking water sources. If a contaminant enters a drinking water source, the surrounding community could inadvertently ingest or absorb the contaminant when using that source of water for drinking, cooking, bathing, and swimming. By trespassing on a restricted property, a trespasser may come in contact with contaminated soil or surface water, or by inhaling harmful vapors.

15.1.15.5. Environmental Setting: Abandoned Mine Lands at or near Telecommunications Sites

Another health and safety hazard in South Dakota includes surface and subterranean mines. As of 2015, South Dakota's total nonfuel mineral production value was $293M, which ranked 41st nationwide (in terms of dollar value). This level of production accounted for less than 0.4 percent of total nationwide production. As of 2015, South Dakota's leading nonfuel mineral commodities were gold, portland cement, crushed stone, construction sand and gravel, and lime (USGS, 2016). Health and safety hazards at active mines and abandoned mine lands (AML) include falling into open shafts, cave-ins from unstable rock and decayed support, deadly gases and lack of oxygen inside the mine, unused explosives and toxic chemicals, horizontal and vertical openings, high walls, and open pits (BLM, 2015b).

The SD DENR, Minerals and Mining Program is responsible for managing South Dakota’s mine reclamation program (SD DENR, 2015k). The USFS estimates approximately 503 abandoned hardrock mines exist in South Dakota (BLM, 2015a). Figure 15.1.15-4 shows the distribution of known High Priority (Priority 1, 2 and adjacent Priority 3) AMLs in South Dakota, where Priority 1 and 2 sites pose a significant risk to human health and safety, and Priority 3 sites pose a risk to the environment. As of December 2015, South Dakota had four Priority 1 and 2 AMLs (U.S. Department of Interior, Office of Surface Mining Reclamation and Enforcement, 2015a).

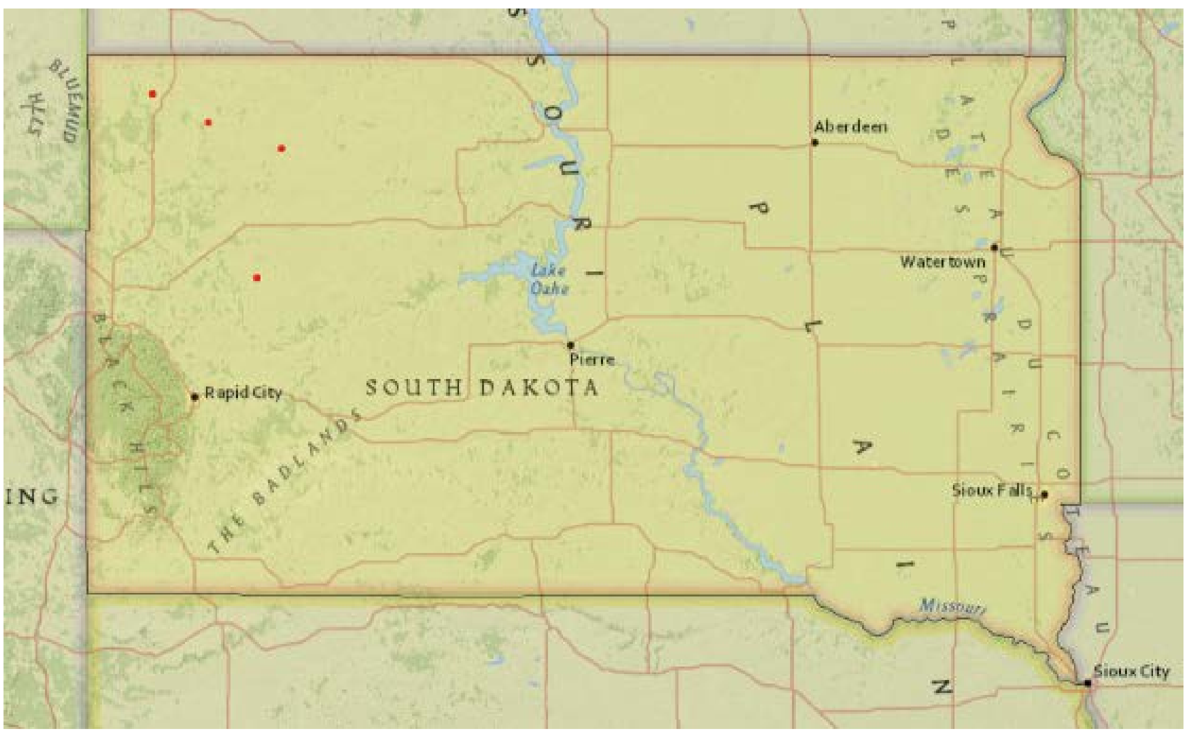

Figure 15.1.15-4: High Priority Abandoned Mine Lands in South Dakota (2015)

Source: (U.S. Department of Interior, Office of Surface Mining Reclamation and Enforcement, 2015b)

Telecommunication Worker Occupational Health and Safety

Telecommunications sites may be on or near AMLs or mine fires, presenting occupational exposure risks from fire, toxic gases, and subsidence during FirstNet deployment, operation, and maintenance activities. Because the locations of many abandoned mines are unknown or hidden, these mines pose a risk to telecommunications workers because they may be encountered during deployment and maintenance operations.

Public Health and Safety

Subterranean mines present additional health and safety risks to the public, by generating toxic combustible gases, which can penetrate the surface through ground fractures, potentially seeping into residential structures. Additionally, mine fires can consume enough sub-surface material, that risk of subsidence increases. As a result, AMLs and mine fires in particular, can result in evacuations of entire communities (U.S. Department of Interior, Office of Surface Mining Reclamation and Enforcement, 2015c).

15.1.15.6. Environmental Setting: Natural & Manmade Disaster Sites

Natural and manmade disaster events can create health and safety risks, as well as present unique hazards, to telecommunication workers and the public. Telecommunications, including public safety communications, can be unavailable (temporarily or permanently) during disaster events. Examples of manmade disasters are train derailments, refinery fires, or other incident involving the release of hazardous constituents. A common example of a natural disaster is flooding. Floodwaters damage transportation infrastructure (roads, railways, etc.) and utility lines (sewer, water, electric power, broadband, natural gas lines, etc.). Hazardous chemicals and sanitary wastes often contaminate floodwaters, which can cause headaches, skin rashes, dizziness, nausea, excitability, weakness, fatigue, and disease to exposed workers (OSHA, 2003).

Physical hazards may also be present at disaster sites, such as downed utility lines, debris blockage or road washout conditions, which increases exposure risks to telecommunication workers. Climbing and working from tower structures damaged by wind increases the risk of slips, trips, or falls. During natural and manmade disasters, access to the telecommunication sites can be obstructed by debris.

Telecommunication Worker Occupational Health and Safety

Telecommunication workers are often called upon to provide support to natural and manmade disasters because of the critical need to restore and maintain telecommunication capabilities. The need to enter disaster areas as part of the recovery effort exposes telecommunication workers to elevated risks because chemical, biological, and physical hazards might not have not been fully identified or assessed. Transportation infrastructure and utilities in the affected areas are often compromised and present unknown chemical and biologic hazards. Correspondingly, if telecommunication workers are injured during response and repair operations, their rescue and treatment might over-extend first responder staff and medical facilities that are delivering care to victims of the initial incident.

Spotlight on South Dakota Natural Disasters: March 2010 Snowmelt Flooding

In March 2010, record flooding occurred along the James, Vermillion, and Big Sioux Rivers in eastern South Dakota after an unusually wet fall and winter. Up to three times normal precipitation amounts accumulated in glacial lakes during October 2009, and combined with up to 60 inches of snowfall in February 2010. Air temperatures were below freezing (32 °F) in early March 2010, before suddenly rising midmonth and causing rapid melting of the 10- to 25-inch thick snowpack, and setting record highs at five USGS river gauges. (NOAA, 2010) The resulting flooding damaged roads, drainage structures, and utilities (Figure 15.1.15-5). More than $21M of federal aid was provided to repair damaged infrastructure (FEMA, 2015). Floodwaters also inundated agricultural lands and damaged homes and farm structures, resulting in economic damage to the region that is heavily dependent on the agriculture sector.

Figure 15.1.15-5: Big Sioux River Flooding of Farmland near Castlewood, SD March 2010

Source: (NOAA, 2010)

Currently, SDDLR and BLS do not report data specific to injuries or fatalities among telecommunication workers responding to natural or manmade disasters. However, the National Response Center (NRC), managed by the U.S. Coast Guard, compiles reports for oil spills, chemical releases, or other maritime security incidents and contains incident reports related to occupational health and safety. Of the 24 NRC-reported incidents for South Dakota in 2015 with known causes, 2 incidents were attributed to natural disaster (e.g., earthquake, flood, hurricane, tornado, or other natural phenomenon), while 22 incidents were attributed to manmade disasters (e.g., derailment, dumping, equipment failure, operator error, over pressuring, transport accident, or trespasser) or other indeterminate causes (U.S. Coast Guard, 2015). For example, during severe weather on June 22, 2015 several overhead transformers were dislodged, spilling transformer oil into surface waters near Garretson, SD (Minnehaha County). Cleanup crews recovered approximately 85 gallons of transformer oil from a roadside culvert (U.S. Coast Guard, 2015). Such incidents present unique, hazardous challenges to telecommunication workers responding during natural or manmade disasters.

Public Health and Safety

Hazards present during natural and manmade disasters are often far-reaching, affecting large geographic areas and affecting all populations living within the area. Similar to telecommunication workers, the public faces risks during these types of disasters, such as compromised transportation infrastructure and utilities, potential for exposure to unknown chemical and biologic hazards, and inadequate medical support. In 2014, South Dakota had one weather-related fatality, due to flooding, and five non-fatal injuries. By comparison, 384 weather-related fatalities and 2,203 injuries were reported nationwide the same year. (NWS, 2015).

15.2. ENVIRONMENTAL CONSEQUENCES

This section describes the potential environmental impacts, beneficial, or adverse, resulting from the Proposed Action and Alternatives. As this is a programmatic evaluation, site- and project-specific issues are not assessed. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Each resource area identifies the range of possible impacts on resources for the Proposed Action and Alternatives, including the No Action Alternative. The No Action Alternative provides a comparison to describe the effects of environmental resources of the existing conditions to the proposed Alternatives.

NEPA requires agencies to assess the potential direct and indirect impacts each alternative could have on the existing environment (as characterized earlier in this section). Direct impacts are those impacts that are caused by the Proposed Action and occur at the same time and place, such as soil disturbance as a result of construction activity. Indirect impacts are those impacts related to the Proposed Action but result from an intermediate step or process, such as changes in surface water quality because of soil erosion.

For each resource, the potential impact is assessed in terms of context of the action and the intensity of the potential impact, per CEQ regulations (40 CFR §1508.27). *Context* refers to the timing, duration, and where the impact could potentially occur (i.e., local vs. national; pristine vs. disturbed; common species vs. protected species). In terms of duration of potential impact, context is described as short or long term. *Intensity* refers to the magnitude or severity of the effect as either beneficial or adverse. Resource-specific significance rating criteria are provided at the beginning of each resource area section.

15.2.1. Infrastructure

15.2.1.1. Introduction

This section describes potential impacts to infrastructure in South Dakota associated with construction, deployment, and operation of the Proposed Action and Alternatives. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.1.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on infrastructure were evaluated using the significance criteria presented in Table 15.2.1-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts addressed in this section are presented as a range of possible impacts.

Table 15.2.1-1: Impact Significance Rating Criteria for Infrastructure

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
Transportation system capacity and safety	Magnitude or Intensity	Creation of substantial traffic congestion/delay and/or a substantial increase in transportation incidents (e.g., crashes, derailments).	Effect that is potentially significant, but with mitigation is less than significant.	Minimal change in traffic congestion/delay and/or transportation incidents (e.g., crashes, derailments).	No effect on traffic congestion or delay, or transportation incidents.
	Geographic Extent	Regional impacts observed throughout the state/territory.		Effects realized at one or multiple isolated locations.	NA
	Duration or Frequency	Permanent: Persisting indefinitely.		Short-term effects will be noticeable for up to the entire construction phase or a portion of the operational phase.	NA
Capacity of local health, public safety, and emergency response services	Magnitude or Intensity	Impacted individuals or communities cannot access health care and/or emergency services, or access is delayed, due to the project activities.	Effect is potentially significant, but with mitigation is less than significant.	Minor delays to access to care and emergency services that do not impact health outcomes.	No impacts on access to care or emergency services.
	Geographic Extent	Regional impacts observed (“regional” assumed to be at least a county or county-equivalent geographical extent, could extend to state).		Impacts only at a local/neighborhood level.	NA
	Duration or Frequency	Duration is constant during construction and deployment phase.		Rare event during construction and deployment phase.	NA

<table>
<tr><th rowspan="2">Type of Effect</th><th rowspan="2">Effect Characteristics</th><th colspan="4">Impact Level</th></tr>
<tr><th>Potentially Significant</th><th>Less than Significant with BMPs and Mitigation Measures Incorporated</th><th>Less than Significant</th><th>No Impact</th></tr>
<tr><td rowspan="3">Modifies existing public safety response, physical infrastructure, telecommunication practices, or level of service in a manner that directly affects public safety communication capabilities and response times</td><td>Magnitude or Intensity</td><td>Substantial adverse changes in public safety response times and the ability to communicate effectively with and between public safety entities.</td><td rowspan="3">Effect that is potentially significant, but with mitigation is less than significant.</td><td>Minimal change in the ability to communicate with and between public safety entities.</td><td>No perceptible change in existing response times or the ability to communicate with and between public safety entities.</td></tr>
<tr><td>Geographic Extent</td><td>Local/City, County/Region, or State/Territory.</td><td>Local/City, County/Region, or State/Territory.</td><td>Local/City, County/Region, or State/Territory.</td></tr>
<tr><td>Duration or Frequency</td><td>Permanent or perpetual change in emergency response times and level of service.</td><td>Change in communication and/or the level of service is perceptible but reasonable to maintaining effectiveness and quality of service.</td><td>NA</td></tr>
<tr><td rowspan="3">Effects to commercial telecommunication systems, communications, or level of service</td><td>Magnitude or Intensity</td><td>Substantial adverse changes in level service and communications capabilities.</td><td rowspan="3">Effect that is potentially significant, but with mitigation is less than significant.</td><td>Minor changes in level of service and communications while transitioning to the new system.</td><td>No perceptible effect to level of service or communications while transitioning to the new system.</td></tr>
<tr><td>Geographic Extent</td><td>Local/City, County/Region, or State/Territory.</td><td>Local/City, County/Region, or State/Territory.</td><td>Local/City, County/Region, or State/Territory.</td></tr>
<tr><td>Duration or Frequency</td><td>Persistent, long-term, or permanent effects to communications and level of service.</td><td>Minimal effects to level of service or communications lasting no more than a short period (minutes to hours) during the construction and deployment phase.</td><td>NA</td></tr>
</table>

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Effects to utilities, including electric power transmission facilities and water and sewer facilities	Magnitude or Intensity	Substantial disruptions in the delivery of electric power or to physical infrastructure that results in disruptions, including frequent power outages or drops in voltage in the electrical power supply system ("brownouts"). Disruption in water delivery or sewer capacity, or damage to or interference with physical plant facilities that impact delivery of water or sewer systems.	Effect that is potentially significant, but with mitigation is less than significant.	Minor disruptions to the delivery of electric power, water, and sewer services, or minor modifications to physical infrastructure that result in minor disruptions to delivery of power, water, and sewer services.	There would be no perceptible impacts to delivery of other utilities and no service disruptions.
	Geographic Extent	Local/City, County/Region, or State/Territory.		Local/City, County/Region, or State/Territory.	Local/City, County/Region, or State/Territory.
	Duration or Frequency	Effects to other utilities would be seen throughout the entire construction phase.		Effects to other utilities would be of short duration (minutes to hours) and would occur sporadically during the entire construction phase.	NA

NA = Not Applicable

15.2.1.3. Description of Environmental Concerns

Transportation System Capacity and Safety

The primary concerns for transportation system capacity and safety related to FirstNet activities would primarily occur during the construction phases of deployment. Depending on the exact site locations and placement of new assets in the field, temporary impacts on traffic congestion, railway use, airport operations, or use of other transportation corridors could occur if site locations were near or adjacent to roadways and other transportation corridors, requiring temporary closures (lane closures on roadways, for example). Coordination would be necessary with the relevant transportation authority (i.e., departments of transportation, airport authorities, and railway companies) to ensure proper coordination during deployment. Based on the impact significance criteria presented in Table 15.2.1-1, such impacts would be less than significant due to the temporary nature of the deployment activities, even if such impacts would be realized at one or more isolated locations. Such impacts would be noticeable during the deployment phase, but would be short-term, with no anticipated impacts continuing into the operational phase, unless any large-scale maintenance would become necessary during operations.

Capacity of Local Health, Public Safety, and Emergency Response Services

The capacity of local health, public safety, and emergency response services would experience less than significant impacts during construction or operation phases. During deployment and system optimization, existing services would likely remain operational in a redundant manner ensuring continued operations and availability of services to the public. The only potential impact would be extremely rare – and that is if emergency response services were using transportation infrastructure to respond to an emergency at the exact time that deployment activities were taking place. This type of impact would be isolated at the local or neighborhood level, and the likelihood of such an impact would be extremely low. Once operational, the new network would provide beneficial impacts to the capacity of local health, public safety, and emergency response services through enhanced communications infrastructure, thereby increasing capacity for and enhancing the ability of first responders to communicate during emergency response situations. Based on the impact significance criteria presented in Table 15.2.1-1, potential negative impacts would be less than significant. Substantial beneficial impacts are likely to result from implementation.

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

The Proposed Action and Alternatives contemplated by FirstNet would not cause negative impacts to 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. Based on the impact significance criteria presented in Table 15.2.1-1, any potential impacts would be less than significant. As described above, during deployment and system optimization, existing services would likely remain operational in a redundant manner ensuring continued operations and availability of services to the public. Once operational, state, and local public safety organizations would need to evaluate telecommunication practices and standard operating procedures (SOPs). FirstNet's mission is to complement such practices and SOPs in a positive manner; therefore, only beneficial or complementary impacts would be anticipated. Public safety communication capabilities and response times would be expected to also experience beneficial impacts through enhanced communications abilities. It is possible that FirstNet would be upgrading physical telecommunications infrastructure, thus the infrastructure would also experience a positive and beneficial impact. Disposal or reuse of old public safety communications infrastructure would also likely need to be considered once the specifics are known. Any negative impacts would be expected to be less than significant given the short-term nature of the deployment activities.

Effects to Commercial Telecommunication Systems, Communications, or Level of Service

Commercial telecommunication systems, communications, or level of service would experience no impacts, as such commercial assets would be using a different spectrum for communications. FirstNet has exclusive rights to use of the assigned spectrum, and only designated public safety organizations would be authorized to connect to FirstNet's network. Depending on the use patterns of FirstNet's spectrum, such spectrum use may be over-built or under-utilized.[119] Anticipated impacts would be less than significant due to the limited extent and temporary nature of the deployment.

Effects to Utilities, including Electric Power Transmission Facilities, and Water and Sewer Facilities

The activities proposed by FirstNet would have less than significant impacts on utilities, including electric power transmission facilities, and water and sewer facilities. Depending on the specific project contemplated, installation of new equipment could require connection with local electric sources, and use of site-specific local generators, on a temporary or permanent basis. In addition, depending on the specific project contemplated, the draw or use of power from the transmission facilities may need to be examined; however, it is not anticipated that such use of power would have negative impacts, due to the local nature of the proposed activities and the widespread availability and use of the power grid in the U.S.

15.2.1.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment, and operation activities.

[119] Telecommunications equipment for specific spectrum use can be built where other equipment for other spectrum use already exists. If the new equipment and spectrum is not fully utilized, the geographic region may experience "over-build," where an abundance of under-utilized equipment may exist in that geographic location. This situation can be caused by a variety of factors including changes in current and future use patterns, changes in spectrum allocation, changes in laws and regulations, and other factors.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to infrastructure and others would not. In addition, and as explained in this section, the same type of Proposed Action infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to infrastructure under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that there would be no impacts to infrastructure resources since the activities that would be conducted at these small entry and exit points are not likely to produce perceptible changes or disruption of transportation, telecommunications, or utility services.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting of dark fiber would have no impacts to infrastructure resources because there would be no ground disturbance and no interference with existing utility, transportation, or communication systems.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the use of portable devices that use satellite technology would not impact infrastructure resources because there would be no change to the built or natural environment from the use of portable equipment. Installation of satellite-enabled equipment would not be expected to have any impacts to infrastructure resources, given that construction activities would occur on existing structures, would not be expected to interfere with existing equipment, and transportation capacity and safety, and access to emergency services would not be impacted.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact infrastructure resources, it is anticipated that this activity would have no impact on infrastructure resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to infrastructure as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur as a result of direct interface with existing infrastructure, most notably existing telecommunication infrastructure. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential impacts to infrastructure include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of points of presence (POPs), huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to infrastructure resources, depending on the specific assets connected on either end of the buried fiber. If a fiber optic plant is being used to tie into existing telecommunications assets, then localized impacts to telecommunications sites could occur during the deployment phase.
  - New Build – Aerial Fiber Optic Plant: Installation of a new aerial fiber optic plant could impact new telecommunications infrastructure through the installation of new or replacement of existing telecommunications poles.
  - Collocation on Existing Aerial Fiber Optic Plant: Similar to new build activities (above), collocation on existing aerial fiber optic plant could include installation of new or replacement towers requiring ground disturbance.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water would not impact infrastructure resources because there would be no local infrastructure to impact, other than harbor operations. However, impacts to infrastructure resources could potentially occur as result of the construction of landings and/or facilities on shores or the banks of waterbodies that accept the submarine cable, depending on the exact site location and proximity to existing infrastructure.
  - Installation of Optical Transmission or Centralized Transmission Equipment: Installation of transmission equipment such as small boxes or huts, or access roads could potentially impact infrastructure. Impacts could include disruption of service in transportation corridors, disruption of service to telecommunications infrastructure, or other temporary impacts.
- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads might result in temporary or unintended impacts to current utility services during installation or interconnection activities. Generally, however, these deployment activities would be independent and would not be expected to interfere with other existing towers and structures. In addition, installation activities would have beneficial impacts due to

expansion of infrastructure at a local level. Such activities can enhance public safety infrastructure, and other telecommunications as the site could potentially be available for subsequent collocation.

- Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, which would result in localized impacts to that tower and tower site such as minor disruptions in services. As a result of collocation of equipment, the potential addition of power units, structural hardening, and physical security measures could potentially have beneficial impacts on existing infrastructure assets, depending on the site-specific plans.
- Deployable Technologies: Deployable technologies such as COWs, COLTs, and SOWs are comprised of cellular base stations, sometimes with expandable antenna masts, and generators that may require connection to utility power cables. Connecting the generators to utility power cables has the potential to disrupt electric power utility systems or cause power outages; however, this is expected to be temporary and minor. Some staging or landing areas (depending on the type of technology) could require minor construction and maintenance within public road ROWs and utility corridors, heavy equipment movement, and minor excavation and paving near public roads, which have the potential to impact transportation capacity and safety as these activities could increase transportation congestion and delays. Implementation of deployable technologies could result in potential impacts to infrastructure resources in terms of infrastructure expansion, if deployment requires paving of previously unpaved surfaces or other new infrastructure build to accommodate the deployable technology. In addition, beneficial impacts could be realized, as deployable technologies are used when other infrastructure is impaired in some way; so deployable technologies could provide continuity of service during emergency events. Where deployable technologies would be implemented on existing paved surfaces and the acceptable load on those paved surfaces is not exceeded, or where aerial deployable technologies may be utilized but launched or recovered on existing paved surfaces, it is anticipated that there would be no impacts to infrastructure resources because there would be no disturbance of the natural or built environment.

In general, the abovementioned activities could potentially impact infrastructure resources in different ways, resulting in both potentially negative and potentially positive impacts. Potential negative impacts to infrastructure associated with deployment could include temporary disruption of various types of transportation corridors, temporary impacts on existing or new telecommunications sites, and more permanent impacts on utilities, if new infrastructure required tie-in to the electric grid. Positive impacts to infrastructure resources may result from the expansion of public safety and commercial telecommunications capacity and an improvement in public safety telecommunications coverage, system resiliency, and system redundancy. These impacts are expected to be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that

FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. It is anticipated that there would be no impacts to infrastructure associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. If usage of heavy equipment as part of routine maintenance or inspections occurs off of established access roads or corridors, or if further construction related activities are required along public road and utility ROWs, increased traffic congestion, current telecommunication system interruption, and utility interruptions could result as explained above, although these potential impacts would be expected to be minor and temporary.

Numerous beneficial impacts would be associated with operation of the NPSBN. The new system is intended to result in substantial improvements in public safety response times and the ability to communicate effectively with and between public safety entities, and would likely result in substantial improvements in level of service and communications capabilities. Operation of the NPSBN is intended to involve high-speed data capabilities, location information, images, and eventually streaming video, which would likely significantly improve communications and the ability of the public safety community to effectively engage and respond. The NPSBN is also intended to have a higher level of redundancy and resiliency than current commercial networks to support the public safety community effectively, even in events of extreme demand. This improvement in the level of resiliency and redundancy is intended to increase the reliability of systems, communications, and level of service, and minimize disruptions and misinformation resulting from limited or disrupted service.

15.2.1.5. Alternatives Impact Assessment

The following section assesses potential impacts to infrastructure associated with the Deployable Technologies Alternative and the No Action Alternative.[120]

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 minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific infrastructure associated with the

[120] As mentioned above and in Section 2.1.2, Proposed Action Infrastructure, the Preferred Alternative includes implementation of deployable technologies.

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. Therefore, potential impacts to infrastructure as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in less than significant impacts to infrastructure if deployment requires expansion of infrastructure, such as paving of previously unpaved surfaces or other new infrastructure built to support deployment. Also, the site-specific location of deployment would need to be considered, and any local infrastructure assets (transportation, telecommunications, or utilities) would need to be considered, planned for, and managed accordingly to avoid any negative impacts to such resources. Beneficial impacts could be realized, as deployable technologies are used when other infrastructure is impaired in some way; so deployable technologies could provide continuity of service during emergency events. These impacts are expected to be less than significant.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be no impacts to infrastructure resources associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. If usage of heavy equipment, as part of routine maintenance or inspection occurs off established access roads or utility ROWs, or if additional maintenance-related construction activities occur within public road and utility ROWs, less than significant impacts could occur to transportation systems or utility services.

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 to infrastructure as a result of deployment and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 15.1.1, Infrastructure. The state also would not realize beneficial impacts to infrastructure resources described above.

15.2.2. Soils

15.2.2.1. Introduction

This section describes potential impacts to soil resources in South Dakota associated with deployment and operation of the Proposed Action and Alternatives. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.2.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on soil resources were evaluated using the significance criteria presented in Table 15.2.2-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to soil resources addressed in this section are presented as a range of possible impacts.

Table 15.2.2-1: Impact Significance Rating Criteria for Soils

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Soil erosion	Magnitude or Intensity	Severe, widespread, and observable erosion in comparison to baseline, high likelihood of encountering erosion-prone soils.	Effect that is potentially significant, but with mitigation is less than significant.	Perceptible erosion in comparison to baseline conditions; low likelihood of encountering erosion-prone soil types.	No perceptible change in baseline conditions.
	Geographic Extent	State or territory.		Region or county.	NA
	Duration or Frequency	Chronic or long-term erosion not likely to be reversed over several years.		Isolated, temporary, or short-term erosion that that is reversed over few months or less.	NA
Topsoil mixing	Magnitude or Intensity	Clear and widespread mixing of the topsoil and subsoil layers.	Effect that is potentially significant, but with mitigation is less than significant.	Minimal mixing of the topsoil and subsoil layers has occurred.	No perceptible evidence that the topsoil and subsoil layers have been mixed.
	Geographic Extent	State or territory.		Region or county.	NA
	Duration or Frequency	NA		NA	NA
Soil compaction and rutting	Magnitude or Intensity	Severe and widespread, observable compaction and rutting in comparison to baseline.	Effect that is potentially significant, but with mitigation is less than significant.	Perceptible compaction and rutting in comparison to baseline conditions.	No perceptible change in baseline conditions.
	Geographic Extent	State or territory.		Region or county.	NA
	Duration or Frequency	Chronic or long-term compaction and rutting not likely to be reversed over several years.		Isolated, temporary, or short term compaction and rutting that is reversed over a few months or less.	No perceptible change in baseline conditions.

NA = Not Applicable

15.2.2.3. Description of Environmental Concerns

Soil Erosion

Soil erosion is an environmental concern of nearly every construction activity that involves ground disturbance. Construction erosion typically only occurs in a small area of land with the actual removal of vegetative cover from construction equipment or by wind and water erosion. Of concern in South Dakota and other states with similar geography and weather patterns is the erosion of construction site soils to natural waterways, where the sediment can impair water and habitat quality, and potentially affect aquatic plants and animals (NRCS, 2000). Areas exist in South Dakota that have steep slopes (i.e., greater than 20 percent) or where the erosion potential is medium to high, including locations with Albolls, Aquents, Aquerts, Aquolls, Argids, Cambids, Cryolls, Fluvents, Orthents, Psamments, Udalfs, Udepts, Udolls, Ustalfs, Ustepts, Usterts, and Ustolls (see Section 15.1.2.4, Soil Suborders and Figure 15.1.2-2).

Based on the impact significance criteria presented in Table 15.2.2-1, building of some of FirstNet's network deployment sites could cause potentially significant erosion at locations with highly erodible soil and steep grades.

To the extent practicable, FirstNet would attempt to minimize ground-disturbing construction in areas with high erosion potential due to steep slopes or soil type. Where construction is required in areas with a high erosion potential, FirstNet could implement BMPs and mitigation measures to avoid or minimize impacts, and minimize the periods when exposed soil is open to precipitation and wind (see Chapter 19, BMPs and Mitigation Measures).

Topsoil Mixing

The loss of topsoil (i.e., organic and mineral topsoil layers) by mixing is a potential impact at all ground disturbing construction sites, including actions requiring clearing, excavation, grading, trenching, backfilling, or site restoration/remediation work.

Based on impact significance criteria presented in Table 15.2.2-1, and due to the relatively small scale (less than 1 acre) of most FirstNet project sites, as well as the implementation of BMPs and mitigation measures (Chapter 19, BMPs and Mitigation Measures), minimal topsoil mixing is anticipated.

Soil Compaction and Rutting

Soil compaction and rutting at construction sites could involve heavy land clearing equipment such as bulldozers and backhoes, trenchers and directional drill rigs to install buried fiber, and cranes to install towers and aerial infrastructure. Heavy equipment can cause perceptible compaction and rutting of susceptible soils, particularly if BMPs and mitigation measures are not implemented.

Soils with the highest potential for compaction or rutting were identified by using the STATSGO2 database (see Section 15.1.2.3, Soil Suborders). The most compaction susceptible soils in South Dakota are hydric soils with poor drainage conditions, which include Albolls, Aquents, Aquerts, Aquolls, and Psamments. These suborders constitute approximately 14.2 percent of South Dakota's land area,[121] and are found across the state (see Figure 15.1.2-2). The potential for compaction or rutting impact would be generally low at FirstNet network deployment sites where other soil types predominate.

Based on impact significance criteria presented in Table 15.2.2-1, the risk of soil compaction and rutting resulting from FirstNet deployment activities would be less than significant due to the extent of susceptible soils in the state (see Chapter 19, BMPs and Mitigation Measures).

15.2.2.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could deploy various types of facilities or infrastructure. Depending on the physical nature and location of FirstNet facilities or infrastructure and the specific action, some activities would result in potential impacts to soil resources and others would not. In addition, and as explained in this section, the same type of Proposed Action infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to soil resources under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Installation of fiber optic cable in existing conduit through existing hand holes, pulling vaults, junction boxes, huts, and POP structures, and would not impact soil resources because it would not produce perceptible changes to soil resources.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting of dark fiber would be conducted electronically through existing infrastructure, with no impacts to soil resources. If physical access is required to light dark fiber, it would be through existing hand holes, pulling vaults, junction boxes, huts, and similar existing structures.
- Satellites and Other Technologies

[121] This percentage was calculated by dividing the acres of soils that fall within the suborders listed above by the total soil land cover for the state.

- Satellite-Enabled Devices and Equipment: Deployment of temporary or portable equipment that use satellite technology, including COWs, COLTs, SOWs, satellite phones, and video cameras, would not impact soil resources because those activities would not require ground disturbance.
- 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. As adding equipment to an existing launch vehicle would be very unlikely to impact soil resources, it is anticipated that this activity would have no impact on soil resources.

Activities with the Potential to Have Impacts

Implementation of the Preferred Alternatives could include potential deployment-related impacts to soil resources resulting from ground disturbance activities, including soil erosion, topsoil mixing, and soil compaction and rutting. The types of deployment activities that could be part of the Preferred Alternative and result in potential impacts to soil resources include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: New fiber optic cable installation usually requires trenching, plowing (including vibratory plowing), or directional boring, as well as construction of hand holes, pulling vaults, junction boxes, huts, and POP structures that require ground disturbance. Impacts from fiber optic plant installation and structure construction, as well as associated grading and restoration of the disturbed ground when construction is completed, could result in soil erosion, topsoil mixing, or soil compaction and rutting.
  - New Build – Aerial Fiber Optic Plant: Installation of new utility poles, and replacement/upgrading of existing poles and structures could potentially impact soil resources resulting from ground disturbance for pole/structure installation (soil erosion and topsoil mixing), and heavy equipment use from bucket trucks operating on existing gravel or dirt roads (soil compaction and rutting). Potential impacts to soils are anticipated to be small-scale and short-term.
  - Collocation on Existing Aerial Fiber Optic Plant: Topsoil removal, soil excavation, and excavated material placement during the replacement of poles and structural hardening could result in soil erosion and topsoil mixing. Heavy equipment use associated with these activities as well as with installing new fiber on existing poles could result in soil compaction and rutting.
  - New Build – Submarine Fiber Optic Plant: Installation of fiber optic plants in or near bodies of water could potentially impact soil resources at and near the landings or facilities on shore to accept submarine cable. Soil erosion and topsoil mixing could potentially occur as result of grading, foundation excavation, or other ground disturbance activities. Perceptible soil compaction and rutting could potentially occur due to heavy

equipment use during these activities depending on the duration of the construction activity.

- Installation of Optical Transmission or Centralized Transmission Equipment: Installation of optical transmission equipment or centralized transmission equipment, including associated new utility poles, hand holes, pulling vault, junction box, hut, and POP structure installation, would require ground disturbance that could potentially impact soil resources. Potential impacts to soils resulting from soil erosion, topsoil mixing, soil compaction, and rutting are anticipated to be small-scale and short-term.

- Wireless Projects
    - New Wireless Communication Towers: Installation of new wireless towers and associated structures, such as generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads, or access roads could result in impacts to soil resources. Land/vegetation clearing, excavation activities, landscape grading, and other ground disturbance activities during the installation of new wireless towers and associated structures or access roads could result in soil erosion or topsoil mixing, and heavy equipment use during these activities could result in soil compaction and rutting.
    - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, which would not result in impacts to soils. However, if additional power units, structural hardening, and physical security measures are needed they may require ground disturbance, such as grading, or excavation activities, impacts to soil resources could occur, including soil erosion and topsoil mixing, as well as soil compaction and rutting associated with heavy equipment use.
    - Deployable Technologies: Implementation of deployable technologies could result in potential impacts to soil resources depending on the technology and location for deployment. Potential impacts may result if deployment of vehicles (i.e., SOWs, COWs, COLTs, or UAVs) occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These activities could result in soil erosion and topsoil mixing. Heavy equipment use associated with these activities may result in soil compaction and rutting. In addition, implementation of deployable technologies themselves could result in soil compaction and rutting if deployed in unpaved areas. Where technologies such as COWs, COLTs, and SOWs are deployed on existing paved surfaces, there would be no impacts to soil resources because there would be no ground disturbance.

In general, the abovementioned activities could potentially involve land/vegetation clearing, topsoil removal, excavation, excavated material placement, trenching or directional boring, construction of access roads and other impervious surfaces, landscape grading, and heavy equipment movement. Potential impacts to soil resources associated with deployment of this infrastructure could include soil erosion, topsoil mixing, or soil compaction and rutting. These impacts are expected to be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described earlier, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. It is anticipated that there would be no impacts to soil resources associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. If usage of heavy equipment as part of routine maintenance or inspections occurs off of established access roads or corridors, or if the acceptable load of the surface is exceeded, soil compaction and rutting impacts could result as explained above. These impacts are expected to be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.2.5. Alternatives Impact Assessment

The following section assesses potential impacts to soils associated with the Deployable Technologies Alternative and the No Action Alternative.

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 minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. 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. Therefore, potential impacts to soil resources as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in less than significant impacts to soil resources if deployment occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. In addition, impacts to soils could occur on paved surfaces if the acceptable load of the surface is exceeded. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These activities could result in soil erosion and topsoil mixing. Heavy equipment use associated with these activities may result in soil compaction and rutting. In addition, implementation of deployable technologies themselves could also result in soil compaction and rutting if deployed in unpaved areas. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be no impacts to soil resources associated with routine inspections of deployable assets, assuming that the same access roads used for deployment are also used for inspections. If usage of heavy equipment as part of routine maintenance or inspections occurs off of established access roads or corridors, or if the acceptable load of the surface is exceeded, less than significant soil compaction and rutting impacts could result as previously explained above. Finally, if deployable technologies are parked and operated with air conditioning for extended periods, the condensation water from the air conditioner could result in minimal soil erosion. However, it is anticipated that the potential soil erosion would result in less than significant impacts. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed. Therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to soil resources as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 15.1.2, Soils.

15.2.3. Geology

15.2.3.1. Introduction

This section describes potential impacts to South Dakota geology resources associated with deployment and operation of the Proposed Action and Alternatives. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.3.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on geology resources were evaluated using the significance criteria presented in Table 15.2.3-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to geology addressed in this section are presented as a range of possible impacts.

Table 15.2.3-1: Impact Significance Rating Criteria for Geology

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
Seismic Hazard	Magnitude or Intensity	High likelihood that a project activity could be located within a high-risk earthquake hazard zone or active fault.	Effect that is potentially significant, but with mitigation is less than significant.	Low likelihood that a project activity could be located within an earthquake hazard zone or active fault.	No likelihood of a project activity being located in an earthquake hazard zone or active fault.
	Geographic Extent	Hazard zones or active faults are highly prevalent within the state/territory.		Earthquake hazard zones or active faults occur within the state/territory, but may be avoidable.	Earthquake hazard zones or active faults do not occur within the state/territory.
	Duration or Frequency	NA		NA	NA
Landslide	Magnitude or Intensity	High likelihood that a project activity could be located within a landslide area.	Effect that is potentially significant, but with mitigation is less than significant.	Low likelihood that a project activity could be located within a landslide area.	No likelihood of a project activity located within a landslide hazard area.
	Geographic Extent	Landslide areas are highly prevalent within the state/territory.		Landslide areas occur within the state/territory, but may be avoidable.	Landslide hazard areas do not occur within the state/territory.
	Duration or Frequency	NA		NA	NA
Land Subsidence	Magnitude or Intensity	High likelihood that a project activity could be located within an area with a hazard for subsidence (e.g., karst terrain).	Effect that is potentially significant, but with mitigation is less than significant.	Low likelihood that a project activity could be located within an area with a hazard for subsidence.	Project activity located outside an area with a hazard for subsidence.
	Geographic Extent	Areas with a high hazard for subsidence (e.g., karst terrain) are highly prevalent within the state/territory.		Areas with a high hazard for subsidence occur within the state/territory, but may be avoidable.	Areas with a high hazard for subsidence do not occur within the state/territory.

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
	Duration or Frequency	NA		NA	NA
Mineral and Fossil Fuel Resource impacts	Magnitude or Intensity	Severe, widespread, observable impacts to mineral and/or fossil fuel resources.	Effect that is potentially significant, but with mitigation is less than significant.	Limited impacts to mineral and/or fossil resources.	No perceptible change in mineral and/or fossil fuel resources.
	Geographic Extent	Regions of mineral or fossil fuel extraction areas are highly prevalent within the state/territory.		Mineral or fossil fuel extraction areas occur within the state/territory, but may be avoidable.	Mineral or fossil fuel extraction areas do not occur within the state/territory.
	Duration or Frequency	Long-term or permanent degradation or depletion of mineral and fossil fuel resources.		Temporary degradation or depletion of mineral and fossil fuel resources.	NA
Paleontological Resources impacts	Magnitude or Intensity	Severe, widespread, observable impacts to paleontological resources.	Effect that is potentially significant, but with mitigation is less than significant.	Limited impacts to paleontological and/or fossil resources.	No perceptible change in paleontological resources.
	Geographic Extent	Areas with known paleontological resources are highly prevalent within the state/territory.		Areas with known paleontological resources occur within the state/territory, but may be avoidable.	Areas with known paleontological resources do not occur within the state/territory.
	Duration or Frequency	NA		NA	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
Surface Geology, Bedrock, Topography, Physiography, and Geomorphology	Magnitude or Intensity	Substantial and measurable degradation or alteration of surface geology, bedrock, topography, physiographic characteristics, or geomorphological processes.	Effect that is potentially significant, but with mitigation is less than significant.	Minor degradation or alteration of surface geology, bedrock, topography that do not result in measurable changes in physiographic characteristics or geomorphological processes.	No degradation or alteration of surface geology, bedrock, topography, physiographic characteristics, or geomorphologic processes.
	Geographic Extent	State/territory.		State/territory.	NA
	Duration or Frequency	Permanent or long-term changes to characteristics and processes.		Temporary degradation or alteration of resources that is limited to the construction and deployment phase.	NA

NA = Not Applicable

15.2.3.3. Description of Environmental Concerns

Environmental concerns regarding geology can be viewed as two distinct types, those that would potentially provide impacts to the project, such as seismic hazards and landslides, and those that would be impacts from the project, such as land subsidence, mineral and fossil fuel resources, paleontological resources, surface geology, bedrock, topography, physiography, and geomorphology. These concerns and their impacts on geology are discussed below.

Seismic Hazard

A concern related to deployment is placement of equipment in highly active seismic zones. Equipment that is exposed to earthquake activity is subject to misalignment, alteration, or, in extreme cases, destruction; all of these activities could result in connectivity loss.

As discussed in Section 15.1.3.8, South Dakota is not at risk to significant earthquake events. As shown in Figure 15.1.3-4, south-central South Dakota, including areas near Mitchell, are at a slightly greater risk to earthquakes than other areas of the state. The USGS estimates that there is a 10 percent risk that South Dakota will experience a magnitude 5.1 or greater earthquake in any one 50-year period (South Dakota Office of Emergency Management, 2014). Based on the impact significance criteria presented in Table 15.2.3-1, seismic impacts from deployment or operation of the Proposed Action would have no impact on seismic activity; however, seismic impacts to the Proposed Action could be potentially significant if FirstNet's deployment locations were within high-risk earthquake hazard zones. Given the potential for minor earthquakes in or near South Dakota, some amount of infrastructure could be subject to earthquake hazards, in which case BMPs and mitigation measures (see Chapter 19, BMPs and Mitigation Measures) could help avoid or minimize the potential impacts.

Volcanic Activity

Volcanoes were considered but not analyzed for South Dakota since they do not occur in South Dakota; therefore, volcanoes do not present a hazard to the state.

Landslides

As discussed in Section 15.1.3.8, widespread portions of South Dakota are at moderate to high risk of experiencing landslide events. Based on the impact significance criteria presented in Table 15.2.3-1, potential impacts to landslides from deployment or operation of the Proposed Action would have less than significant impacts; however, landslide impacts to the Proposed Action could be potentially significant if FirstNet's deployment locations were within areas in which landslides are highly prevalent. Equipment that is exposed to landslides is subject to misalignment, alteration, or, in extreme cases, destruction; all of these activities could result in connectivity loss. South Dakota is most susceptible to landslides in areas of the state along, and to the west of, the Missouri River. To the extent practicable, FirstNet would avoid deployment in areas that are susceptible to landslide events. However, given that several of South Dakota's major cities, including Pierre and Rapid City, are in areas that experience landslides with moderate frequency, some amount of infrastructure could be subject to landslide hazards, in which case BMPs and mitigation measures (see Chapter 19, BMPs and Mitigation Measures) could help avoid or minimize the potential impacts.

Land Subsidence

As discussed in Section 15.1.3.8, portions of South Dakota are vulnerable to land subsidence due to karst topography. Based on the impact significance criteria presented in Table 15.2.3-1, potential impacts to soil subsidence from deployment or operation of the Proposed Action would have less than significant impacts; however, subsidence impacts to the Proposed Action could be potentially significant to the Proposed Action if FirstNet's deployment locations were within areas at high risk to karst topography or located in mining areas. Equipment that is exposed to land subsidence, such as sinkholes created by karst topography, is subject to misalignment, alteration, or, in extreme cases, destruction. All of these activities could result in connectivity loss. To the extent practicable, FirstNet would avoid deployment in known areas of karst topography. However, where infrastructure is subject to landslide hazards, BMPs and mitigation measures, as discussed in Chapter 19 (BMPs and Mitigation Measures), could help avoid or minimize the potential impacts.

Potential Mineral and Fossil Fuel Resource Impacts

Equipment deployment near mineral and fossil fuel resources would have less than significant effects on these resources. Rather the new construction is only likely to limit access to extraction of these resources. Based on the impact significance criteria presented in Table 15.2.3-1 impacts to mineral and fossil fuel resources are unlikely as the Proposed Action could only be potentially significant if FirstNet's deployment locations were to cause severe, widespread, observable impacts to mineral and/or fossil fuel resources. To the extent practicable, FirstNet would avoid construction in areas where these resources exist.

Potential Paleontological Resource Impacts

Equipment installation and construction activities that require ground disturbance could damage existing paleontological resources, which are both fragile and irreplaceable. Based on the impact significance criteria presented in Table 15.2.3-1, impacts to paleontological resources could be potentially significant if FirstNet's buildout/deployment locations uncovered paleontological resources during construction activities. As discussed in Section 15.1.3.8, fossils are abundant in parts of South Dakota. Potential impacts to fossil resources should be considered on a site-by-site basis, and BMPs and mitigation measures (see Chapter 19, BMPs and Mitigation Measures) may be required help avoid or minimize the potential impacts.

Surface Geology, Bedrock, Topography, Physiography, and Geomorphology

Equipment installation and construction activities that degrade or alter surface geology, bedrock, or topography could cause measurable changes in physiographic characteristics of an area's geology, topography, physiography, or geomorphology. Based on the impact significance criteria presented in Table 15.2.3-1, impacts could be potentially significant if FirstNet's deployment were to cause substantial and measurable degradation or alteration of surface geology, bedrock, topography, physiographic characteristics, or geomorphological processes. Construction activities related to the Proposed Action and Alternatives are likely to be less than significant, because they are not likely to require removal of significant volumes of terrain to reach the threshold of significance. When ground disturbance is required, BMPs and mitigation measures (see Chapter 19, BMPs and Mitigation Measures) could be implemented to help avoid or minimize the potential impacts.

15.2.3.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

Implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities have the potential to be impacted by geologic hazards, some activities could result in potential impacts to geology, and other activities would have no impacts. In addition, and as explained in this section, the same type of Proposed Action infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to geology under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. In most cases, there would be no impacts to geologic resources since the activities that would be conducted at these small entry and exit points are not likely to produce perceptible changes. The section below addresses potential impacts if entry/exit points are installed in coastal locations that are susceptible to land subsidence.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to geologic resources because there would be no ground disturbance.
- Satellites and Other Technologies
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch

vehicle would be very unlikely to impact geologic resources, it is anticipated that this activity would have no impact on geologic resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to geologic resources, or resulting from geologic hazards due to implementation of the Preferred Alternative, would encompass a range of impacts that could occur as a result of ground disturbance activities, including loss of mineral and fuel resources and paleontological resources. The types of infrastructure development scenarios or deployment activities that could be part of the Preferred Alternative and result in potential impacts to geologic resources, or impacts from geologic hazards, include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POP huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to geologic resources due to associated ground disturbance, such as impacts to fuel and mineral resources or paleontological resources. Where equipment is installed in locations that are susceptible to landslides, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.
  - New Build – Aerial Fiber Optic Plant: Installation of new utility poles, and associated use of heavy equipment during construction, could result in potential impacts to geologic resources due to associated ground disturbance. Where equipment is installed in locations that are susceptible to landslides, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water is not expected to impact geologic resources including marine paleontological resources. However, where landings and/or facilities for submarine cable are installed at locations that are susceptible to landslides, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.
  - Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment would occur in existing boxes or huts and require ground disturbance in locations that are susceptible to geologic hazards (e.g., land subsidence, landslides, or earthquakes), it is possible that they could be affected by that hazard.
- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in impacts to geologic resources. Land/vegetation clearing, excavation activities, landscape grading, and other ground disturbance activities during the installation of new wireless towers and associated structures or access roads could result in erosion or

disturbance of geologic resources. Where equipment is installed in locations that are susceptible to landslides, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.

- Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, which would not result in ground disturbance. However, if additional power units are needed, structural hardening, and physical security measures required ground disturbance, such as grading, or excavation activities, impacts to geologic resources could occur due to ground disturbance. Where equipment is installed in locations that are susceptible to landslides, earthquakes, and other geologic hazards, it is possible that equipment could be affected by that hazard.
- Deployable Technologies: Implementation of deployable technologies could result in potential impacts to geologic resources depending on the technology and location proposed for deployment. Potential impacts may result if deployment of vehicles (i.e., SOWs, COWs, COLTs, or UAVs) occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. Where deployable technologies would be implemented on existing paved surfaces, there would be no impacts to/from geologic resources because there would be no ground disturbance and mobile technologies could be moved to avoid geologic hazards.

- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: In most cases, the installation of permanent equipment on existing structures or the use of portable devices that use satellite technology would not impact geologic resources because those activities would not require ground disturbance. However, where equipment is permanently installed in locations that are susceptible to landslides, earthquakes, and other geologic hazards, it is possible that they could be affected by that hazard. The use of portable satellite-enabled devices would not impact geologic resources nor would it be affected by geologic hazards because there would be no ground disturbance nor any impact to the built or natural environment.

In general, the abovementioned activities could potentially involve ground disturbance resulting from land/vegetation clearing, topsoil removal, excavation, excavated material placement, trenching or directional boring, construction of access roads and other impervious surfaces, landscape grading, and heavy equipment movement. Potential impacts to geology associated with deployment could include minimal removal of bedrock or mineral resources, or adverse impacts to installed equipment resulting from geologic hazards (e.g., seismic hazards, landslides, and land subsidence). Specific FirstNet projects are likely to be small scale; correspondingly, disturbance to geologic resources for those types of projects with the potential to impact geologic resources is also expected to be small scale. These impacts are expected to be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. It is anticipated that there would be no impacts to geology associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections.

The operation of the Preferred Alternative could be affected by to geologic hazards including seismic activity, landslides, and land subsidence. However, potential impacts would be anticipated to be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.3.5. Alternatives Impact Assessment

The following section assesses potential impacts to geology associated with the Deployable Technologies Alternative and the No Action Alternative.

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 minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. 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. Therefore, potential impacts to geology as a result of implementation of this alternative could be as described below.

Deployment Impacts

Implementation of deployable technologies on existing paved surfaces would not result in impacts to geologic resources (or from geologic hazards) as there would be no ground disturbance and mobile technologies could be moved to avoid geologic hazards. Potential impacts may result if deployment of vehicles (i.e., SOWs, COWs, COLTs, or UAVs) occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These impacts are expected to be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of

BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be no impacts to geologic resources (or from geologic hazards) associated with routine inspections of the Preferred Alternative.

The operation of the Deployable Technologies Alternative could be affected by to geologic hazards including seismic activity, landslides, and land subsidence. However, potential impacts would be anticipated to be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure, or satellites and other technologies. As a result, there would be no impacts to geologic resources (or from geologic hazards) as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 15.1.3, Geology.

15.2.4. Water Resources

15.2.4.1. Introduction

This section describes potential impacts to water resources in South Dakota associated with deployment and operation of the Proposed Action and Alternatives. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.4.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on water resources were evaluated using the significance criteria presented in Table 15.2.4-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact. Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to water resources addressed in this section are presented as a range of possible impacts.

Table 15.2.4-1: Impact Significance Rating Criteria for Water Resources

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
Water Quality (groundwater and surface water) - sedimentation, pollutants, nutrients, water temperature	Magnitude or Intensity	Groundwater contamination creating a drinking quality violation, or otherwise substantially degrade groundwater quality or aquifer; local construction sediment water quality violation, or otherwise substantially degrade water quality; water degradation poses a threat to the human environment, biodiversity, or ecological integrity. Violation of various regulations including: CWA, SDWA.	Effect that is potentially significant, but with mitigation is less than significant.	Potential impacts to water quality, but potential effects to water quality would be below regulatory limits and would naturally balance back to baseline conditions.	No changes to water quality; no change in sedimentation or water temperature, or the presence of water pollutants or nutrients.
	Geographic Extent/Context	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Chronic and long term changes not likely to be reversed over several years or seasons.		The impact is temporary, lasting no more than six months.	NA
Floodplain degradation*	Magnitude or Intensity	The use of floodplain fill, substantial increases in impervious surfaces, or placement of structures within a 500-year flood area that will impede or redirect flood flows or impact floodplain hydrology. High likelihood of encountering a 500-year floodplain within a state or territory.	Effect that is potentially significant, but with mitigation is less than significant.	Activities occur inside the 500-year floodplain, but do not use fill, do not substantially increase impervious surfaces, or place structures that will impede or redirect flood flows or impact floodplain hydrology, and do not occur during flood events. Low likelihood of encountering a 500-year floodplain within a state or territory.	Activities occur outside of floodplains and therefore do not increase fill or impervious surfaces, nor do they impact flood flows or hydrology within a floodplain.

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Chronic and long term changes not likely to be reversed over several years or seasons.		The impact is temporary, lasting no more than one season or water year, or occurring only during an emergency.	NA
Drainage pattern alteration	Magnitude or Intensity	Alteration of the course of a stream of a river, including stream geomorphological conditions, or a substantial and measurable increase in the rate or amount of surface water or changes to the hydrologic regime.	Effect that is potentially significant, but with mitigation is less than significant.	Any alterations to the drainage pattern are minor and mimic natural processes or variations.	Activities do not impact drainage patterns.
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Impact occurs in perennial streams, and is ongoing and permanent.		The impact is temporary, lasting no more than six months.	NA
Flow alteration	Magnitude or Intensity	Consumptive use of surface water flows or diversion of surface water flows such that there is a measurable reduction in discharge.	Effect that is potentially significant, but with mitigation is less than significant.	Minor or no consumptive use with negligible impact on discharge.	Activities do not impact discharge or stage of waterbody.
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Impact occurs in perennial streams, and is ongoing and permanent.		Impact is temporary, not lasting more than six months.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Changes in groundwater or aquifer characteristics	Magnitude or Intensity	Substantial and measurable changes in groundwater or aquifer characteristics, including volume, timing, duration, and frequency of groundwater flow, and other changes to the groundwater hydrologic regime.	Effect that is potentially significant, but with mitigation is less than significant.	Any potential impacts to groundwater or aquifers are temporary, lasting no more than a few days, with no residual impacts.	Activities do not impact groundwater or aquifers.
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Impact is ongoing and permanent.		Potential impact is temporary, not lasting more than six months.	NA

* - Since public safety infrastructure is considered a critical facility, project activities should avoid the 500-year floodplain wherever practicable, per the Executive Orders on Floodplain Management (EO 11988 and EO 13690).

NA = Not Applicable

15.2.4.3. Description of Environmental Concerns

Potential Water Quality Impacts

Water quality impaired waterbodies are those waters that have been identified as not supporting their appropriate uses. Projects in watersheds of impaired waters may be subject to heightened permitting requirements. For example, the CWA requires states to assess and report on the quality of waters in their state. Section 303(d) of the CWA requires states to identify impaired waters. For these impaired waters, states must consider the development of a Total Maximum Daily Load (TMDL) or other strategy to reduce the input of the specific pollutant(s) restricting waterbody uses, in order to restore and protect such uses.

More than half of South Dakota's assessed rivers and streams assessed and nearly half of the assessed lakes, reservoirs, and ponds are impaired. Designed uses of the impaired waterbodies include aquatic life and recreation use. Probable sources of impairment include agricultural operations, sediment, and nutrients from surface water runoff, and fecal coliform and *E. coli* from livestock operations and wildlife. Groundwater quality within the state is generally suitable for daily uses. (USEPA, 2014) (SD DENR, 2014)

Deployment activities can contribute pollutants in a number of ways but the primary manner is increased sediment in surface waters. Vegetation removal onsite exposes soils to rain and wind that can increase erosion. Impacts to water quality may occur from post construction vegetation management, such as herbicides, that may leach into groundwater or move to surface waters through soil erosion or runoff, spray drift, or inadvertent direct overspray. Fuel, oil, and other lubricants from equipment can contaminate groundwater and surface waters if carried in runoff. Other water quality impacts could include changes in temperature, pH or dissolved oxygen levels, water odor, color, or taste, or addition of suspended solids.

Soil erosion or the introduction of suspended solids into waterways from implementation of the Preferred Alternative could contribute to degradation of water quality. If the Proposed Action and Alternatives would disturb more than 1 acre of soil, a state or USEPA NPDES Construction General Permit (CGP) would be required. As part of the permit application for the CGP, a stormwater pollution prevention plan (SWPPP) would need to be prepared containing BMPs that would be implemented to prevent, or minimize the potential for, sedimentation and erosion. Adherence to the CGP and the BMPs would help prevent keep sediment and suspended solids from entering the waterways and ensure that effects on water quality during construction would not be adverse.

Deployment activities associated with the Proposed Action have the potential to increase erosion and sedimentation around construction and staging areas. Grading activities associated with construction would potentially result in a temporary increase in the amount of suspended solids running off construction sites. If a storm event were to occur, construction site runoff could result in sheet erosion of exposed soil. If not adequately controlled, water runoff from these areas would have the potential to degrade surface water quality. Implementing BMPs and mitigation measures, where practicable and feasible, would reduce potential impacts to surface water quality.

Expected deployment activities would not violate applicable state, federal (e.g., CWA, and Safe Drinking Water Act), and local regulations, cause a threat to the human environment, biodiversity, or ecological integrity through water degradation, or cause a sediment water quality violation from local construction, or otherwise substantially degrade water quality.

Therefore, based on the impact significance criteria presented in Table 15.2.4-1, water quality impacts would likely be less than significant, and could be further reduced if BMPs and mitigation measures were to be incorporated where practicable and feasible.

During implementation of the Proposed Action and Alternatives, there is the potential to encounter shallow groundwater due to clearing and grading activities, shallow excavation, or relocation of utility lines. This is unlikely, as trenching is not expected to exceed a 48-inch depth. However, groundwater contamination may exist in areas directly within or near the project area. If trenching[122] were to occur near or below the existing water table (depth to water), then dewatering would be anticipated at the location. Residual contaminated groundwater could be encountered during dewatering activities. Construction activities would need to comply with South Dakota dewatering requirements. Any groundwater extracted during dewatering activities or as required by a dewatering permit would be treated prior to discharge or disposed of at a wastewater treatment facility.

Due to average thickness of most South Dakota aquifers, there is little potential for groundwater contamination within a watershed or multiple watersheds. Thus, it is unlikely that the majority of FirstNet's deployment locations would result in a drinking quality violation, or otherwise substantially degrade groundwater quality or aquifer, and based on the impact significance criteria presented in Table 15.2.4-1, there would likely be less than significant impacts on groundwater quality within most of the state. In areas where groundwater is close to the surface, then site-specific analysis, BMPs, and mitigation measures could be implemented to further reduce potential impacts.

Floodplain Degradation

Floodplains are low-lying lands next to rivers and streams. When left in a natural state, floodplain systems store and dissipate floods without adverse impacts on humans, buildings, roads and other infrastructure. The 500-year floodplain is the area of minimal flood hazard, where there is a 0.2-percent-annual-chance flood. Some projects may be outside of a floodplain, but still be in an area with known flooding history.

Based on the impact significance criteria presented in Table 15.2.4-1, floodplain degradation impacts would be potentially less than significant since the majority of FirstNet's likely deployment activities, on the watershed or subwatershed level, would likely occur inside the 500-year floodplain, use minimal fill, do not substantially increase impervious surfaces, do not

[122] Telecommunications activities involve laying conduit, with minimal trenching. Trenching activities would likely be at a minimal depth (less than 36 inches) and width (6 to 12 inches).

impede or redirect flood flows or impact floodplain hydrology, and do not occur during flood events with the exception of deployable technologies which may be deployed in response to an emergency. Additionally, any effects would be temporary, lasting no more than one season or water year,[123] or occur only during an emergency.

Examples of activities that would have less than significant impacts include:

- Construction of any structure in the 500-year floodplain that is built above base flood elevation pursuant to floodplain management regulations.
- Land uses that include pervious surfaces such as gravel parking lots.
- Land uses that do not change the flow of water or drainage patterns.
- Limited clearing or grading activities.

Implementation of BMPs and mitigation measures would reduce the risk of additional impacts to floodplain degradation (see Chapter 19, BMPs and Mitigation Measures).

Drainage Pattern Alteration

Flooding and erosion from land disturbance can changes drainage patterns. Stormwater runoff causes erosion while construction activities and land clearing can change drainage patterns. Clearing or grading activities, or the creation of walls or berms, can alter water flow in an area or cause changes to drainage patterns. Drainage can be directed to stormwater drains, storage, and retention areas designed to slow water and allow sediments to settle out. Improperly handled drainage can cause increased erosion, changes in stormwater runoff, flooding, and damage to water quality. Existing drainage patterns can be modified by channeling (straightening or restructuring natural watercourses); creation of impoundments (detention basins, retention basins, and dams); stormwater increases; or altered flow patterns.

According to the significance criteria in Table 15.2.4-1, any temporary (lasting less than six months) alterations to drainage patterns that are minor and mimic natural processes or variations within the watershed or subwatershed level would be considered less than significant.

Example of projects that could have minor changes to the drainage patterns include:

- Land uses with pervious surfaces that create limited stormwater runoff.
- Activities designed so that stormwater is contained onsite and does not flow to or impact surface waterbodies offsite on other properties.
- Activities designed so that the amount of stormwater generated before construction is the same as afterwards.
- Activities designed using low impact development techniques for stormwater.

[123] A water year is defined as "the 12-month period October 1, for any given year through September 30, of the following year. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months." (USGS, 2016)

Since the proposed activities would not substantially alter drainage patterns in ways that alter the course of a stream or river; create a substantial and measurable increase in the rate and amount of surface water; or change the hydrologic regime; and any effects would be short-term; impacts to drainage patterns would be less than significant. BMPs, mitigation measures, and avoidance could be implemented to further reduce any potentially significant impacts.

Flow Alteration

Flow alteration refers to the modification of flow characteristics, relative to natural conditions. Human activities may change the amount of water reaching a stream, divert flow through artificial channels, or alter the shape and location of streams. Surface water and groundwater withdrawals can alter flow by reducing water volumes in streams. Withdrawals may return to the surface/groundwater system at a point further downstream, be removed from the watershed through transpiration by crops, lawns or pastures, or be transferred to another watershed altogether (e.g., water transferred to a different watershed for drinking supply). Altered flow can increase flooding and introduce more erosion and potential for pollution. Alternatively, if water is diverted from its normal flow, the opposite may occur; wetlands and streams may not receive as much water as necessary to maintain the ecology and previous functions.

Activities that do not impact discharge or stage of waterbody (stream height) are not anticipated to have an impact on flow, according to Table 15.2.4-1. Projects that include minor consumptive use of surface water with less than significant impacts on discharge (do not direct large volumes of water into different locations) on a temporary (no more than six months) are likely to have less than significant impacts on flow alteration, on a watershed or subwatershed level. Examples of projects likely to have less than significant impacts include:

- Construction of any structure in a 100-year or 500-year floodplain that is built above base flood elevation pursuant to floodplain management regulations.
- Land uses that are maintaining or increasing pervious surfaces.
- Land uses that do not change the flow of water or drainage patterns offsite or into surface waterbodies that have not received that volume of stormwater previously.
- Minor clearing or grading activities.

Since the proposed activities would not likely alter flow characteristics or change the hydrologic regime, impacts would be less than significant impacts to flow alteration. BMPs, mitigation measures, and avoidance could be implemented to further reduce any impacts.

Changes in Groundwater or Aquifer Characteristics

As described in Section 15.1.4.7, most of the drinking water systems in South Dakota rely on groundwater sources. Generally, the water quality of South Dakota's aquifers is suitable for drinking and daily water needs. Groundwater is an important natural resource used by industrial, commercial, agricultural, and residential uses for manufacturing, irrigation, and drinking water purposes. (SD DENR, 1999) Once a groundwater supply is exhausted or contaminated, it is very expensive, and sometimes impossible, to replace. Water supply demand from the deployment activities is unlikely to exceed safe and sustainable withdrawal capacity rate of the local supply or aquifer.

Storage of generator fuel over groundwater or an aquifer would unlikely cause any impacts to water quality. Activities that may cause changes is groundwater or aquifer characteristics include:

- Excavation, mining, or dredging during or after construction.
- Any liquid waste, including but not limited to wastewater, generation.
- Storage of petroleum or chemical products.

Private and public water supplies often use groundwater as a water source. To maintain a sustainable system, the amount of water withdrawn from these groundwater sources must be balanced with the amount of water returned to the groundwater source (groundwater recharge).

Deployment activities should be less than significant since they would not substantially deplete supplies of potable groundwater, as any construction dewatering would be short-term. The siting of deployment activities should, as practicable and feasible, be considered to avoid areas that would extract groundwater from potable groundwater sources in the area.

15.2.4.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to water resources and others would not. In addition, and as explained in this section, the same type of Proposed Action infrastructure could result in a range of no impacts to potentially significant impacts depending on the deployment scenario or site-specific conditions. The impact on the water resources that could be affected would depend on the watershed, duration (chronic or short-term) and frequency (many years or a few months) the resource would be used and the water resource’s current use (sole source for drinking water, considered exceptional value for recreation, or provides critical habitat for a species).

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Infrastructure, the following are likely to have no impacts to water resources under the conditions described below:

- Wired Projects
    - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that there would be no impacts to water resources since the activities that would be conducted at these small entry and exit points are not likely to produce perceptible changes.
    - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to water resources because there would be no ground disturbance.
- Satellites and Other Technologies
    - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would not impact water resources because those activities would not require ground disturbance.
    - 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. As adding equipment to an existing launch vehicle would be very unlikely to impact water resources, it is anticipated that this activity would have no impact on water resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to water resources because of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including impaired water quality. The types of deployment activities that could be part of the Preferred Alternative and result in potential impacts to water resources include the following:

- Wired Projects
    - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to water resources. Land/vegetation clearing and excavation activities, associated with construction of POPs, huts, or other associated facilities could result in direct and indirect impacts to water quality from a temporary increase in the amount of suspended solids running off construction sites. The amount of impact depends on the land area affected, installation technique, and location. Trenching would not be expected to occur near or below the existing water table (depth to water). Implementing BMPs and mitigation measures could reduce impact intensity.
    - New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water would impact water resources from a short-term increase in suspended solids in the water. Site-specific impact assessment could be required to marine and shoreline

environments prior to installation to fully assess potential impacts to lake or river coastal environments.

- New Build – Aerial Fiber Optic Plant: Potential impacts would be similar to Buried Fiber Optic Plant. Ground disturbance activities could cause impacts to water quality from increased suspended solids; groundwater impacts from trenching activities are not expected. If a new roadway were built, additional impervious surface would not be expected to impact water resources or the overall amount of runoff and nonpoint pollution.
- Collocation on Existing Aerial Fiber Optic Plant: Replacement of poles or structural hardening could result in ground disturbance that could cause impacts to water quality from increased suspended solids.
- Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment required grading or other ground disturbance to install small boxes or huts, or access roads, there could potentially be direct and indirect impacts to water quality from a temporary increase in the amount of suspended solids running off construction sites. The amount of impact depends on the land area affected, installation technique, and location. Trenching would not be expected to occur near or below the existing water table (depth to water). If installation of transmission equipment would occur in existing boxes or huts and require no ground disturbance, there would be no impacts to water resources.
- Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to water resources. If required, and if done in existing huts with no ground disturbance, installation of new associated equipment would also have no impacts to water resources. If construction of new huts or other equipment is required, impacts to water quality may occur from a temporary increase in the amount of suspended solids running off construction sites. The amount of impact depends on the land area affected, installation technique, and location.

- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security lighting, electrical feeds, and concrete foundations and pads) or access roads could result in potential direct and indirect impacts to water quality from a temporary increase in the amount of suspended solids running off construction sites. The amount of impact depends on the land area affected, installation technique, and location. Trenching would not be expected to occur near or below the existing water table (depth to water). Implementing BMPs could reduce impact intensity. If a new roadway were built, additional impervious surface would not be expected to impact water resources or the overall amount of runoff and nonpoint pollution.
  - Deployable Technologies: Implementation of land-based deployable technologies could result in potential impacts to water resources if deployment involves movement of

equipment through streams, occurs in riparian or floodplain areas, occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These activities could result in direct and indirect impacts to water quality from a temporary increase in the amount of suspended solids running off construction sites or deployment in unpaved areas. The amount of impact depends on the land area affected, installation technique, and location. Implementing BMPs and mitigation measures could reduce impact intensity. The activities could also result in indirect impacts on water quality if fuels leak into surface or groundwater. Where deployable technologies would be implemented on existing paved surfaces, or where aerial and vehicular deployable technologies may be used on existing paved surfaces, it is anticipated that there would be no impacts to water resources because there would be no ground disturbance.

- Deployment of drones, balloons, blimps, or piloted aircraft could have indirect impacts on water quality if fuels spill or other chemicals seep into ground or surface waters. In general, the abovementioned activities could potentially involve land/vegetation clearing; excavation and trenching; installation of security/safety lighting and fencing; and deployment of aerial platforms. Potential impacts to water resources associated with deployment of this infrastructure could include water quality impacts, but are expected to be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

In general, the abovementioned activities could potentially involve land/vegetation clearing; excavation and trenching; construction of access roads; installation or restructuring of towers or poles; installation of security/safety lighting and fencing; and deployment of aerial platforms. Potential impacts to water resources associated with deployment of this infrastructure could include water quality impacts. BMPs to help mitigate or reduce any potential impacts are described in Chapter 19, BMPs and Mitigation Measures.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities, and are expected to have no impacts. Impacts to water quality would likely be less than significant for operations and maintenance activities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. Impacts to surface and groundwater quality from routine operations and maintenance, such as herbicide application to control vegetation, are not expected.

15.2.4.5. Alternatives Impact Assessment

The following section assesses potential impacts to water resources associated with the Deployable Technologies Alternative and the No Action Alternative.

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 minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. 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. Therefore, potential impacts to water resources from implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in less than significant impacts to water resources could occur on paved surfaces if there is any runoff into the surface water. Some staging or launching/landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These activities could result in direct and indirect impacts to water quality from a temporary increase in the amount of suspended solids running off construction sites. The amount of impact depends on the land area affected, installation technique, and location. Implementing the BMPs and mitigation measures identified in Chapter 19 could further avoid or reduce potential impacts. The activities could also result in indirect impacts on water quality if fuels leak into surface or groundwater.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Deployable Technologies Alternative would consist of routine maintenance and inspection of the deployable technologies. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. The water resources impacts would depend on the watershed, duration (chronic or short-term) and frequency (many years or a few months) the resource would be used, and the water resource’s current use (considered exceptional value for recreation, or provides critical habitat for a species).

It is anticipated that there would be less than significant impacts to water resources associated with routine inspections of the Deployable Technologies Alternative, assuming that the same access roads used for deployment are also used for inspections. If usage of heavy equipment as part of routine maintenance or inspections occurs off of established access roads or corridors and near waterbodies, the resulting ground disturbance could increase sedimentation in waterbodies, potentially impacting water quality. It is assumed that routine maintenance would not include operation of vehicles or equipment in waterbodies. Finally, if ground-based deployable technologies are parked and operated with air conditioning for extended periods, the condensation water from the air conditioner could result in soil erosion that could potentially impact waterbodies if the deployables are located adjacent to waterbodies. Site maintenance, including mowing or herbicides, may result in less than significant effects to water quality, due to the small scale of expected FirstNet activities in any particular location. In addition, the presence of new access roads could increase the overall amount of impervious surface in the area, and increase runoff effects on water resources, as explained above.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to water resources from construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 15.1.4, Water Resources.

15.2.5. Wetlands

15.2.5.1. Introduction

This section describes potential impacts to wetlands in South Dakota associated with deployment and operation of the Proposed Action and Alternatives. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.5.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on wetlands were evaluated using the significance criteria presented in Table 15.2.5-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to wetlands addressed in this section are presented as a range of possible impacts.

Table 15.2.5-1: Impact Significance Rating Criteria for Wetlands

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Direct wetland loss (fill or conversion to non-wetland)	Magnitude or Intensity	Substantial loss of high-quality wetlands (e.g., those that provide critical habitat for sensitive or listed species, are rare or a high-quality example of a wetland type, are not fragmented, support a wide variety of species, etc.); violations of Section 404 of the CWA.	Effect that is potentially significant, but with mitigation is less than significant.	Impacts to lower quality wetlands (e.g., not rare or unique, that have low productivity and species diversity, and those that are already impaired or impacted by human activity).	No direct loss of wetlands.
	Geographic Extent/Context	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Chronic and long term changes not likely to be reversed over several years or seasons.		Periodic and/or temporary loss reversed over 1-2 growing seasons with or without active restoration.	NA
Other direct effects: vegetation clearing; ground disturbance; direct hydrologic changes (flooding or draining); direct soil changes; water quality degradation (spills or sedimentation)	Magnitude or Intensity	Substantial and measurable changes to hydrological regime of the wetland impacting salinity, pollutants, nutrients, biodiversity, ecological integrity, or water quality; introduction and establishment of invasive species to high quality wetlands.	Effect that is potentially significant, but with mitigation is less than significant.	Impacts to lower quality wetlands affecting the hydrological regime including salinity, pollutants, nutrients, biodiversity, ecological integrity, or water quality; introduction and establishment of invasive species to high quality wetlands.	No direct impacts to wetlands affecting vegetation, hydrology, soils, or water quality.
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
	Duration or Frequency	Long-term or permanent alteration that is not restored within 2 growing seasons, or ever.		Periodic and/or temporary loss reversed over 1-2 growing seasons with or without active restoration.	NA
Indirect effects:[2] change in function(s)[3] change in wetland type	Magnitude or Intensity	Changes to the functions or type of high quality wetlands (e.g., those that provide critical habitat for sensitive or listed species, are rare or a high-quality example of a wetland type, are not fragmented, support a wide variety of species, etc.).	Effect that is potentially significant, but with mitigation is less than significant.	Impacts to lower quality wetlands (e.g., not rare or unique, that have low productivity and species diversity, and those that are already impaired or impacted by human activity).	No changes in wetland function or type.
	Geographic Extent	Watershed level, and/or within multiple watersheds.		Watershed or subwatershed level.	NA
	Duration or Frequency	Long-term or permanent.		Periodic and/or temporary loss reversed over 1-2 growing seasons with or without active restoration.	NA

[1] "Magnitude" is defined based on the type of wetland impacted, using USACE wetland categories (USACE 2014). Category 1 are the highest quality, highest functioning wetlands

[2] Indirect effects are those resulting from direct effects, but they occur elsewhere in space and/or time. Includes indirect hydrologic effects (wetting or drying) that in turn alters wetland function or type

[3] Wetland functions include hydrologic, ecological, geomorphic, and social functions typically assessed for wetlands as part of USACE compensatory mitigation planning. Typical functions assessed may include flood attenuation, bank stabilization, water quality, organic matter input/transport, nutrient processing, wildlife habitat, T/E species habitat, biodiversity, recreational/social value.

NA = Not Applicable

15.2.5.3. Description of Environmental Concerns

Potential Direct Wetland Loss (Fill or Conversion to Non-Wetland)

Construction-related impacts from several of the deployment activities have the potential for direct wetland impacts such as filling, draining, or conversion to a non-wetland. Examples include placement of fill in a wetland to construct a new tower, trenching through a wetland or directly connected waterway to install a cable, and placement of a structure (tower, building) within the wetland.

Wetlands regulate the quality and quantity of surface and groundwater supplies, reduce flood hazards by serving as retention basins for surface runoff, and maintain water supplies after floodwaters subside. If wetlands were filled, the entire area may be at risk for increased flooding. There could be a loss of open space to be enjoyed by the community, and decreased wildlife populations may be observed due to displacement and increased noise, light, and other human disturbance. To the extent practicable or feasible, FirstNet and/ or their partners would avoid filling wetlands or altering the hydrologic regime so that wetlands would not be lost or converted to non-wetlands. Loss of high and low-quality wetlands would be less than significant given the amount of land disturbance associated with the project locations (generally less than an acre) and the short time-frame of deployment activities. Additionally, all site-specific locations will be subject to an environmental review to help ensure environmental concerns are addressed. Potential wetlands impacts can be further reduced by implementing BMPs and mitigation measures (see Chapter 19, BMPs and Mitigation Measures).

There are more than 2 million acres of wetlands throughout South Dakota (USFWS, 2014c). In South Dakota, the main type of wetlands are palustrine (freshwater) wetlands found on river and lake floodplains across the state, as shown in Figure 15.1.5-1 and Figure 15.1.5-2.

Based on the impact significance criteria presented in Table 15.2.5 1, the deployment activities would most likely have less than significant direct impacts on wetlands. Additionally, the deployment activities would not violate applicable federal, state, and local regulations.

In South Dakota, as discussed in Section 15.1.5.4, Wetlands, regulated high quality wetlands include prairie potholes and peatlands.

- Prairie potholes are depressional wetlands, which usually occur within uplands. They are filled by rain and groundwater (SDGFP, 2015n). Common prairie pothole plants in South Dakota include cattail (*Typha sp.*), bulrush (*Scirpus sp.*), and horsetail (*Equisetem sp.*). The Prairie Pothole Region is in eastern South Dakota, north and east of the Missouri River. The entire region extends into western Minnesota, eastern North Dakota, Iowa, Alberta, Saskatchewan, and Manitoba. This unique area contains millions of depressional wetlands "that constitute one of the richest wetland complexes in the world." (Bakker, 2005) (Young, 1992)
- Peatlands are protected under the USACE Nationwide permit regional conditions. Peatlands control water runoff during storms, reduce soil erosion, absorb, filter, and hold contaminants. They control water flow by soaking up flood and meltwater, then releasing the water more

slowly. Peatlands also convert accumulated plant materials to peat, which stores carbon. There are two main types of peatlands, differentiated by how they receive water; bogs receive water only from precipitation; fens are fed by surface and groundwater. (SDGFP, 2015n)

If any of the proposed deployment activities were to occur in these high quality wetlands, potentially significant impacts could occur. High quality wetlands occur throughout the state, and are not always included on state maps; therefore, site-specific analysis would be required, in addition to BMPs and mitigation measures to avoid potentially significant impacts to wetlands.

Potential Other Direct Effects

Direct impacts consist of altering the chemical, physical, or biological components of a wetland to the extent that changes to the wetland functions occur. However, direct impacts would not result in a loss of total wetland acreage. Changes, for example, could include conversion of a forested wetland system to a non-forested state through mechanical, or hydrologic manipulation; altered hydrologic conditions (increases or decreases) such as stormwater discharges or water withdrawals that alter the functions of the wetlands.

Based on the impact significance criteria presented in Table 15.2.5-1, construction-related deployment activities that result in long-term or permanent, substantial, and measurable changes to hydrological regime of the wetland (i.e., changes in salinity, pollutants, nutrients, biodiversity, ecological integrity, or water quality) could cause potentially significant impacts. In addition, introduction and establishment of invasive species to high quality wetlands within a watershed or multiple watersheds could be potentially significant. Other direct effects to high- and low-quality wetlands would be less than significant given the amount of land disturbance associated with the project locations (generally less than an acre) and the short time-frame of deployment activities and the application of federal, state, and local wetlands regulations. Additionally, site-specific locations will be subject to an environmental review to help ensure environmental concerns are addressed. Potential wetlands impacts can be further reduced by implementing BMPs and mitigation measures (see Chapter 19, BMPs and Mitigation Measures).

Examples of activities that could have other direct effects to wetlands in South Dakota include:

- Vegetation Clearing: removing existing vegetation by clearing forest and herbaceous vegetation during construction activities, grading, seeding, and mulching. Clearing and grading may include increased soil erosion and a decrease in the available habitat for wildlife.
- Ground Disturbance: Increased amounts of stormwater runoff in wetlands can alter water level response times, depths, and duration of water detention. Reduction of watershed infiltration capacity could cause wetland water depths to rise more rapidly following storm events.
- Direct Hydrologic Changes (flooding or draining): Greater frequency and duration of flooding can destroy native plant communities, as can depriving them of their water supply. Hydrologic changes can make a wetland more vulnerable to pollution. Increased water

depths or flooding frequency can distribute pollutants more widely through a wetland. Sediment retention in wetlands is directly related to flow characteristics, including degree and pattern of channelization, flow velocities, and storm surges.

- Direct Soil Changes: Changes in soil chemistry can lead to degradation of wetlands that have a specific pH range and/or other parameter, such as the acidic conditions of bogs and alkaline conditions of fens (which are high quality wetlands in South Dakota).
- Water Quality Degradation (spills or sedimentation): The loss of wetlands results in a depletion of water quality both in the wetland and downstream. Filtering of pollutants by wetlands is an important function and benefit. High levels of suspended solids (sedimentation) can reduce light penetration, dissolved oxygen, and overall wetland productivity. Toxic materials in runoff can interfere with the biological processes of wetland plants, resulting in impaired growth, mortality, and changes in plant communities.

Indirect Effects:[124] Change in Function(s)[125] or Change in Wetland Type

Indirect effects to wetlands could include change in wetland function or conversion of a resource to another type (i.e., wetland to an open body of water). The construction of curb and gutter systems diverts surface runoff and can cause flooding or wetlands to dry out, depending on the direction of diversion. Indirect effects to both high- and low-quality wetlands would be less than significant given the amount of land disturbance associated with the project locations (generally less than an acre) and the short time-frame of deployment activities and the application of federal, state, and local wetlands regulations. Additionally, site-specific locations will be subject to an environmental review to help ensure environmental concerns are addressed. Potential wetlands impacts can be further reduced by implementing BMPs and mitigation measures (see Chapter 19, BMPs and Mitigation Measures) . Examples of functions related to wetlands in South Dakota that could potentially be impacted from construction-related deployment activities include:

- Flood Attenuation: Wetlands provide flood protection by holding excess runoff after storms, before slowly releasing it to surface waters. While wetlands may not prevent flooding, they can lower flood peaks by providing detention of storm flows.
- Bank Stabilization: By reducing the velocity and volume of flow, wetlands provide erosion control, floodwater retention, and reduce stream sedimentation.
- Water Quality: Water quality impacts on wetland soils can eventually threaten a wetland's existence. Where sediment inputs exceed rates of sediment export and soil consolidation, a wetland would gradually become filled.

[124] Indirect effects are those resulting from direct effects, but they occur elsewhere in space and/or time. Includes indirect hydrologic effects (wetting or drying) that in turn alters wetland function or type.
[125] Wetland functions include hydrologic, ecological, geomorphic, and social functions typically assessed for wetlands as part of USACE compensatory mitigation planning. Typical functions assessed may include flood attenuation, bank stabilization, water quality, organic matter input/transport, nutrient processing, wildlife habitat, T/E species habitat, biodiversity, recreational/social value.

- Nutrient Processing: Wetland forests retain ammonia during seasonal flooding. Wetlands absorb metals in the soils and by plant uptake via the roots. They also allow metabolism of oxygen-demanding materials and reduce fecal coliform populations. These pollutants are often then buried by newer plant material, isolating them in the sediments.
- Wildlife Habitat: Impacts on wetland hydrology and water quality affect wetland vegetation. While flooding can harm some wetland plant species, it promotes others. Shifts in plant communities because of hydrologic changes can have impacts on the preferred food supply and animal cover.
- Recreational Value: Wetlands provide recreation opportunities for people, such as hiking, bird watching, and photography.
- Groundwater Recharge: Wetlands retain water, allowing time for surface waters to infiltrate into soils and replenish groundwater.

According to the significance criteria defined in Table 15.2.5-1, impacts to lower quality wetlands (e.g., not rare or unique, that have low productivity and species diversity, and those that are already impaired or impacted by human activity), would be considered potentially less than significant. Since the majority of the wetlands in South Dakota are not considered high quality, deployment activities could have less than significant indirect impacts on wetlands in the state. BMPs and mitigation measures could be implemented, as feasible and practicable, to reduce potential impacts to all wetlands.

In areas of the state with high quality wetlands, there could be potentially significant impacts at the project level that would be analyzed on a case-by-case basis. If avoidance were not possible, BMPs and mitigation measures would help to mitigate impacts.

15.2.5.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities. To determine the magnitude of potential impacts of site-specific activities, wetland delineations could be required to determine the exact location of all wetlands, including high quality wetlands, as well as a functional assessment by an experienced wetland delineator.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to wetlands and others would not. In addition, and as explained in this section, the same type of Proposed Action infrastructure could result in a range of no impacts to potentially significant impacts depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to wetlands under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant*:* Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that there would be no impacts to wetlands since the activities that would be conducted at these small entry and exit points are not likely to produce perceptible changes.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable*:* Lighting up of dark fiber would have no impacts to wetlands because there would be no ground disturbance.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment*:* It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology is not likely to impact wetlands since there would be no ground disturbance.
  - Deployment of Satellites*:* FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact wetlands, it is anticipated that this activity would have no impact on wetlands.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to wetlands because of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including direct effects, other direct effects, and indirect effects on wetlands. The types of deployment activities that could be part of the Preferred Alternative and result in potential impacts to wetlands include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant*:* Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to wetlands. Land/vegetation clearing and excavation activities, associated with construction of POPs, huts, or other associated facilities could result in direct and indirect impacts to wetlands. The amount of impact depends on the land area affected, installation technique, proximity to wetlands, and type of wetland that could be affected (e.g., high quality). Any ground disturbance could cause direct and/or indirect impacts wetlands,

depending on the proximity to wetlands and type of wetlands that could be affected. Implementing BMPs and mitigation measures could reduce impact intensity.

- New Build – Submarine Fiber Optic Plant*:* The installation of cables in or near bodies of water would potentially impact wetlands found along shorelines. Additional project-specific environmental reviews would be required to assess potential impacts to wetland environments, including coastal and marine environments.
- New Build – Aerial Fiber Optic Plant*:* Potential impacts would be similar to Buried Fiber Optic Plant. Any ground disturbance could cause direct and indirect impacts wetlands, depending on the proximity to wetlands and type of wetlands that could be affected.
- Collocation on Existing Aerial Fiber Optic Plant*:* Any ground disturbance could cause direct and indirect impacts to wetlands from increased suspended solids and runoff from activities, depending on the proximity to wetlands and type of wetlands that could be affected.
- Installation of Optical Transmission or Centralized Transmission Equipment*:* If installation of transmission equipment required grading or other ground disturbance to install small boxes or hunts, or access roads, there could potentially be direct and indirect impacts to wetlands. The amount of impact from a temporary increase in the amount of suspended solids running off construction sites and into wetlands, depends on the land area affected, installation technique, and location. If trenching were to occur near wetlands, it could cause impacts on wetlands. Implementing BMPs and mitigation measures could reduce impact intensity.

- Wireless Projects
  - New Wireless Communication Towers*:* Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could potentially cause direct and indirect impacts to wetlands. The activities could cause a temporary increase in the amount of suspended solids running off construction sites and into wetlands, depending on their proximity. The amount of impact depends on the land area affected, installation technique, and proximity to wetlands, and wetland type. If trenching were to occur near wetlands, it could cause impacts on wetlands. Implementing BMPs and mitigation measures could reduce impact intensity.
  - Collocation on Existing Wireless Tower, Structure, or Building*:* Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, which would not result in impacts to wetlands. However, if additional power units are needed, structural hardening and physical security measures requiring ground disturbance, such as grading, or excavation activities, impacts to wetlands could occur near wetlands, it could cause impacts on wetlands. Implementing BMPs and mitigation measures (see Chapter 19, BMPs and Mitigation Measures) could reduce impact intensity.

- Deployable Technologies*:* Implementation of deployable technologies could result in potential impacts to wetlands if deployment occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. The amount of impact depends on the land area affected, installation technique, and location. Implementing BMPs and mitigation measures could reduce impact intensity. The activities could also result in other direct impacts on wetlands if fuels leak into nearby waterbodies or wetlands. Deployment of drones, balloons, or blimps piloted aircraft could have other direct impacts on wetlands if fuels spill or other chemicals seep into nearby waterbodies or wetlands.

In general, the abovementioned activities could potentially involve land/vegetation clearing; excavation and trenching; construction of access roads; installation or restructuring of towers, poles, or underwater cables; installation of security/safety lighting and fencing; and deployment of aerial platforms. Depending on the deployment activity for this infrastructure, potential impacts to wetlands may occur. The amount of impact depends on the land area affected, installation technique, proximity to wetlands, and type of wetland that could be affected (e.g., high quality). Any ground disturbance could cause direct and indirect impacts wetlands, depending on the proximity to wetlands and type of wetlands that could be affected. These impacts are expected to be less than significant. These impacts are expected to be less than significant due to the small amount of land disturbance (generally less than one acre) and the short timeframe of deployment activities. To minimize any potential impacts to wetlands, BMPs and mitigation measures would be implemented in compliance with any issued federal, state, and local permits. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to further avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. It is anticipated that there could be ongoing other potential other direct impacts to wetlands if heavy equipment is used for routine operations and maintenance application of herbicides occurs to control vegetation along all ROWs and near structures, depending on the proximity to wetlands. The intensity of the impact depends on the amount of herbicides used, frequency, and location of nearby sensitive wetlands. These impacts are not expected to be significant as it is anticipated that such herbicide applications would be intermittent and use a minimal amount of herbicides. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to further avoid or minimize potential impacts.

15.2.5.5. Alternatives Impact Assessment

The following section assesses potential impacts to water resources associated with the Deployable Technologies Alternative and the No Action alternative.

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 minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. 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. Therefore, potential impacts to wetlands from implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in less than significant impacts to wetlands. Some staging or launching/landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These activities could result in direct and/or indirect impacts to wetlands from a temporary increase in the amount of suspended solids running off construction sites to nearby surface waters. The amount of impact depends on the land area affected, installation technique, and proximity to wetlands, and wetland type; however, impacts are expected to be less than significant due to the small scale and temporary duration of expected FirstNet deployment activities in any one location. To minimize any potential impacts to wetlands, BMPs and mitigation measures would be implemented in compliance with any issued federal, state, and local permits. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to further avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Deployable Technologies Alternative would consist of routine maintenance and inspection of the deployable technologies. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. The wetlands impacts would depend on the watershed, duration (chronic or short-term) and frequency (many years or a few months) the resource would be used, and the wetland's quality and function.

It is anticipated that there would be less than significant impacts to wetlands associated with routine inspections of the Deployable Technologies Alternative. Site maintenance, including mowing or herbicides, is anticipated to result in less than significant effects to wetlands, depending on the proximity to, wetland type, and amount of herbicides used. In addition, the presence of new access roads could increase the overall amount of impervious surface in the area, and increase runoff effects on wetlands, as explained above.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to wetlands from construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 15.1.5, Wetlands.

15.2.6. Biological Resources

15.2.6.1. Introduction

This section describes potential impacts to terrestrial vegetation, wildlife, fisheries and aquatic habitat, and threatened and endangered species in South Dakota associated with deployment and operation of the Proposed Action and its alternatives. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.6.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on terrestrial vegetation, wildlife, fisheries, and aquatic habitats were evaluated using the significance criteria presented in Table 15.2.6-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to terrestrial vegetation, wildlife, and fisheries and aquatic habitat addressed in Sections 15.2.6.3, 15.2.6.4, and 15.2.6.5, respectively, are presented as a range of possible impacts.

Refer to Section 15.2.6.6 for impact assessment methodology and significance criterial associated with threatened and endangered species in South Dakota.

Table 15.2.6-1: Impact Significance Rating Criteria for Terrestrial Vegetation, Wildlife, Fisheries, and Aquatic Habitats

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
Direct Injury/Mortality	Magnitude or Intensity	Population-level or sub-population injury /mortality effects observed for at least one species depending on the distribution and the management of said species. Events that may impact endemics, or concentrations during breeding or migratory periods. Violation of various regulations including MBTA and Bald and Golden Eagle Protection Act (BGEPA).	Effect that is potentially significant, but with BMPs and mitigation measures is less than significant.	Individual mortality observed but not sufficient to affect population or sub-population survival.	No direct individual injury or mortality would be observed.
	Geographic Extent	Regional effects observed within South Dakota for at least one species. Anthropogenic disturbances that lead to exclusion from nutritional or habitat resources, or direct injury or mortality of endemics or a significant portion of the population or sub-population located in a small area during a specific season.		Effects realized at one location when population is widely distributed, and not concentrated in affected area.	NA
	Duration or Frequency	Chronic and long-term effects not likely to be reversed over several years for at least one species.		Temporary, isolated, or short-term effects that are reversed within one to three years.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Vegetation and Habitat Loss, Alteration, or Fragmentation	Magnitude or Intensity	Population-level or sub-population effects observed for at least one species or vegetation cover type, depending on the distribution and the management of the subject species. Impacts to terrestrial, aquatic, or riparian habitat or other sensitive natural community vital for feeding, spawning/breeding, foraging, migratory rest stops, refugia, or cover from weather or predators. Violation of various regulations including MBTA and BGEPA.	Effect that is potentially significant, but with BMPs and mitigation measures is less than significant.	Habitat alteration in locations not designated as vital or critical for any period. Temporary losses to individual plants within cover types, or small habitat alterations take place in important habitat that is widely distributed and there are no cover type losses or cumulative effects from additional projects.	Sufficient habitat would remain functional to maintain viability of all species. No damage or loss of terrestrial, aquatic, or riparian habitat from project would occur.
	Geographic Extent	Regional effects observed within South Dakota for at least one species. Anthropogenic disturbances that lead to the loss or alteration of nutritional or habitat resources for endemics or a significant portion of the population or sub-population located in a small area during a specific season.		Effects realized at one location.	NA
	Duration or Frequency	Chronic and long-term effects not likely to be reversed over several years for at least one species.		Temporary, isolated, or short-term effects that are reversed within one to three years.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
Indirect Injury/Mortality	Magnitude or Intensity	Population-level or sub-population effects observed for at least one species depending on the distribution and the management of said species. Exclusion from resources necessary for the survival of one or more species and one or more life stages. Anthropogenic disturbances that lead to mortality, disorientation, the avoidance or exclusion from nutritional or habitat resources for endemics or a significant portion of the population or sub-population located in a small area during a specific season. Violation of various regulations including MBTA and BGEPA.	Effect that is potentially significant, but with BMPs and mitigation measures is less than significant.	Individual injury/mortality observed but not sufficient to affect population or sub-population survival. Partial exclusion from resources in locations not designated as vital or critical for any given species or life stage, or exclusion from resources that takes place in important habitat that is widely distributed. Anthropogenic disturbances are measurable but minimal as determined by individual behavior and propagation, and the potential for habituation or adaptability is high given time.	No stress or avoidance of feeding or important habitat areas. No reduced population resulting from habitat abandonment.
	Geographic Extent	Regional or site-specific effects observed within South Dakota for at least one species. Behavioral reactions to anthropogenic disturbances depend on the context, the time of year age, previous experience and activity. Anthropogenic disturbances that lead to startle responses of large groupings of individuals during haulouts, resulting in injury or mortality.		Effects realized at one location.	NA
	Duration or Frequency	Chronic and long-term effects not likely to be reversed over several years for at least one species.		Temporary, isolated, or short-term effects that are reversed within one to three years.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Effects to Migration or Migratory Patterns	Magnitude or Intensity	Population-level or sub-population effects observed for at least one species depending on the distribution and the management of said species. Temporary or long-term loss of migratory pattern/path or rest stops due to anthropogenic activities. Violation of various regulations including MBTA and BGEPA.	Effect that is potentially significant, but with BMPs and mitigation measures is less than significant.	Temporary loss of migratory rest stops due to anthropogenic activities take place in important habitat that is widely distributed and there are no cumulative effects from additional projects.	No alteration of migratory pathways, no stress or avoidance of migratory paths/patterns due to project.
	Geographic Extent	Regional effects observed within South Dakota for at least one species. Anthropogenic disturbances that lead to exclusion from nutritional or habitat resources during migration, or lead to changes of migratory routes for endemics or a significant portion of the population or sub-population located in a small area during a specific season.		Effects realized at one location when population is widely distributed, and not concentrated in affected area.	NA
	Duration or Frequency	Chronic and long-term effects not likely to be reversed over several years for at least one species.		Temporary, isolated, or short-term effects that are reversed within one to three years.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Reproductive Effects	Magnitude or Intensity	Population or sub-population level effects in reproduction and productivity over several breeding/spawning seasons for at least one species depending on the distribution and the management of said species. Violation of various regulations including MBTA and BGEPA.	Effect that is potentially significant, but with BMPs and mitigation measures is less than significant.	Effects to productivity are at the individual rather than population level. Effects are within annual variances and not sufficient to affect population or sub-population survival.	No reduced breeding or spawning success.
	Geographic Extent	Regional effects observed within South Dakota for at least one species. Anthropogenic disturbances that lead to exclusion from prey or habitat resources required for breeding/spawning or stress, abandonment and loss of productivity for endemics or a significant portion of the population or sub-population located in a small area during the breeding/spawning season.		Effects realized at one location.	NA
	Duration or Frequency	Chronic and long-term effects not likely to be reversed over several breeding/spawning seasons for at least one species.		Temporary, isolated, or short-term effects that are reversed within one breeding season.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Invasive Species Effects	Magnitude or Intensity	Extensive increase in invasive species populations over several seasons.	Effect that is potentially significant, but with BMPs and mitigation measures is less than significant.	Mortality observed in individual native species with no measurable increase in invasive species populations.	No loss of forage and cover due to the invasion of exotic or invasive plants introduced to project sites from machinery or human activity.
	Geographic Extent	Regional impacts observed throughout South Dakota.		Effects realized at one location.	NA
	Duration or Frequency	Chronic and long-term changes not likely to be reversed over several years or seasons.		Periodic, temporary, or short-term changes that are reversed over one or two seasons.	NA

NA = Not Applicable

15.2.6.3. Terrestrial Vegetation

Impacts to terrestrial vegetation occurring in South Dakota are discussed in this section.

Description of Environmental Concerns

Direct Injury/Mortality

Direct injury/mortality effects are physical injuries, extreme physiological stress, or death of an individual organism from interactions associated with the Proposed Action. The most common direct injuries are permanent or temporary loss or disturbance of individual plants. Based on the impact significance criteria presented in Table 15.2.6-1, direct injury or mortality impacts could be significant if population-level or sub- population effects were observed for at least one species depending on the distribution and the management of the subject species. Although unlikely, direct mortality/injury to plants could occur in construction zones from land clearing, excavation activities, or vehicle traffic; however, these events are expected to be relatively small in scale. The implementation of BMPs and mitigation measures and avoidance measures would help to minimize or altogether avoid potential impacts to plant population survival.

Vegetation and Habitat Loss, Alteration, or Fragmentation

Habitat impacts are primarily physical disturbances that result in alterations in the amount or quality of a habitat. As with all of the effects categories, the magnitude of the impact depends on the duration, location, and spatial scale of the system and associated activities. Habitat fragmentation is the loss or breaking down of continuous and connected habitat. Areas near Rapid City and Pierre have experienced land use changes due to urbanization, while other portions of the state have experienced land use changes from agriculture. However, a large portion of the state consists of unfragmented forested.

Construction of new infrastructure and long-term facility maintenance would result in the alteration of the type of vegetative communities in these localized areas, and in some instances the permanent loss of vegetation. Further, if proposed sites with sensitive or rare regional vegetative communities are unavoidable, BMPs and mitigation measures could be recommended to help minimize or avoid potential impacts.

Indirect Injury/Mortality

Indirect effects are effects that are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable (40 CFR 1508.8[b]). Indirect injury/mortality can include stress related to disturbance. The alteration of soils or hydrology within a localized area can result in stress or mortality of plants. Construction activities that remove large quantities of soil in the immediate vicinity of trees could cause undue stress to trees from root exposure, although this is unlikely to occur due to the small size of expected FirstNet activities. Increasing or decreasing hydrology in an area as an indirect effect, could lead to moisture stress and/or mortality of plant species that are adapted to specific hydrologic regimes. Indirect injury/mortality impacts vary depending on the species, time of year and duration of construction or deployment, though BMPs and mitigation measures could help to minimize or avoid the potential impacts.

Effects to Migration or Migratory Patterns

No effects to the long-term migration or migratory patterns for terrestrial vegetation (e.g., forest migration) are expected as a result of the Proposed Action given the small scale of deployment activities.

Reproductive Effects

No reproductive effects to terrestrial vegetation are expected as a result of the Proposed Action given the small scale of deployment activities.

Invasive Species Effects

When human activity results in a species entering an ecosystem new to it, the species is classified as introduced or, depending on its ability to spread rapidly and outcompete native species, invasive. The introduction of invasive species can have a dramatic effect on natural resources and biodiversity. Several South Dakota regulations govern the management of invasive species and noxious weeds. SDWPCC under SDDA must “formulate a weed and pest program for the prevention, suppression, control, and eradication of weeds and pests in South Dakota” (SDCL 38-22-7 and 38-22-9). Additionally, other plant pests that are not considered noxious weeds but that are non-native plants are quarantined; treatment methods must be established for these species (SDCL 38-24A-6).

When non-native species are introduced into an ecosystem in which they did not evolve, their populations sometimes increase rapidly. Natural or native community species evolve together into an ecosystem with many checks and balances that limit the population growth of any one species. These checks and balances include such things as predators, herbivores, diseases, parasites, and other organisms competing for the same resources and limiting environmental factors. However, when an organism is introduced into an ecosystem in which it did not evolve naturally, those limits may not exist and its numbers can sometimes dramatically increase. The unnaturally large population numbers can then have severe impacts to the environment, local economy, and human health. Invasive species can out-compete the native species for food and habitats and sometimes even cause their extinction. There are seven state-listed noxious weeds (SDR 12:62:03:01.06) and 22 non-native plant species (SDR 12:51:03:01) are regulated in South Dakota. All noxious weeds are also considered non-native species. Two of the 22 species occur on the Federal Noxious Weed List (USDA, 2014a). Of these species/complexes, 20 of them are terrestrial and 2 are aquatic species (Burgess & Bertrand, 2008). Even if natives are not completely eliminated, the ecosystem often becomes much less diverse (USFWS, 2012).

The potential to introduce invasive plants within construction zones and during long-term site maintenance can occur from vehicles and equipment being transported from one region to another, or when conducting revegetation of a site after deployment activities are complete. BMPs could help to minimize or avoid the potential for introducing invasive plant species during implementation of the Proposed Action.

Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including construction/deployment and operational activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to terrestrial vegetation resources and others would not. In addition, the same type of Proposed Action Infrastructure could result in a range impacts, from no impacts to less than significant impacts, depending on the deployment scenario or site-specific conditions. The terrestrial vegetation that would be affected would depend on the ecoregion, the species' phenology,[126] and the nature as well as the extent of the habitats affected.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are expected to have no impacts to terrestrial vegetation under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. Although terrestrial vegetation could be impacted, it is anticipated that effects to vegetation would be minimal since the activities that would be conducted at these small entry and exit points are not likely to produce perceptible changes.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to terrestrial vegetation because there would be no ground disturbance.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures, attaching equipment to satellite launches for other purposes, and the use of portable devices that use satellite technology would not impact terrestrial vegetation because those activities would not require ground disturbance.
  - 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. As adding equipment to an existing launch

[126] Phenology is the seasonal changes in plant and animal lifecycles, such as emergence of insects or migration of birds.

vehicle would be very unlikely to impact biological resources, it is anticipated that this activity would have no impact on terrestrial vegetation.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to terrestrial vegetation as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including direct injury/mortality; vegetation and habitat loss, alteration, or fragmentation; indirect injury/mortality; and invasive species effects. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential impacts to terrestrial vegetation include the following:

- Wired Projects
    - New Build – Buried Fiber Optic Plant: Plowing, trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to terrestrial vegetation. Land/vegetation clearing and excavation activities, associated with construction of POPs, huts, or other associated facilities could result in direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species effects if BMPs and mitigation measures are not implemented.
    - New Build – Aerial Fiber Optic Plant: The installation of new poles and hanging cable and associated security, safety, or public lighting components on public right-of-ways (ROWs) or private easements as well as the construction of access roads, POPs, huts, or facilities to house outside plant equipment could result in potential impacts to terrestrial vegetation. Impacts may vary depending on the number or individual poles installed, but could include direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species effects if BMPs and mitigation measures are not implemented.
    - Collocation on Existing Aerial Fiber Optic Plant: Land clearing and excavation during replacement of poles and structural hardening could result in direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species effects.
    - New Build – Submarine Fiber Optic Plant: The installation of cables in bodies of water would not impact terrestrial vegetation. However, impacts to terrestrial vegetation could potentially occur as a result of the construction of landings and/or facilities on shore to accept submarine cables could potentially occur as a result of land clearing, excavation activities, and heavy equipment use. Effects could include direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species effects if BMPs and mitigation measures are not implemented.
    - Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment required construction of access roads, trenching,

and/or land clearing, such disturbance could result in direct or indirect injury to plants, the vegetation loss, and invasive species effects.

- Wireless Projects
  - New Wireless Communication Towers or Backhaul Equipment: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads), microwave facilities, or access roads could result in impacts to terrestrial vegetation. Land/vegetation clearing, excavation activities, landscape grading, and other disturbance activities during the installation of new wireless towers and associated structures or access roads could result in direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species effects.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, which would not result in impacts to terrestrial vegetation. However, if new power units, replacement towers, structural hardening, and physical security measures require land clearing or excavation activities, impacts would be similar to new wireless construction.
  - Deployable Technologies: Implementation of deployable technologies including COWs, COLTs, or SOWs could result in direct impacts to terrestrial vegetation if deployment occurs on vegetated areas, or the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These activities could result in direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species effects.
  - Deployment of drones, balloons, blimps, or piloted aircraft could potentially impact terrestrial vegetation if launching or recovery occurs on vegetated areas. Impacts would be similar to deployment of COWs, COLTs, and SOWs.

In general, the abovementioned activities could potentially involve land/vegetation clearing; topsoil removal; excavation and trenching; construction of access roads; installation or restructuring of towers, poles, or cables; heavy equipment movement; installation of security/safety lighting and fencing; and deployment of aerial platforms. Potential impacts to terrestrial vegetation associated with deployment of this infrastructure, depending on their scale, could include direct or indirect injury/mortality to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species depending on the ecoregion, the species' phenology, and the nature and extent of the vegetation affected. These impacts are expected to be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operational activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the above-mentioned deployment impacts. The terrestrial vegetation that would be affected would depend on the ecoregion, the species' phenology, and the nature and extent of the habitats affected.

It is anticipated that there would be no impacts to terrestrial vegetation associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. Site maintenance, including mowing or herbicides, may result in less than significant effects to terrestrial vegetation from accidental spills from maintenance equipment or release of herbicides and because these areas would not be allowed to revert to a more natural state. If usage of heavy equipment or land clearing activities occurs off established roads or corridors as part of routine maintenance or inspections, direct or indirect injury/mortality to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species could occur to terrestrial vegetation, however impacts are expected to be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Alternatives Impact Assessment

The following section assesses potential impacts to terrestrial vegetation associated with the Deployable Technologies Alternative and the No Action Alternative.

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 minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. 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. Therefore, potential impacts to terrestrial vegetation as a result of implementation of this alternative could be as described below.

<u>Deployment Impacts</u>

As described above, implementation of deployable technologies could result in less than significant impacts from land/vegetation clearing, excavation, and paving activities. These activities could result in direct or indirect injury to plants; the loss, alteration, or fragmentation of vegetative communities; and invasive species effects. Greater frequency and duration of deployments could change the magnitude of impacts. However, impacts are expected to remain less than significant due to the relatively small scale of FirstNet activities at individual locations. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operational Impacts

As described above, operational activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be less than significant impacts to terrestrial vegetation associated with routine operations, management, and monitoring due to the relatively small scale of likely FirstNet project sites. The impacts can vary greatly among species, vegetative community, and geographic region, but are expected to be less than significant.

No Action Alternative

Under the No Action Alternative, the nationwide, interoperable, public safety broadband network would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to terrestrial vegetation as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 15.1.6.3, Terrestrial Vegetation.

15.2.6.4. Wildlife

Impacts to amphibians and reptiles, terrestrial mammals, birds, and terrestrial invertebrates occurring in South Dakota are discussed in this section.

Description of Environmental Concerns

Direct Injury/Mortality

Direct injury/mortality effects are physical injuries, extreme physiological stress, or death of an individual organism from interactions associated with the Proposed Action. The most common direct injuries are entanglement, vehicle or vessel strike, problems associated with accidental ingestion, and injuries incurred by sensitive animals from disturbance events.

Based on the impact significance criteria presented in Table 15.2.6-1, less than significant impacts would be anticipated given the anticipated small size and nature of the majority of proposed deployment activities. Although anthropogenic disturbances may be measurable but minimal for some FirstNet projects, impacts to individual behavior of animals would be short-term and direct injury or mortality impacts at the population-level or sub-population effects would not likely be observed.

Terrestrial Mammals

Vehicle strikes are common sources of direct mortality or injury to both small and large mammals in South Dakota. Mammals are attracted to roads for a variety of reasons including use as a source of minerals, preferred vegetation along roadways, areas of insect relief, and ease of travel along road corridors (FHWA, 2015i). Individual injury or mortality as a result of vehicle strikes associated with the Proposed Action could occur.

Entanglement in fences or other barriers could be a source of mortality or injury to terrestrial mammals, though entanglements would likely be isolated, individual events.

If tree-roosting bats and particularly, maternity colonies, are present at a site location, removal of trees during land clearing activities could result in direct injury/mortality if bats are utilizing them as roost trees or for rearing young. The scale of this impact would be expected to be small and would be dependent on the location and type of deployment activity, and tree removal. Site avoidance measures could be implemented to help avoid disturbance to bats.

Birds

Mortalities from collisions or electrocutions with manmade cables and wires are environmental concerns for avian species and could violate MBTA and BGEPA. Generally, collision events occur to night-migrating birds, "poor" fliers (e.g., ducks), night-migrating birds, heavy birds (e.g., swans and cranes), and birds that fly in flocks; while species susceptible to electrocution are birds of prey, ravens, and thermal soarers, typically having large wing spans (FAA, 2012b; Gehring, Kerlinger, & Manville., 2011).

Avian mortalities or injuries can also result from vehicle strikes, although typically occur as isolated events.

Direct injury and mortality of birds can occur to ground-nesting birds when nests are either disturbed or destroyed during land clearing, excavation and trenching, and other ground disturbing activities. Removal of trees during land clearing activities could also result in direct injury/mortality to forest dwelling birds if they are utilizing them as roost trees for nesting or shelter from predators and inclement weather, or as nest trees for rearing young. The scale of this impact would be associated with the amount of tree removal and the abundance of forest-dwelling birds roosting/nesting in the area. These impacts could be particularly pronounced in IBAs within the state as these areas provide them with essential habitat that supports various life stages (Hill, D. et al., 1997). Direct injury/mortality is not anticipated to be widespread or affect bird populations due to the small scale of likely FirstNet actions.

Direct mortality and injury to birds of South Dakota are not likely to be widespread or affect populations of species as a whole; individual species impacts may be realized depending on the nature of the deployment activity. If siting considerations, BMPs, and mitigation measures are implemented (Chapter 19, BMPs and Mitigation Measures) , potential impacts could be minimized. Additionally, potential impacts under MBTA and BGEPA could be addressed through BMPs and mitigation measures developed in consultation with USFWS.

Reptiles and Amphibians

Either direct mortality to amphibians or reptiles could occur in construction zones by excavation activities or by vehicle strikes; however, these events are expected to be temporary and isolated, affecting only individual animals.

Terrestrial Invertebrates

The terrestrial invertebrate populations of South Dakota are so widely distributed that injury/mortality events are not expected to affect populations of species as a whole.

Vegetation and Habitat Loss, Alteration, or Fragmentation

Habitat impacts are primarily physical disturbances that result in alterations in the amount or quality of a habitat. As with all of the effects categories, the magnitude of the impact depends on the duration, location, and spatial scale of the system and associated activities. Habitat fragmentation is the loss or breaking down of continuous and connected habitat, and impeding access to resources and mates. Areas near Rapid City and Pierre have experienced land use changes due to urbanization, while other portions of the state have experienced land use changes from agriculture. However, a large portion of the state consists of unfragmented forested.

Additionally, habitat loss can occur through exclusion, directly or indirectly, preventing an animal from accessing an 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. It is expected that activities associated with the Proposed Action would cause exclusion effects only in very special circumstances, as in most cases an animal could fly, swim, or walk to a nearby area that would provide refuge.

Potential effects of vegetation and habitat loss, alteration, or fragmentation are described for South Dakota's wildlife species below.

Terrestrial Mammals

Mammals occupy a wide range of habitats throughout South Dakota and may experience localized effects of habitat loss or fragmentation. Removal or loss of vegetation may impact large mammals (e.g., elk, white-tailed deer) by decreasing the availability of forest for cover from predators or foraging. Loss of cover may increase predation on both breeding adults as well as their young. The loss, alteration, or fragmentation of forested habitat would also impact some small mammals (e.g., beaver, rabbits) that utilize these areas for roosting, foraging, sheltering, and for rearing their young. Loss of habitat or exclusions from these areas could be avoided or minimized by implementing BMPs and mitigation measures.

Birds

The direct removal of most bird nests is prohibited under the MBTA. The USFWS and the SDGFP can provide regional guidance on the most critical times (e.g., breeding season) to avoid vegetation clearing. The removal and loss of vegetation can affect avian species directly by loss of nesting, foraging, stopover, and cover habitat.

Noise disturbance and human activity, as discussed previously, could directly restrict birds from using their preferred resources. Greater human activity of longer duration would increase the likelihood that birds would avoid the area, possibly being excluded from essential resources. These impacts could be particularly pronounced in IBAs within the state as birds may temporarily avoid these areas (Hill, D. et al., 1997).

The degree to which habitat exclusion affects birds depends on many factors. The impact to passerine[127] species from disturbance or displacement from construction activities is likely to be short-term with minor effects from exclusion. Exclusion from resources concentrated in a small migratory stop area during peak migration can have major impacts to species that migrate in large flocks and concentrate at stopovers (e.g., shorebirds). BMPs and mitigation measures, including nest avoidance during construction-related activities, could help to avoid or minimize the potential impacts to birds from exclusion of resources, as appropriate.

Reptiles and Amphibians

Important habitats for South Dakota's amphibians and reptiles typically consist of wetlands and, in some cases as with the timber rattlesnake, the surrounding upland forest. Impacts are expected to be less than significant. If proposed project sites were unable to avoid sensitive areas, BMPs and mitigation measures (see Chapter 19, BMPs and Mitigation Measures) could help to avoid or minimize the potential impacts.

Filling or draining of wetland breeding habitat (see Section 15.2.4, Water Resources) and alterations to ground or surface water flow from development associated with the Proposed Action may also have effects on South Dakota's amphibian and reptile populations, though BMPs and mitigation measures would help to avoid or minimize the potential impacts.[128]

Terrestrial Invertebrates

Habitat loss and degradation are the most common causes of invertebrate species' declines; however, habitat for many common terrestrial invertebrates is generally assumed to be abundant and widely distributed across the state, therefore no significant effects to terrestrial invertebrates are expected. Impacts to sensitive invertebrate species are discussed below in Section 15.2.6.6, Threatened and Endangered Species and Species of Concern.

Indirect Injury/Mortality

Indirect injury/mortality impacts vary depending on the species, time of year and duration of deployment, though BMPs and mitigation measures would help to avoid or minimize the potential impacts.

[127] Passerines are an order of "perching" birds that have four toes, three facing forward and one backward, which allows the bird to easily cling to both horizontal and nearly vertical perches.
[128] See Section 15.2.5, Wetlands, for a discussion of BMPs for wetlands.

Terrestrial Mammals

Stress from repeated disturbances during critical time periods (e.g., roosting and mating) can reduce the overall fitness and productivity of young and adult terrestrial mammals. Indirect effects could occur result to roosting bats from noise, light, or human disturbance causing them to leave their roosting locations or excluding them from their summer roosting/maternity colony roosts. For example, some bat species establish summer roosting or maternity colonies in the same general area that they return to year and after year. The majority of FirstNet deployment activities would be short-term in nature, therefore repeated disturbances would be unlikely to occur. Depending on the project type and location, individual species may be disturbed resulting in less than significant impacts.

Birds

Repeated disturbance, especially during the breeding and nesting season, can cause stress to individuals lowering fitness and productivity. These impacts could be particularly pronounced in IBAs within the state if birds temporarily avoid those areas, since they provide essential habitat for various life stages (Hill, D. et al., 1997). The majority of FirstNet deployment activities would be short-term in nature, therefore repeated disturbances would not occur. Depending on the project type and location, individual species may be disturbed resulting in less than significant impacts.

Reptiles and Amphibians

Changes in water quality, especially during the breeding seasons, can cause stress resulting in lower productivity. The majority of FirstNet deployment activities would be short-term in nature, therefore repeated disturbances would be unlikely to occur. Depending on the project type and location, individual species may be disturbed resulting in less than significant impacts.

Terrestrial Invertebrates

Terrestrial invertebrates can experience chronic stress, either by changes in habitat composition or competition for resources, resulting in lower productivity. Due to the large number of invertebrates distributed throughout the state, and given the short-term nature of most of the deployment activities, this impact would likely be less than significant.

Effects to Migration or Migratory Patterns

Migration is the regular movement of animals from one region to another and back again. Migratory patterns vary by species and sometimes within the same species. Potential effects to migration patterns of South Dakota’s amphibians and reptiles, terrestrial mammals, birds, and terrestrial invertebrates are described below.

Terrestrial Mammals

Large game animals (e.g., elk, white-tailed deer) have well-defined migratory routes. Route knowledge is passed on from one generation to the next and includes important feeding and calving areas. Small mammals (e.g., bats) also have migratory routes that include spring and fall roosting areas between their summer maternity roosts and hibernacula[129]. Any clearance, drilling, and construction activities needed for network deployment, including noise associated with these activities, has the potential to divert mammals from these migratory routes. Impacts can vary depending on the species, time of year of construction/operation, and duration but are generally expected to be less than significant. BMPs and mitigation measures could help to further avoid or minimize the potential impacts.

Birds

Because many birds have extremely long migrations, protection efforts for critical sites along migratory routes must be coordinated over vast distances often involving many different countries. For example, as a group, migrating through South Dakota undertake some of the longest-distance migrations of all animals. South Dakota is located within the Central Flyway. The eastern edge of the Central Flyway is in line with the South Dakota eastern border. Covering the entire state, the Central Flyway spans from the Gulf Coast of Texas to the Canadian boreal forest. According to the Audubon Society, a total of 28 IBAs, providing over 900,000 acres of land, have been identified in South Dakota, including breeding ranges[130], migratory stop-over, feeding, and over-wintering areas, and a variety of habitats such as native grasslands, grasslands, sage brush, and wetland/riparian areas. These IBAs are widely distributed throughout the state, although the largest concentration of IBAs is located in the eastern half of the state, within the Northwestern Glaciated Plains, Northern Glaciated Plains, and the Lake Agassiz Plains ecoregions. IBAs in South Dakota are mostly prairie and/or wetland communities that are key habitats for many migrating birds. The Wolsley Crane Stopover Areas IBA is an enormous site, encompassing 236,161 acres of land, and provides stopover habitat for migrating sandhill cranes (*Grus canadensis*) and whooping cranes (*Grus americana*) (Audubon, 2015).

Many migratory routes are passed from one generation to the next. Impacts can vary (e.g., mortality of individuals or abandonment of stopover sites by whole flocks) depending on the species, time of year of construction/operation, and duration, and impacts are expected to be less than significant. BMPs and mitigation measures could help to further avoid or minimize effects to migratory pathways.

Reptiles and Amphibians

Several species of mole salamanders and the wood frog are known to seasonally migrate in South Dakota. These amphibians often travel by the hundreds on their migration pathway that often crosses roadways. Mole salamanders are typically found in burrows in the forest floor. Wood frogs use diverse vegetation types from grassy meadows to open forests. After they emerge from dormancy, wood frogs migrate up 900 feet to breeding pools, where they breed rapidly in early spring in permanent or ephemeral water (Homan, Atwood, Dunkle, & Karr, 2010). However, Berven and Grudzien (*1990*) found that a small percentage of juvenile wood frogs could migrate over 1.5 miles from natal ponds, suggesting juveniles may be capable of

[129] A location chosen by an animal for hibernation.
[130] Breeding range: "The area utilized by an organism during the reproductive phase of its lifecycle and during the time that young are reared" (USEPA, 2015t).

migrating relatively long distances. Mortality and barriers to movement could occur as result of the Proposed Action (Berven & Grudzien, 1990; Calhoun & DeMaynadier, 2007).

Species that use streams as dispersal or migratory corridors may be impacted if these waterways are restricted or altered, and impacts are expected to be less than significant. BMPs could help to further avoid or minimize the potential impacts.

<u>Terrestrial Invertebrates</u>

The proposed deployment would be expected to be short-term or temporary in nature. No effects to migratory patterns of South Dakota's terrestrial invertebrates are expected as a result of the Proposed Action.

Reproductive Effects

Reproductive effects are considered those that either directly or indirectly reduce an animal's ability to produce offspring or reduce the rates of growth, maturation, and survival of offspring, which can affect the overall population of individuals.

<u>Terrestrial Mammals</u>

Restricted access to important winter hibernacula or summer maternity roosts for bats and calving grounds for large mammals, such as the elk and white-tailed deer, has the potential to negatively affect body condition and reproductive success of mammals in South Dakota. For example, moose use certain types of habitats that allow for more effective defense of their calves from predators.

Disturbance from deployment and operations could also result in the abandonment of offspring leading to reduced survival, although these activities are expected to be small scale. Reproductive effects as a result of displacement and disturbance are minimized through the use of BMPs and mitigation measures.

<u>Birds</u>

Impacts due to Proposed Action deployment and operations could include abandonment of the area and nests due to disturbance. Disturbance (visual and noise) may displace birds into less suitable habitat and thus reduce survival and reproduction. These impacts could be particularly pronounced in IBAs within the state if birds temporarily avoid those areas, since they provide essential habitat for various life stages (Hill, D. et al., 1997). The majority of FirstNet deployment or operation activities are likely to be small scale in nature. BMPs and mitigation measures as defined through consultation with USFWS, if required, could help to avoid or minimize any potential impacts.

<u>Reptiles and Amphibians</u>

Reproductive effects to reptile nests may occur through direct loss or disturbance of nests. For example, the snapping turtle leaves its breeding pool in the spring and travels to its nesting site.

Reproductive effects to sub-populations of amphibians and reptiles may occur through the direct loss of vernal pools as breeding habitat if deployment activities occur near breeding pools, alter water quality through sediment infiltration, or obstruction of natural water flow to pools, though BMPs would help to avoid or minimize the potential impacts.

Terrestrial Invertebrates

The majority of FirstNet deployment or operation activities are likely to be short-term in nature; no reproductive effects to terrestrial invertebrates are expected as a result of the Proposed Action.

Invasive Species Effects

When human activity results in a species entering an ecosystem new to it, the species is classified as introduced or invasive. The introduction of invasive species can have a dramatic effect on natural resources. South Dakota maintains a list of prohibited mammal animals (SDR 12:68:18:03.01), which includes any species in the family *Suidae* and raccoon dogs (*Nyctereutes procyonoides*). Additionally, South Dakota has a list of restricted nondomestic mammals (SDR 12:68:18:03.02). Species on this list are limited to the east of the Missouri River in South Dakota, which runs north to south through the middle of the state. Species included in this list include any nondomestic mammals capable of crossbreeding with wild elk, deer, sheep, or goats (SDR 12:68:18:03.02).

FirstNet deployment or operation activities could result in short-term or temporary changes to specific project sites, although these sites are expected to return to their natural state in a year or two. Invasive species are not expected to be introduced to project sites as part of the deployment activities from machinery or construction workers.

Potential invasive species effects to South Dakota’s wildlife are described below.

Terrestrial Mammals

FirstNet deployment or operation activities could result in short-term or temporary changes to specific project sites, although these sites are expected to return to their natural state in a year or two. FirstNet deployment activities are not expected to introduce terrestrial mammal species to project sites as these activities temporary and would not provide a mechanism for transport of invasive terrestrial mammals to project sites from other locations.

Birds

Invasive plant and pest species directly alter the landscape or habitat to a condition that is more favorable for an invasive species and less favorable for native species and their habitats. No invasive birds are regulated in South Dakota, although non-native birds are known to occur in the state. For example, some mon-native birds can impact native birds causing nest abandonment or impacts to rearing young due to aggressive behavior. Although FirstNet deployment activities could result in short-term or temporary changes to specific project sites; these sites are expected to return to their natural state in a year or two. Invasive bird species are not expected to be introduced at project sites as part of the deployment activities.

Reptiles and Amphibians

No invasive reptiles or amphibians are regulated in South Dakota, although non-native reptiles and amphibians are known to occur in the state. Some non-native reptiles and amphibians can be highly adaptable and can threaten native wildlife by competing with them for food sources and also spread disease. Although FirstNet deployment activities could result in short-term or temporary changes to specific project sites, these sites are expected to return to their natural state in a year or two. Invasive reptile or amphibian species are not expected to be introduced at project sites as part of the deployment activities.

Terrestrial Invertebrates

Terrestrial invertebrate populations are susceptible to invasive plant species that may change or alter the community composition of specific plants on which they depend. Effects from invasive plant species to terrestrial invertebrates would be similar to those described for habitat loss and degradation.

Invasive insects pose a large threat to South Dakota's forest and agricultural resources. Species such as the gypsy moth, Asian longhorn beetle, and emerald ash borer are of particular concern in South Dakota and are known to cause irreversible damage to native forests. The potential to introduce invasive invertebrates within construction zones and during long-term site maintenance can occur from vehicles and equipment being transported from one region to another, or when conducting revegetation of a site after deployment activities are complete. BMPs and mitigation measures (see Chapter 19, BMPs and Mitigation Measures) would help to avoid or minimize the potential for introducing invasive plant species during implementation of the Proposed Action.

Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including construction/deployment and operational activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to wildlife resources and others would not. In addition, and as described in this section, infrastructure developed under the Preferred Alternative could result in a range of impacts, from no impacts to less than significant impacts, depending on the deployment scenario or site-specific conditions. The wildlife that would be affected would depend on the ecoregion, the species' phenology and the nature and extent of the habitats affected.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are expected to have no impacts to wildlife resources under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. Noise generated by equipment required to install fiber would be infrequent and of short duration, and unlikely to produce measurable changes in wildlife behavior. It is anticipated that effects to wildlife would be temporary and would not result in any perceptible change.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to wildlife resources because there would be no ground disturbance.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would not impact wildlife because those activities would not require ground disturbance.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact wildlife resources, it is anticipated that this activity would have no impact on wildlife resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to wildlife resources as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including direct injury/mortality; vegetation and habitat loss, alteration, or fragmentation; effects to migratory patterns; indirect injury/mortality; reproductive effects; and invasive species effects. The types of infrastructure development scenarios or deployment activities that could be part of the Preferred Alternative and result in potential impacts to wildlife resources include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing, trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to wildlife resources. Land/vegetation clearing and excavation activities, associated with construction of POPs, huts, or other associated facilities could result in direct injury/mortalities of wildlife that are not mobile enough to avoid construction activities (e.g. reptiles, small mammals, and young individuals), that

utilize burrows (e.g., ground squirrels), or that are defending nest sites (such as ground-nesting birds). Disturbance, including noise, associated with the above activities involving heavy equipment or land clearing could result in habitat loss, effects to migration patterns, indirect injury/mortality, reproductive effects, and invasive species effects if BMPs and mitigation measures are not implemented.

- New Build – Aerial Fiber Optic Plant: The installation of new poles and hanging cable and associated security, safety, or public lighting components on public ROWs or private easements as well as the construction of access roads, POPs, huts, or facilitates to house outside plant equipment could result in potential impacts to wildlife resources. Impacts may vary depending on the number or individual poles installed and the extent of ground disturbance, but could include direct injury/mortality of individual species as described above; habitat loss, alteration, or fragmentation; effects to migratory patterns; indirect injury/mortality; and invasive species effects.
- Collocation on Existing Aerial Fiber Optic Plant: Land clearing and excavation during replacement of poles and structural hardening could result in direct injury/mortality, habitat loss or alteration, effects to migratory patterns, indirect injury/mortality, and invasive species effects. Noise disturbance from heavy equipment use associated with these activities as well as with installing new fiber on existing poles could result in migratory effects and indirect injury/mortality.
- New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water and construction of landings and/or facilities on the shore to accept submarine cables could potentially impact wildlife (see Section 15.2.4, Water Resources, for a discussion of potential impacts to water resources). Potential effects could include direct injury/mortality, habitat loss, alteration, or fragmentation depending on the site location. If activities occurred during critical periods, effects to migratory patterns as well as reproductive effects and indirect injury/ mortality could occur.
- Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment required construction of access roads, trenching, and/or land clearing, such disturbance could result in direct injury/mortality of wildlife as described for other New Build activities. Habitat loss, alteration and fragmentation; effects to migration or migratory patterns, indirect injury/mortality, and invasive species effects could occur as a result of construction and resulting disturbance.

- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (e.g., generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in impacts to wildlife resources. Land/vegetation clearing, excavation activities, landscape grading, and other disturbance activities during the installation of new wireless towers and associated structures or access roads could result in direct injury/mortality, habitat loss, alteration or fragmentation, and effects to migratory

patterns. Security lighting and fencing could result in direct and/or indirect injury or mortality, effects to migratory patterns, as well as reproductive effects. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions.

- Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, which would not result in impacts to wildlife. However, if new power units, replacement towers, or structural hardening is required, impacts would be similar to new wireless construction. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions.
- Deployable Technologies: Implementation of deployable technologies including COWs, COLTs, and SOWs could result in direct injury/mortalities to wildlife on roadways. If external generators are used, noise disturbance could potentially impact migratory patterns of wildlife. RF hazards could result in indirect injury or mortality as well as reproductive effects depending on duration and magnitude of operations. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions.
- Deployment of drones, balloons, blimps, and piloted aircraft could potentially impact wildlife by direct or indirect injury/mortality from collision, entanglement, or ingestion and effects to migratory patterns and reproductive effects from disturbance and/or displacement due to noise. The magnitude of these effects depends on the timing and frequency of deployments. However, deployment activities are expected to be temporary and isolated, and likely affecting only a small number of wildlife.

In general, the abovementioned activities could potentially involve land/vegetation clearing; excavation and trenching; construction of access roads; installation or restructuring of towers or poles; installation of security/safety lighting and fencing; and deployment of aerial platforms. Potential impacts to wildlife resources associated with deployment of this infrastructure are anticipated to be less than significant given the small scale of likely individual FirstNet projects; however, some deployment activities could include direct injury/mortality, habitat loss, indirect injury/mortality, effects to migration, reproductive effects, and effects of invasive species depending on the project type, location, ecoregion, the species' phenology, and the nature and extent of the habitats affected. As stated above, these impacts would likely be limited to individual wildlife species and unlikely to cause population-level impacts. The specific deployment activity and location will be determined on site-specific conditions and site-specific environmental reviews. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operational activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. The wildlife that would be affected would depend on the ecoregion, the species' phenology, and the nature and extent of the habitats affected.

It is anticipated that there would be less than significant impacts to wildlife resources associated with routine inspections of the Preferred Alternative. Site maintenance would be infrequent, including mowing or limited application of herbicides, may result in less than significant effects to wildlife including direct injury/mortality to less mobile wildlife, or exposure to contaminants from accidental spills from maintenance equipment or release of pesticides.

During operations, direct injury/mortality of wildlife could occur from collisions and/or entanglements with transmission lines, towers, and aerial platforms.

Wildlife resources could be affected by the reduction in habitat quality associated with habitat fragmentation from the presence of access roads, transmission corridors, and support facilities. These features could also continue to disrupt movements of terrestrial wildlife, particularly during migrations between winter and summer ranges or in calving areas.

In addition, the presence of new access roads and transmission line ROWs may increase human use of the surrounding areas, which could increase disturbance to wildlife resulting in effects to migratory pathways, indirect injury/mortalities, reproductive effects, as well as the potential introduction and spread of invasive species as explained above. As stated above, these impacts would likely be limited to individual wildlife species and unlikely to cause population-level impacts. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Alternatives Impact Assessment

The following section assesses potential impacts to wildlife resources associated with the Deployable Technologies Alternative and the No Action Alternative.

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 minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. 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. Therefore, potential impacts to wildlife resources as a result of implementation of this alternative could be as described below.

Deployment Impacts

As described above, implementation of deployable technologies could result in less than significant impacts from direct and indirect injury or mortality events, changes in migratory patterns, disturbance, or displacement. Greater frequency and duration of deployments could change the magnitude of impacts depending on species, life history, and region of the state. However, impacts are expected to remain less than significant because deployment activities are expected to be temporary, likely affecting only a small number of wildlife. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operational Impacts

As described above, operational activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be less than significant impacts. The impacts can vary greatly among species and geographic region. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the nationwide, interoperable, public safety broadband network would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to wildlife resources as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 15.1.6.4, Terrestrial Wildlife.

15.2.6.5. Fisheries and Aquatic Habitats

Impacts to fisheries and aquatic habitats occurring in South Dakota are discussed in this section.

Description of Environmental Concerns

Direct Injury/Mortality

Direct injury/mortality effects are physical injuries, extreme physiological stress, or death of an individual organism from interactions associated with the Proposed Action. The most common direct injuries are entanglement, vessel strike, problems associated with accidental ingestion, and injuries incurred by sensitive animals from disturbance events (USEPA, 2012d).

Based on the impact significance criteria presented in Table 15.2.6-1, less than significant impacts would be anticipated given the size and nature of the majority of proposed deployment activities. Although anthropogenic disturbances may be measurable (although minimal) for some FirstNet projects, individual behavior of fish species would be short-term and direct injury or mortality impacts at the population-level or sub-population effects would not likely be observed. BMPs and mitigation measures could help to avoid or minimize potential impacts to fisheries and aquatic invertebrate population survival.

Vegetation and Habitat Loss, Alteration, or Fragmentation

Habitat impacts are primarily physical disturbances that result in alterations in the amount or quality of a habitat. As with all of the effects categories, the magnitude of the impact depends on the duration, location, and spatial scale of the system and associated activities. Habitat fragmentation is the breaking down of continuous and connected habitat, and impeding access to resources and mates.

Depending on the location, construction of new infrastructure and long-term facility maintenance could result in the shoreline habitat alteration in localized areas; in some instances, the permanent loss of riparian vegetation could occur, which could lead to water quality impacts and in turn aquatic habitat alteration. Habitat loss is not likely to be widespread or affect populations of species as a whole; fish species would be expected to swim to a nearby location depending on the nature of the deployment activity. Additionally, deployment activities with the potential for impacts to sensitive aquatic habitats can be addressed through BMPs and mitigation measures.

Indirect Injury/Mortality

Water quality impacts from exposure to contaminants from accidental spills from vehicles and equipment, and erosion or sedimentation from land clearing and excavation activities near or within riparian areas, floodplains, wetlands, streams, and other aquatic habitats could result in changes to habitat, food sources, or prey resulting in indirect mortality/ injury to fish and aquatic invertebrates. Indirect injury/mortality impacts vary depending on the species, time of year, and duration of deployment. These impacts are expected to be less than significant, and BMPs and mitigation measures to protect water resources (see Section 15.2.4, Water Resources) could help to minimize or avoid potential impacts.

Effects to Migration or Migratory Patterns

Migration is the regular movement of animals from one region to another and back again. Migratory patterns vary by species and sometimes within the same species. For example, restrictions or alterations to waterways could alter migration patterns, limit fish passage, or affect foraging and spawning site access. Impacts are expected to be less than significant, and are anticipated to be localized and at a small scale, and would vary depending on the species, time of year, and duration of deployment. BMPs and mitigation measures could help to further avoid or minimize the potential impacts.

Reproductive Effects

Reproductive effects are considered those that either directly or indirectly reduce an animal's ability to produce offspring or reduce the rates of growth, maturation, and survival of offspring, which can affect the overall population of individuals. Restrictions to spawning/breeding areas for fish and aquatic invertebrates and the alteration of water quality through sediment infiltration, obstruction of natural water flow, or loss of submerged vegetation resulting from the deployment of various types of infrastructure, are expected to be less than significant, though BMPs and mitigation measures could help to further avoid or minimize the potential impacts.

Invasive Species Effects

The potential to introduce invasive plants within construction zones can occur from vehicles and equipment being transported from one region to another, or when conducting revegetation of a site after deployment activities are complete. FirstNet deployment activities could result in short-term or temporary changes to specific project sites and these sites are expected to return to their natural state in a year or two. Invasive species are not expected to be introduced to project sites as part of the deployment activities from machinery or construction workers, therefore impacts are expected to be less than significant. BMPs and mitigation measures could help to avoid or minimize the potential for introducing invasive aquatic plant and animal species during implementation of the Proposed Action.

Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including construction/deployment and operational activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to fisheries and aquatic habitats and others would not. In addition, and as explained in this section, the same type of Proposed Action Infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions. The fisheries and aquatic habitats that would be affected would depend on the ecoregion, the species' phenology, and the nature and extent of the habitats affected.

<u>Activities Likely to Have No Impacts</u>

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are expected to have no impacts to fisheries and aquatic habitats under the conditions described below:

- Wired Projects
    - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance, including noise, associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that effects to fisheries would be temporary and would not result in any perceptible change.

- Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to fisheries and aquatic habitats because there would be no ground disturbance.

- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would not impact fisheries and aquatic habitats because those activities would not require ground disturbance.
  - 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. As adding equipment to an existing launch vehicle would be very unlikely to impact fisheries, it is anticipated that this activity would have no impact on the aquatic environment.

<u>Activities with the Potential to Have Impacts</u>

Potential deployment-related impacts to fisheries and aquatic habitats as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including direct injury/mortality; vegetation and habitat loss, alteration, or fragmentation; effects to migratory patterns; indirect injury/mortality; reproductive effects; and invasive species effects. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential impacts to fisheries and aquatic habitats include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing, trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to fisheries and aquatic habitats. Land/vegetation clearing and excavation activities, associated with construction of POPs, huts, or other associated facilities, particularly if they occur adjacent to water resources that support fish, could result in habitat loss, alteration and fragmentation; indirect injury/mortality; and invasive species effects if BMPs and mitigation measures are not implemented.
  - New Build – Aerial Fiber Optic Plant: The installation of new poles and hanging cable and associated security, safety, or public lighting components on public ROWs or private easements as well as the construction of access roads, POPs, huts, or facilitates to house outside plant equipment could result in potential impacts to fisheries and aquatic habitats if activities occur near water resources that support fish. Impacts may vary depending on the number or individual poles installed or if access roads or stream crossings are needed, but could include habitat loss, alteration and fragmentation; indirect injury/mortality; and invasive species effects.
  - Collocation on Existing Aerial Fiber Optic Plant: Land clearing and excavation during replacement of poles and structural hardening, if conducted near water resources that

support fish, could result in habitat loss, alteration and fragmentation; indirect injury/mortality; and invasive species effects.

- New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water and construction of landings and/or facilities on the shore to accept submarine cables could result in direct injury/mortalities of fisheries and aquatic invertebrates that are not mobile enough to avoid construction activities (e.g. mussels), that utilize burrows (e.g., crayfish), or that are defending nest sites (some fish). Disturbance, including noise, associated with the above activities could result in habitat loss, effects to migration patterns, indirect injury/mortality, reproductive effects, and invasive species effects.
- Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment required construction of access roads, trenching, and/or land clearing, particularly near water resources that support fish, such disturbance could result in habitat loss, alteration and fragmentation; indirect injury/mortality, and invasive species effects.

- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in impacts to fisheries and aquatic habitats, if such actions were deployed near water resources. Land/vegetation clearing, excavation activities, landscape grading, and other disturbance activities during the installation of new wireless towers and associated structures or access roads, particularly if they occur near waterbodies, could result in habitat loss or indirect injury/mortality, and invasive species effects, although highly unlikely. Refer to Section 2.4, Radio Frequency Emissions, for more information on RF emissions.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, which would not result in impacts to fisheries and aquatic habitats. However, if new power units, replacement towers, or structural hardening is required, impacts would be similar to new wireless construction. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions.
  - Deployable Technologies: Implementation of deployable technologies including COWs, COLTs, or SOWs could result in habitat loss, alteration and fragmentation; indirect injury/mortality, and invasive species effects if new access roads or other ground disturbing activities are necessary that generate erosion, sedimentation, or water quality impacts. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions.
  - Deployment of drones, balloons, blimps, or piloted aircraft could potentially impact fisheries and aquatic habitat if deployment occurs within or adjacent to water resources.

The magnitude of these effects depends on the timing and frequency of deployments, and could result in result in habitat loss, alteration and fragmentation, indirect injury/mortality, and invasive species effects.

In general, the abovementioned activities could potentially involve land/vegetation clearing; excavation and trenching; construction of access roads; installation or restructuring of towers, poles, or underwater cables; installation of security/safety lighting and fencing; and deployment of aerial platforms. Potential impacts to fisheries and aquatic habitats associated with deployment of this infrastructure could include direct injury/mortality, habitat loss, indirect injury/mortality, effects to migration, reproductive effects, and effects of invasive species depending on the ecoregion, the species' phenology, and the nature and extent of the habitats affected. These impacts are anticipated to be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operational activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. The fisheries and aquatic habitats that would be affected would depend on the ecoregion, the species' phenology, and the nature and extent of the habitats affected.

It is anticipated that there would be less than significant impacts to fisheries and aquatic habitats associated with routine inspections of the Preferred Alternative. Site maintenance that might include accidental spills from maintenance equipment or pesticide runoff near fish habitat are anticipated to result in less than significant effects to fisheries and aquatic habitats due to the limited nature of such activities and the likely small quantities of potentially harmful liquids used.

Fisheries and aquatic invertebrates could still be affected by the reduction in habitat quality associated with habitat fragmentation from the presence of access roads, transmission corridors, and support facilities. These features could also continue to disrupt movements of fish passage. In addition, the presence of new access roads and transmission line ROWs near water resources that support fish may increase human use of the surrounding areas, which could increase disturbance to fisheries and aquatic habitats resulting in effects to migratory pathways, indirect injury/mortalities, reproductive effects, as well as the potential introduction and spread of invasive species as explained above. Fisheries and aquatic habitat may also be impacted if increased access leads to an increase in the legal or illegal take of biota.

Alternatives Impact Assessment

The following section assesses potential impacts to fisheries and aquatic habitats associated with the Deployable Technologies Alternative and the No Action Alternative.

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 minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. 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. Therefore, potential impacts to fisheries and aquatic habitats as a result of implementation of this alternative could be as described below.

<u>Deployment Impacts</u>

As explained above, implementation of deployable technologies could result in less than significant impacts from habitat loss, alteration and fragmentation, indirect injury/mortality, and invasive species effects. Greater frequency and duration of deployments could change the magnitude of impacts depending on species, life history, and region of the state. However, impacts are expected to remain less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

<u>Operational Impacts</u>

Operational activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be less than significant impacts to fisheries and aquatic habitats associated with routine operations, management, and monitoring. The impacts can vary greatly among species and geographic region but they are still expected to remain less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the nationwide, interoperable, public safety broadband network would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to fisheries and aquatic habitats as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 15.1.6.5, Fisheries and Aquatic Habitats.

15.2.6.6. Threatened and Endangered Species and Species of Conservation Concern

This section describes potential impacts to threatened and endangered species in South Dakota associated with deployment and operation of the Proposed Action and Alternatives. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on threatened and endangered species and their habitat were evaluated using the significance criteria presented in Table 15.2.6-2. The categories of impacts for threatened and endangered species and their habitats are defined as may affect, likely to adversely affect; may affect, not likely to adversely affect; and no effect. Characteristics of each effect type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes across the state, the potential impacts to threatened and endangered species addressed below are presented as a range of possible impacts.

Table 15.2.6-2: Impact Significance Rating Criteria for Threatened and Endangered Species

Type of Effect	Effect Characteristics	Impact Level		
		May Affect, Likely to Adversely Affect	**May Affect, Not Likely to Adversely Affect**	**No Effect**
Injury/Mortality of a Listed Species	Magnitude or Intensity	As per the ESA, this impact threshold applies at the individual level so applies to any mortality of a listed species and any impact that has more than a negligible potential to result in unpermitted take of an individual of a listed species. Excludes permitted take.	Does not apply in the case of mortality (any mortality unless related to authorized take falls under likely to adversely affect category). Applies to a negligible injury that does not meet the threshold of take due to its low level of effect and/or ability to fully mitigate the effect. Includes permitted take.	No measurable effects on listed species.
	Geographic Extent	Any geographic extent of mortality or any extent of injury that could result in take of a listed species.	Any geographic extent that does not meet the threshold of take due to its low level of effect and/or ability to fully mitigate the effect. Typically applies to one or very few locations.	
	Duration or Frequency	Any duration or frequency that could result in take of a listed species.	Any duration or frequency that does not meet the threshold of take due to its low level of effect and/or ability to fully mitigate the effect. Typically applies to infrequent, temporary, and short-term effects.	
Reproductive Effects	Magnitude or Intensity	Any reduction in breeding success of a listed species.	Changes in breeding behavior (e.g., minor change in breeding timing or location) that are not expected to result in reduced reproductive success.	No measurable effects on listed species.
	Geographic Extent	Reduced breeding success of a listed species at any geographic extent.	Changes in breeding behavior at any geographic extent that are not expected to result in reduced reproductive success of listed species. Typically applies to one or very few locations.	
	Duration or Frequency	Any duration or frequency that could result in reduced breeding success of a listed species.	Infrequent, temporary, or short-term changes in breeding behavior that do not reduce breeding success of a listed species within a breeding season.	

Type of Effect	Effect Characteristics	Impact Level		
		May Affect, Likely to Adversely Affect	May Affect, Not Likely to Adversely Affect	No Effect
Behavioral Changes	Magnitude or Intensity	Disruption of normal behavior patterns (e.g., breeding, feeding, or sheltering) that could result in take of a listed species.	Minor behavioral changes that would not result in take of a listed species.	No measurable effects on listed species.
	Geographic Extent	Any geographic extent that could result in take of a listed species.	Changes in behavior at any geographic scale that are not expected to result in take of a listed species. Typically applies to one or very few locations.	
	Duration or Frequency	Any duration or frequency that could result in take of a listed species.	Infrequent, temporary, or short-term changes that are not expected to result in take of a listed species.	
Loss or Degradation of Designated Critical Habitat	Magnitude or Intensity	Effects to any of the essential features of designated critical habitat that would diminish the value of the habitat for the survival and recovery of the listed species for which the habitat was designated.	Effects to designated critical habitat that would not diminish the functions or values of the habitat for the species for which the habitat was designated.	No measurable effects on designated critical habitat
	Geographic Extent	Effects to designated critical habitat at any geographic extent that would diminish the value of the habitat for listed species. Note that the likely to adversely affect threshold for geographic extent depends on the nature of the effect. Some effects could occur at a large scale but still not appreciably diminish the habitat function or value for a listed species. Other effects could occur at a very small geographic scale but have a large adverse effect on habitat value for a listed species.	Effects realized at any geographic extent that would not diminish the functions and values of the habitat for which the habitat was designated. Typically applies to one or few locations within a designated critical habitat.	
	Duration or Frequency	Any duration or frequency that could result in reduction in critical habitat function or value for a listed species.	Any duration or frequency that would not diminish the functions and values of the habitat for which the habitat was designated. Typically applies to Infrequent, temporary, or short-term changes.	

Description of Environmental Concerns

Injury/Mortality of a Listed Species

Direct injury/mortality effects are physical injuries, extreme physiological stress, or death of an individual organism from interactions associated with the Proposed Action. The most common direct injuries are entanglement, vehicle strike, problems associated with accidental ingestion, and injuries incurred by sensitive animals from disturbance events.

Based on the impact significance criteria presented in Table 15.2.6-2, any direct injury or mortality of a listed species at the individual-level could be potentially significant as well as any impact that has more than a negligible potential to result in unpermitted take of an individual species at any geographic extent, duration, or frequency. Direct injury/mortality environmental concerns pertaining to federally listed terrestrial mammals, birds, fish, invertebrates, and plants with known occurrence in South Dakota are described below.

<u>Terrestrial Mammals</u>

Direct mortality or injury to the federally listed Northern long-eared bat (*Myotis septentrionalis*) could occur if tree clearing activities occurred during the roosting season (i.e., approximately April-November) and bats were present. While projects would not likely directly affect winter hibernacula (e.g., caves), human disturbance in and around hibernacula when bats are present could lead to adverse effects to these species; when disturbed by noise or light, bats awaken resulting in a loss of body fat needed to help them survive in the spring (USFWS, 2015g).

The endangered black-footed ferret (*Mustela nigripes*) occurs throughout the western half of South Dakota. Direct mortality or injury to the black-footed ferret could occur from vehicle strikes as cottontails are occasionally found along transportation corridors. Entanglement in fences or other barriers could also be a source of mortality or injury to this species. Impacts would likely be isolated, individual events. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

<u>Birds</u>

Two endangered and two threatened bird species are federally listed for South Dakota. The least tern (*Sterna antillarum*) occurs along sections of the Missouri and Cheyenne rivers in South Dakota. The piping plover (*Charadrius melodus*) occurs along the Missouri River and reservoirs in South Dakota. The red knot (*Calidris canutus rufa*) occurs near the East and Missouri Rivers and throughout South Dakota during migration. The whooping crane (*Grus americana*) occurs throughout South Dakota on its spring and fall migration. Depending on the project type and location, direct mortality or injury to these birds could occur from collisions or electrocutions with manmade cables and wires, vehicle strikes, or by disturbance or destruction of nests during ground disturbing activities. If proposed project sites are unable to avoid sensitive areas, BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Fish

Two endangered fish species are federally listed for South Dakota. The Pallid Sturgeon (*Scaphirhynchus albus*) occurs in large rivers and lakes throughout South Dakota. The Topeka Shiner (*Notropis topeka (=tristis)*) occurs in small streams throughout South Dakota. Direct mortality or injury to these endangered fish is unlikely but could occur could occur from entanglements resulting from the Proposed Action are unlikely as the majority of FirstNet deployment projects would not occur in the aquatic environment. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Reptiles and Amphibians

No federally listed reptiles and amphibians are known to occur in South Dakota. Therefore, no injury or mortality effects to federally threatened and endangered reptile and amphibian species are expected as a result of the Proposed Action.

Invertebrates

Four endangered and one threatened invertebrate species are federally listed for South Dakota. The Dakota skipper (*Hesperia dacotae*) and the Poweshiek skipperling (*Oarisma poweshiek*) occur in northeastern South Dakota, while the American burying beetle (*Nicrophorus americanus*) occurs in southern South Dakota. The Higgins eye (pearlymussel) (*Lampsilis higginsii*) and the scaleshell mussel (*Leptodea leptodon*) can both be found in the southeastern part of the state. Direct mortality or injury could occur to these species if land clearing or excavation activities associated with the Proposed Action occur in an area inhabited by one of these species. Distribution of these species is very limited throughout the state. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Plants

Two threatened plant species are federally listed for South Dakota. The western prairie fringed orchid (*Platanthera praeclara*) occurs in eastern South Dakota, while the Leedy's roseroot (*Rhodiola integrifolia ssp. leedyi*) occurs in southwestern South Dakota. Direct mortality to federally listed plants could occur if land clearing or excavation activities associated with the Proposed Action occur in an area inhabited by one of these species. In general, distribution of these species is very limited throughout the state. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional

BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Reproductive Effects

Reproductive effects are considered those that either directly or indirectly reduce the breeding success of a listed species either by altering its breeding timing or location, or reducing the rates of growth, maturation, and survival of offspring, which can affect the breeding success. Potential effects to federally listed terrestrial mammals, birds, fish, invertebrates, and plants with known occurrence in South Dakota are described below.

Terrestrial Mammals

Noise, light, and other human disturbances associated with the Proposed Action could adversely affect federally listed terrestrial mammals within or near Project activities. Impacts would be directly related to the frequency, intensity, and duration of these activities. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Birds

The least tern and piping plover nest along sandbar islands and shorelines and the Sprague's pipit nests in native grasslands in South Dakota. Noise, light, or human disturbance within nesting areas could cause federally threatened and endangered birds to abandon their nests, relocate to less desirable locations, or cause stress to individuals reducing survival and reproduction. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Reptiles and Amphibians

No federally listed amphibians or reptiles are known to occur in South Dakota. Therefore, no reproductive effects to federally threatened and endangered reptiles or amphibian species are expected as a result of the Proposed Action.

Fish

Deployment activities in the Big Sioux and Missouri Rivers resulting in increased disturbance (e.g., humans, noise), especially during spawning activity, and changes in water quality could cause stress resulting in lower productivity (see Section 15.2.4, Water Resources, for a discussion of potential impacts to water resources). Effects to reproduction for the endangered pallid sturgeon and Topeka shiner species are unlikely since the majority of FirstNet deployment projects would not occur in an aquatic environment. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional

BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Invertebrates

Changes in water quality from ground disturbing activities could cause stress resulting in lower productivity for federally listed mollusks known to occur in South Dakota. Impacts to staple food sources for federally listed butterflies and the American burying beetle could result in reduced survival and reproduction. Impacts associated with deployment activities are expected to result in less than significant changes to water quality. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Plants

No reproductive effects to federally listed plants are expected as a result of the Proposed Action as limited pesticides would be used and avoidance measures could be undertaken.

Behavioral Changes

Effects to normal behavior patterns that could lead to disruptions in breeding, feeding, or sheltering, resulting in take of a listed species would be considered potentially significant. Potential effects to federally listed terrestrial mammals, birds, fish, invertebrates, and plants with known occurrence in South Dakota are described below.

Mammals

Noise associated with the installation of cables could affect mammal migration patterns, though impacts are likely to be short-term. It is clear that behavioral responses are strongly affected by the context of exposure and by the animal’s experience, motivation, and conditioning. Additional BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Birds

Because many birds have extremely long migrations, protection efforts for critical sites along migratory routes must be coordinated over vast distances often involving many different countries. For example, the red knot has been found to fly up to 9,300 miles from their breeding and wintering sites and often return to the same stopover sites year and after year. Disturbance in stopover, foraging, or breeding areas (visual or noise) or habitat loss/fragmentation can cause stress to individuals causing them to abandon areas for less desirable habitat and potentially reduce over fitness and productivity. Activities related to the Proposed Action, such as aerial deployment or construction activities, could result in adverse effects to federally listed birds. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in

Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Reptiles and Amphibians

There are no listed reptiles or amphibians in the state of South Dakota.

Therefore, no behavioral effects to federally threatened and endangered reptiles and amphibians are expected as a result of the Proposed Action.

Fish

Changes in water quality could impact food sources for the pallid sturgeon and Topeka shiner. Further, increased human disturbance, noise, and vessel traffic could cause stress to the pallid sturgeon and Topeka shiner causing them to abandon spawning locations or altering migration patterns. Behavioral changes are unlikely as the majority of FirstNet deployment projects would not occur in an aquatic environment. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Invertebrates

Changes in water quality, habitat loss or alternation, and introduction of aquatic invasive species could impact food sources for federally listed mollusks resulting in lower productivity. Disturbances to staple food sources, especially during the breeding season, in areas known to have federally listed butterflies and the American burying beetle could impact survival. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Plants

No behavioral effects to federally listed plants are expected as a result of the Proposed Action.

Loss or Degradation of Designated Critical Habitat

Effects to designated critical habitat and any of its essential features that could diminish the value of the habitat for the listed species or its survival and recovery would be considered an adverse effect and could be potentially significant. Depending on the species or habitat, the adverse effect threshold would vary for geographic extent. In some cases, although unlikely to occur, large-scale impacts could diminish the functions and values of the habitat, while in other cases small-scale change could lead to potential adverse effects. For example, impacts to designated critical habitat for a listed species that is only known to occur in one specific location geographically. Potential effects to federally listed terrestrial mammals, birds, fish, invertebrates, and plants with designated critical habitat in South Dakota are described below.

Terrestrial Mammals

No designated critical habitat occurs for terrestrial mammals in South Dakota. Therefore, no effect to threatened and endangered species from the loss or degradation of designated critical habitat is expected as a result of the Proposed Action.

Birds

Critical habitat for the Northern Great Plains breeding population of the piping plover was designated in 2002 (67 FR 57638 57717, September 11, 2002) in parts of the Missouri River in South Dakota (USFWS, 2002a). Land clearing, excavation activities, and other ground disturbing activities in these regions of South Dakota could lead to habitat loss or degradation, which could lead to adverse effects to the piping plover depending on the duration, location, and spatial scale of the associated activities. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Reptiles and Amphibians

There are no listed reptiles or amphibians in the state of South Dakota.

Therefore, no effect to threatened and endangered species from the loss or degradation of designated critical habitat is expected as a result of the Proposed Action.

Fish

No designated critical habitat occurs for fish in South Dakota. Therefore, no effect to threatened and endangered species from the loss or degradation of designated critical habitat is expected as a result of the Proposed Action.

Invertebrates

Two of the five federally listed invertebrate species in South Dakota have federally designated critical habitat. Critical habitat was designated in 2015 (80 FR 59247 59384, October 1, 2015) for the Dakota skipper butterfly in Brookings, Day, Deuel, Grant, Marshall, and Roberts counties, South Dakota (USFWS, 2015s). Critical habitat was designated for the Poweshiek skipperling butterfly in 2015 (80 FR 59247 59384, October 1, 2015) in Brookings, Day, Deuel, Grant, Marshall, Moody, and Roberts counties, South Dakota (USFWS, 2015s). Land clearing, excavation activities, and other ground disturbing activities in these regions of South Dakota could lead to habitat loss or degradation, which could lead to adverse effects to the Dakota skipper and Poweshiek skipperling depending on the duration, location, and spatial scale of the associated activities. BMPs and mitigation measures as defined through consultation with the appropriate resource agency would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Plants

No designated critical habitat occurs for plants in South Dakota. Therefore, no effect to threatened and endangered species from the loss or degradation of designated critical habitat is expected as a result of the Proposed Action.

Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operational activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential effects to threatened and endangered species and others would not. In addition, and as explained in this section, the same type of Proposed Action Infrastructure could result in a range of no affect to may affect but not likely to adversely affect depending on the deployment scenario or site-specific conditions. The threatened and endangered species that would be affected would depend on the ecoregion, the species' phenology, and the nature and extent of the habitats affected.

Activities Likely to Have No Effect

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are expected to have no effect on threatened and endangered species or their habitat under the conditions described below:

- Wired Projects
    - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance, including noise, associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. Although threatened and endangered species and their habitat could be impacted, it is anticipated that effects to threatened and endangered species would be temporary, infrequent, and likely not conducted in locations designated as vital or critical for any period.
    - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to threatened and endangered species or their habitat because there would be no ground disturbance and very limited human activity.
- Satellites and Other Technologies
    - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would not impact threatened or endangered species because those activities would not require ground disturbance.

- 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. As adding equipment to an existing launch vehicle would be very unlikely to impact protected species, it is anticipated that this activity would have no impact on protected species.

Activities with the Potential to Affect Listed Species

Potential deployment-related effects to threatened and endangered species and their habitats as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential effects to threatened and endangered species include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing, trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to threatened and endangered species. Land/vegetation clearing and excavation activities, associated with construction of POPs, huts, or other associated facilities could result in direct injury/mortalities of threatened and endangered species that are not mobile enough to avoid construction activities (e.g. reptiles, mollusks, small mammals, and young), that utilize burrows (e.g., ground squirrels), or that are defending nest sites (e.g., ground-nesting birds). Disturbance, including noise, associated with the above activities could result in direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat if BMPs and mitigation measures are not implemented.
  - New Build – Aerial Fiber Optic Plant: The installation of new poles and hanging cable and associated security, safety, or public lighting components on public ROWs or private easements as well as the construction of access roads, POPs, huts, or facilitates to house outside plant equipment could result in potential impacts to threatened and endangered species and their habitat. Impacts may vary depending on the number or individual poles installed, but could include direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat.
  - Collocation on Existing Aerial Fiber Optic Plant: Land clearing and excavation during replacement of poles and structural hardening could result in direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat to threatened and endangered species. Noise disturbance from heavy equipment use associated with these activities as well as with installing new fiber on existing poles could result in reproductive effects or behavior changes.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water and construction of landings and/or facilities on the shore to accept submarine cables could potentially impact threatened and endangered species and their habitat,

particularly aquatic species (see Section 15.2.4, Water Resources, for a discussion of potential impacts to water resources). Effects could include direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat. If activities occurred during critical time periods, reproductive effects and behavioral changes could occur.

- Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment would occur in existing boxes or huts, there would be no impacts to threatened and endangered species or their habitats. If installation of transmission equipment required construction of access roads, trenching, and/or land clearing, such disturbance could result in direct injury/mortality of threatened and endangered species as described for other New Build activities. Reproductive effects, behavioral changes, and loss/degradation of designated critical habitat could also occur as a result of construction and resulting disturbance.

- Wireless Projects
    - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in impacts to threatened and endangered species and their habitat. Land/vegetation clearing, excavation activities, landscape grading, and other disturbance activities during the installation of new wireless towers and associated structures or access roads could result in direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat. Security lighting and fencing could result in direct injury/mortality, disruption of normal behavior patterns, as well as reproductive effects. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions.
    - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower; FirstNet activities would be infrequent, temporary, or short-term in nature and are unlikely to result in direct injury/mortality or behavioral changes to threatened and endangered species. However, if replacement towers or structural hardening are required, impacts could be similar to new wireless construction. Hazards related security/safety lighting and fencing may produce direct injury/mortality, reproductive effects, and behavioral changes. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions.
    - Deployable Technologies: Implementation of land-based deployable technologies including COWs, COLTs, or SOWs could result in direct injury/mortalities to threatened and endangered species on roadways. If external generators are used, noise disturbance could potentially result in reproductive effects or behavioral changes to threatened and endangered species. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions.

- Deployment of drones, balloons, piloted aircraft, or blimps could potentially impact threatened and endangered species by direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat. The magnitude of these effects depends on the timing and frequency of deployments.

In general, the abovementioned activities could potentially involve land/vegetation clearing; excavation and trenching; construction of access roads; installation or restructuring of towers, poles, or underwater cables; installation of security/safety lighting and fencing; and deployment of aerial platforms. Potential impacts to threatened and endangered species associated with deployment of this infrastructure could include direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat depending on the species' phenology and the nature and extent of the habitats affected. These impacts may affect, but are not likely adversely affect protected species due to the small-scale nature of expected activities. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operational activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. The threatened and endangered species that would be affected would depend on the species' phenology and the nature and extent of the habitats affected.

It is anticipated that operational impacts may affect, but are not likely to adversely affect threatened and endangered species due to routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. Site maintenance, including mowing or application of herbicides, may affect, but are not likely to adversely affect threatened and endangered species, as they would be conducted infrequently and in compliance with BMPs and mitigation measures developed through consultation with the appropriate resource agency.

During operations, direct injury/mortality of threatened and endangered species could occur from collisions and/or entanglements with transmission lines, towers, and aerial platforms. Listed species may be affected, but are not likely to be adversely affected. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Threatened and endangered species may be affected, but are not likely to be adversely affected, by the reduction in habitat quality associated with habitat fragmentation from the presence of access roads, transmission corridors, and support facilities. These features could also continue to disrupt movements of some species, particularly during migrations between winter and summer ranges. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

Alternatives Impact Assessment

The following section assesses potential effects to threatened and endangered species associated with the Deployable Technologies Alternative and the No Action Alternative.

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 minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. 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. Therefore, potential impacts to threatened and endangered species as a result of implementation of this alternative could be as described below.

<u>Deployment Impacts</u>

As explained above, implementation of deployable technologies may affect, but is not likely to adversely affect, threatened and endangered species through direct injury/mortality, reproductive effects, behavioral changes, and loss/degradation of designated critical habitat. Greater frequency and duration of deployments could change the magnitude of impacts depending on species, life history, and region of the state. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

<u>Operational Impacts</u>

As explained above, operational activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that activities may affect, but are not likely to adversely affect, threatened and endangered species and their habitats as a result of routine operations, management, and monitoring. BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would be implemented. Additional BMPs and mitigation measures, as defined in Chapter 19, BMPs and Mitigation Measures, may be implemented as appropriate to further minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the nationwide, interoperable, public safety broadband network would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no effects to threatened and endangered species as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 15.1.6.6, Threatened and Endangered Species and Species of Concern.

15.2.7. Land Use, Recreation, and Airspace

15.2.7.1. Introduction

This section describes potential impacts to land use, recreation, and airspace resources in South Dakota associated with deployment and operation of the Proposed Action and Alternatives. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.7.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on land use, recreation, and airspace resources were evaluated using the significance criteria presented in Table 15.2.7-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to land use, recreation, and airspace resources addressed in this section are presented as a range of possible impacts.

Table 15.2.7-1: Impact Significance Rating Criteria for Land Use, Recreation, and Airspace

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Direct land use change	Magnitude or Intensity	Change in designated/permitted land use that conflicts with existing permitted uses, and/or would require a change in zoning. Conversion of prime or unique agricultural lands.	Effect that is potentially significant, but with mitigation is less than significant.	Minimal changes in existing land use, or change that is permitted by-right, through variance, or through special exception.	No changes to existing development, land use, land use plans, or policies. No conversion of prime or unique agricultural lands.
	Geographic Extent	Regional impacts observed throughout the state or territory.		Effects realized at one or multiple isolated locations.	NA
	Duration or Frequency	Permanent: Land use altered indefinitely.		Short-Term: Land use altered for as long as the entire construction phase or a portion of the operations phase.	NA
Indirect land use change	Magnitude or Intensity	New land use directly conflicts with surrounding land use pattern, and/or causes substantial restriction of land use options for surrounding land uses.	Effect that is potentially significant, but with mitigation is less than significant.	New land use differs from, but is not inconsistent with, surrounding land use pattern; minimal restriction of land use options for surrounding land uses.	No conflicts with adjacent existing or planned land uses.
	Geographic Extent	Regional impacts observed throughout the state or territory.		Effects realized at one or multiple isolated locations.	NA
	Duration or Frequency	Permanent: Land use altered indefinitely.		Short-Term: Land use altered for as long as the entire construction phase or a portion of the operations phase.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
Loss of access to public or private recreation land or activities	Magnitude or Intensity	Total loss of access to recreation land or activities.	Effect that is potentially significant, but with mitigation is less than significant.	Restricted access to recreation land or activities.	No disruption or loss of access to recreational lands or activities.
	Geographic Extent	Most or all recreational land/sites in a state or territory; recreational lands/sites that are of national significance.		Effects realized at one or multiple isolated locations; recreational lands that are not nationally significant, but that are significant within the state/territory.	NA
	Duration or Frequency	Persists during the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA
Loss of enjoyment of public or private recreation land (due to visual, noise, or other impacts that make recreational activity less desirable)	Magnitude or Intensity	Total loss of enjoyment of recreational activities; substantial reduction in the factors that contribute to the value of the recreational resource, resulting in avoidance of activity at one or more sites.	Effect that is potentially significant, but with mitigation is less than significant.	Small reductions in visitation or duration of recreational activity.	No loss of enjoyment of recreational activities or areas; no change to factors that contribute to the value of the resource.
	Geographic Extent	Most or all recreational land/sites in a state or territory; recreational lands/sites that are of national significance.		Effects realized at one or multiple isolated locations; recreational lands that are not nationally significant, but that are significant within the state/territory.	NA
	Duration or Frequency	Persists during or beyond the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Use of airspace	Magnitude or Intensity	Measurable, substantial change in flight patterns and/or use of airspace.	Effect that is potentially significant, but with mitigation is less than significant.	Alteration to airspace usage is minimal.	No alterations in airspace usage or flight patterns.
	Geographic Extent	Regional impacts observed throughout the state or territory.		Effects realized at one or multiple isolated locations.	NA
	Duration or Frequency	Permanent: Airspace altered indefinitely.		Short-Term: Airspace altered for as long as the entire construction phase or a portion of the operations phase.	NA

NA = Not Applicable

15.2.7.3. Description of Environmental Concerns

Direct Land Use Change

The deployment, operation, and maintenance of facilities or other infrastructure, and the acquisition of rights-of-way or easement could influence changes in land use. The deployment, operation, and maintenance of structures, towers, roads, and other permanent features could conflict with exiting development or land use. The installation of poles, towers, structures, or other aboveground facilities or assets could have short- or long-term effects to existing development or land use based on the characteristics of the structures or facilities, such as the location, type, or height. In addition, the acquisition of rights-of-way or easements and the construction of roads to access facilities and locations could influence changes in land use. The effects from these actions would depend on the geographic location; compatibility with existing land uses; and characteristics of the right-of-way, easement, or access road. These characteristics, such as the length, width, and location could change the existing land use to another category or result in the short- or long-term loss of the existing land use.

Based on the impact significance criteria presented in Table 15.2.7-1, less than significant impacts would be anticipated given the size and nature of the majority of the proposed deployment activities. Direct land use changes would be minimized and isolated at specific locations and all required permits would be obtained; only short-term impacts during the construction phase would be expected.

Indirect Land Use Change

Changes in surrounding land use patterns and options for surrounding land uses could be influenced by the deployment, operation, and maintenance of facilities and the acquisition of rights-of-way or easement. The deployment, operation, and maintenance of structures, towers, roads, and other permanent features could conflict with surrounding land use patterns and options for surrounding land uses. The installation of poles, towers, structures, or other aboveground facilities or assets could have short- or long-term effects to surrounding land use patterns or options for surrounding land uses based on the characteristics of the structures or facilities, such as the location, type, or height. In addition, the acquisition of ROWs or easements and the construction of roads to access facilities and locations could influence changes in surrounding land uses. The effects from these actions would depend on the geographic location; compatibility with surrounding land uses; and characteristics of the right-of-way, easement, or access road. These characteristics, such as the length, width, and location could conflict with surrounding land use patterns or restrict options for surrounding land uses.

Based on the impact significance criteria presented in Table 15.2.7-1, less than significant impacts would be anticipated as any new land use would be small-scale; only short-term impacts during the construction phase would be expected.

Loss of Access to Public or Private Recreation Land or Activities

Access to public or private recreation land or activities could be influenced by the deployment, operation, and maintenance of facilities and the acquisition of ROWs or easement. Localized, short-term accessibility to recreation land or activities could be impacted by the deployment and maintenance of structures, towers, roads, and other permanent features. In the long-term, the deployment and installation of poles, towers, structures, or other aboveground facilities could alter the types and locations of recreation activities.

Based on the impact significance criteria presented in Table 15.2.7-1, less than significant impacts would be anticipated as restricted access or a loss of access to recreation areas would not occur; only short-term impacts or small-scale limitations during the construction phase would be expected.

Loss of Enjoyment of Public or Private Recreation Land

The deployment of new towers, and the resulting built tower, could influence the enjoyment of public or private recreation land. Enjoyment of recreation land could be temporarily impacted by crews accessing the site during the deployment and maintenance of structures, towers, roads, and other permanent features. The deployment of poles, towers, structures, or other aboveground facilities could affect the enjoyment of recreational land based on the characteristics of the structures or facilities, including permanent impacts to scenery, short-term noise impacts, and the presence of deployment or maintenance crews.

Based on the impact significance criteria presented in Table 15.2.7-1, less than significant impacts would be anticipated as only small reductions, if any, in recreational visits or durations would occur due to the relatively small-scale nature of likely FirstNet activities. Only short-term impacts during the construction phase would be expected.

Use of Airspace

Primary concerns to airspace include the following: if aspects of the Proposed Action would result in violation of FAA regulations; undermine the safety of civilian, military, or commercial aviation; or infringe on flight activity and flight corridors. Impacts could include air routes or flight paths, available flight altitudes, disruption of normal flight patterns, and restrictions to flight activities. Construction of new towers or alternations to existing towers could obstruct navigable airspace depending on the tower location. Use of aerial technologies could result in SUA considerations.

Based on impact significance criteria presented in Table 15.2.7-1, airspace impacts are not likely to change or alter flight patterns or airspace usage. As drones, balloons, and piloted aircraft would likely only be deployed in an emergency and for a short period, FirstNet would not impact airspace resources.

15.2.7.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure, and the specific deployment requirements, some activities would result in potential impacts to land use, recreation, and airspace resources and others would not. In addition, and as explained in this section, the same type of Proposed Action Infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to land use, recreation, and airspace resources under the conditions described below:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring alongside the road in utility corridors or within public road rights-of-way.
    - <u>Land Use:</u> See Activities Likely to Have Impacts below.
    - <u>Recreation:</u> See Activities Likely to Have Impacts below.
    - <u>Airspace:</u> No impacts to airspace would be anticipated since the activities would not affect flight patterns or cause obstructions that would require FAA and/or state review based on FAR 14 CFR, Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace* (See Section 15.1.7.5 Obstructions to Airspace Considerations).
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas.
    - <u>Land Use:</u> It is anticipated that there would be no impacts to land use since the activities that would be conducted would not directly or indirectly result in changes to existing and surrounding land uses.
    - <u>Recreation:</u> See Activities Likely to Have Impacts below.
    - <u>Airspace:</u> It is anticipated that there would be no impacts to airspace since the activities would not affect flight patterns or cause obstructions that would require FAA and/or state review based on FAR 14 CFR, Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace* (See Section 15.1.7.5 Obstructions to Airspace Considerations).
  - New Build – Aerial Fiber Optic Plant: Installing new poles and hanging cables on previously disturbed or new (undisturbed) ROWs or easements and the potential construction of access roads.

  - Land Use: See Activities Likely to Have Impacts below.
  - Recreation: See Activities Likely to Have Impacts below.
  - Airspace: Installation of new poles would not have an effect on airspace because utility poles are an average of 40 feet in height and do not intrude into useable airspace.
- Collocation on Existing Aerial Fiber Optic Plant: Installation of new fiber on existing poles would be limited to previously disturbed areas.
  - Land Use: It is anticipated that there would be no impacts to land use since the activities that would be conducted would not directly or indirectly result in changes to existing and surrounding land uses.
  - Recreation: No impacts to recreation would be anticipated since the activities that would be conducted would not cause disruption or loss of access to recreational lands or activities or the enjoyment of those lands or activities.
  - Airspace: No impacts are anticipated to airspace from collocations.
- Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting of dark fiber and installation of new equipment in existing huts.
  - Land Use: It is anticipated that there would be no impacts to land use since the activities would not directly or indirectly result in changes to existing and surrounding land uses.
  - Recreation: Use of existing dark fiber would not impact recreation because it would not impede access to recreational resources.
  - Airspace: Lighting of dark fiber would have no impacts to airspace.
- New Build – Submarine Fiber Optic Plant: Installing cables in or near bodies of water and the constructing landings and/or facilities on shore to accept submarine cable.
  - Land Use: See Activities Likely to Have Impacts below.
  - Recreation: See Activities Likely to Have Impacts below.
  - Airspace: The installation of cables in limited nearshore and inland bodies of water and construction of landings/facilities would not impact flight patterns or cause obstructions that would require FAA and/or state review based on FAR 14 CFR, Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace* (See Section 15.1.7.5 Obstructions to Airspace Considerations).
- Installation of Optical Transmission or Centralized Transmission Equipment: Installation of transmission equipment would occur in existing boxes or huts. The section below addresses potential impacts to land use, recreation resources, and airspace if deployment of new boxes, huts, or access roads is required.
  - Land Use: See Activities Likely to Have Impacts below.

    - Recreation: See Activities Likely to Have Impacts below.
    - Airspace: No impacts to airspace would be anticipated since the activities would not affect flight patterns or cause obstructions that would require FAA and/or state review based on FAR 14 CFR, Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace* (See Section 15.1.7.5 Obstructions to Airspace Considerations).

- Wireless Projects
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, structure, or building.
    - Land Use: There would be no impacts to existing and surrounding land uses. The potential addition of power units, structural hardening, and physical security measures would not impact existing or surrounding land uses.
    - Recreation: See Activities Likely to Have Impacts below.
    - Airspace: See Activities Likely to Have Impacts below.
- Deployable Technologies
  - Deployable Technologies: These technologies would be used where permanent, fixed infrastructure cannot be deployed due to a variety of factors such as the need to supplement coverage or to avoid or mitigate permanent impacts to sensitive resources or receptors.
    - Land Use: It is anticipated that there would be no impacts to existing or surrounding land uses because these technologies would be temporarily located in areas compatible with other land uses.
    - Recreation: No impacts to recreation are anticipated, as deployable technologies would not affect the use or enjoyment of recreational lands.
    - Airspace: Use of land-based deployable technologies (COW, COLT, and SOW) is not expected to result in impacts to airspace, provided antenna masts do not exceed 200 feet (AGL) or do not trigger any of the other FAA obstruction to airspace criteria listed in Section 15.1.7.5 Obstructions to Airspace Considerations.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: Installation of permanent equipment on existing structures and the use of portable devices that use satellite technology.
    - Land Use: It is anticipated that there would be no impacts to existing or surrounding land uses because these technologies would be temporarily located in areas compatible with other land uses.
    - Recreation: It is anticipated that there would be no impacts to recreational uses because these technologies would be temporarily deployed but would not restrict access to, or enjoyment of, recreational lands.

    - Airspace: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would not impact airspace because those activities would not result in changes to flight patterns and airspace usage or result in obstructions to airspace.
  - 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. As adding equipment to an existing launch vehicle would be very unlikely to impact to land use, it is anticipated that this activity would have no impact on land use.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to land use, recreation resources, or airspace as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur, including changes to existing and surrounding land uses. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential impacts to land use resources include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring alongside the road in utility corridors or within public road rights-of-way.
    - Land Use: Deployment activities could temporarily restrict existing and surrounding land uses at isolated locations.
    - Recreation: It is anticipated that plowing, trenching, or directional boring may cause temporary, localized restrictions to recreational land or activities, which may persist during the deployment phase. It is reasonable to anticipate that small reductions in visitation to localized areas may occur during the deployment phase.
    - Airspace: No impacts are anticipated – see previous section.
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas.
    - Land Use: No impacts are anticipated – see previous section.
    - Recreation: Installation of fiber optic cable in existing conduits occurs in previously disturbed areas, which may include areas used for recreational purposes. It is possible that access to recreational lands or activities may be restricted during the deployment phase or a portion of the operations phase.
    - Airspace: No impacts are anticipated – see previous section.

- New Build – Aerial Fiber Optic Plant: Installing new poles and hanging cables on previously disturbed or new (undisturbed) rights-of-way or easements and the potential construction of access roads.
  - Land Use: These activities could result in term potential impacts to land uses. Construction activities could temporarily restrict existing and surrounding land uses at isolated locations. New structures, poles, or access roads on previously undisturbed rights-of-way or easements could have long-term impacts to existing and surrounding land uses. The magnitude of the impact would depend on the specific location and the compatibility of the new structures with existing and surrounding land uses.
  - Recreation: Deployment activities may cause temporary, localized restricted access to recreation land or activities, which may persist for the duration of the deployment phase. Small reductions to visitation during the deployment phase may be anticipated.
  - Airspace: No impacts are anticipated – see previous section.
- New Build – Submarine Fiber Optic Plant: Installing cables in or near bodies of water and the constructing landings and/or facilities on shore to accept submarine cable.
  - Land Use: Construction activities could temporarily restrict existing and surrounding land uses at isolated locations. New landings and/or facilities on shore could have long-term impacts to existing and surrounding land uses. The magnitude of the impact would depend on the specific location and the compatibility of the new facilities with existing and surrounding land uses.
  - Recreation: Deployment may temporarily restrict recreation on or within limited nearshore and inland bodies of water and the surrounding area during the deployment phase. Reductions in visitation may result during deployment.
  - Airspace: No impacts are anticipated – see previous section.
- Installation of Optical Transmission or Centralized Transmission Equipment: Installation of equipment including construction of new boxes, huts, or access roads.
  - Land Use: Construction activities could temporarily restrict existing and surrounding land uses at isolated locations. New boxes, huts, or access roads could have long-term impacts to existing and surrounding land uses. The magnitude of the impact would depend on the specific location and the compatibility of the new facilities with existing and surrounding land uses.
  - Recreation: Deployment of installation equipment and the construction of boxes, huts, or access roads may restrict access to recreation land or activities. Reductions in visitation during deployment may occur.
  - Airspace: No impacts are anticipated – see previous section.

- Wireless Projects
  - New Wireless Communication Towers: Installing new wireless towers, associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads.
    - Land Use: Construction activities could temporarily restrict existing and surrounding land uses at isolated locations. New wireless towers, associated structures, or access roads could have long-term impacts to existing and surrounding land uses. The magnitude of the impact would depend on the specific location and the compatibility of the new facilities with existing and surrounding land uses.
    - Recreation: Deployment of new towers and associated structures could result in temporary, localized restricted access for recreation land or activities for the duration of the deployment phase. Reductions in visitation or duration of recreational activity may result from restricted access.
    - Airspace: Installation of new wireless towers could result in impacts to airspace if towers exceed 200 feet AGL or meets the other criteria listed in Section 15.1.7.5 Obstructions to Airspace Considerations. An OE/AAA could be required for the FAA to determine if the proposed construction does affect navigable airways or flight patterns of an airport if the aerial fiber optic plant is located in proximity to one of South Dakota's airports.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower.
    - Land Use: No impacts are anticipated – see previous section.
    - Recreation: Installation of antennas or microwaves to existing towers may cause temporary, localized restricted access to recreation lands or activities during installation, which may cause small reductions in visitation for the duration of installation.
    - Airspace: Collocation of mounting or installing equipment (such as antennas or microwave dishes) on an existing tower, addition of power units, structural hardening, and physical security measures could result in impacts if located near airports.
- Deployable Technologies
  - Deployable Technologies: These technologies would be used where permanent, fixed infrastructure cannot be deployed due to a variety of factors such as the need to supplement coverage or to avoid or mitigate permanent impacts to sensitive resources or receptors.
    - Land Use: No impacts are anticipated – see previous section.
    - Recreation: No impacts are anticipated – see previous section.

        - Airspace: Implementation of deployable aerial communications architecture could result in temporary or intermittent impacts to airspace. Deployment of tethered systems (such as balloons or blimps) could pose an obstruction hazard if deployed above 200 feet and near South Dakota airports (See obstruction criteria in Section 15.1.10.3 Obstructions to Airspace Considerations). Potential impacts to airspace (such as SUAs and MTRs) may be possible depending on the planned use of drones, piloted aircraft, untethered balloons, and blimps (e.g., frequency of deployment, altitudes, proximity to airports and airspaces classes/types, length of deployment, etc.). Coordination with the FAA would be required to determine the actual impact and the required certifications. It is expected that FirstNet would attempt to avoid changes to airspace and the flight profiles (boundaries, flight altitudes, operating hours, etc.).

- Satellites and Other Technologies
    - Satellite-Enabled Devices and Equipment: The installation of permanent equipment on existing structures and the use of portable devices that use satellite technology.
        - Land Use: No impacts are anticipated – see previous section.
        - Recreation: It is anticipated the installation of equipment on existing structures may cause temporary, localized restricted access to recreation lands or activities during installation, which may cause small reductions in visitation for the duration of installation.
        - Airspace: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology may impact airspace if equipment creates an obstruction.

In general, the abovementioned activities could potentially involve construction, including the construction of access roads. Potential impacts to land uses associated with deployment of this infrastructure could include temporary restrictions to existing and surrounding land uses in isolated locations. Potential impacts to recreation land and activities could include temporary, localized restricted access and reductions in visitation or duration of recreational activities. Potential impacts to airspace could include obstructions to airspace or affect flight profiles and operating parameters of SUAs/MTRs. These impacts are expected to be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. It is anticipated that there would be no impacts to land use, recreation resources, or airspace associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for temporary, short-term inspections because there would be no ground disturbance, no airspace activity, and no access restrictions to recreational lands. If routine maintenance or inspection activities would conflict with existing or surrounding land uses, impact recreation resources, or conflict with airspace, impacts could result as explained above. Operation of the Deployable Technologies options of the Preferred Alternative could result in the temporary presence of deployable vehicles and equipment (including airborne equipment), potentially for up to two years in some cases. The degree of change in the visual environment (see Section 15.2.8, Visual Resources)—and therefore the potential indirect impact on a landowner's ability to use or sell of their land as desired—would be highly dependent on the specific deployment location and length of deployment. The use of deployable aerial communications architecture could temporarily add new air traffic or aerial navigation hazards. The magnitude of these effects would depend on the specific location of airborne resources along with the duration of their use. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.7.5. Alternatives Impact Assessment

The following section assesses potential impacts to land use, recreation resources, and airspace associated with the Deployable Technologies Alternative and the No Action Alternative.

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 minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. 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. Therefore, potential impacts to land use, recreation, and airspace resources as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in less than significant impacts to land use if deployment occurs in areas with compatible land uses. While a single deployable technology may have imperceptible impact, multiple technologies operating in close proximity for longer periods could impact existing and surrounding land uses. There could be impacts to recreation activities during the deployment of technologies if such deployment were to occur within or near designated recreation areas. Enjoyment of activities dependent upon the visibility of wildlife or scenic vistas may be affected. Also, implementation of deployable technologies could result in less than significant impacts to airspace if deployment does trigger any obstruction criterion or result in changes to flight patterns and airspace restrictions. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be no impacts to land use, recreation resources, or airspace associated with routine inspections of the Deployable Technologies Alternative, assuming that the same access roads used for deployment are also used for inspections. Operation of deployable technologies would result in land use, land ownership, airspace, and recreation (access and enjoyment) similar in type to those described for the Preferred Alternative. The frequency and extent of those potential impacts would be greater than for the Proposed Action because under this Alternative, deployable technologies would be the only options available. As a result, this alternative would require a larger number of terrestrial and airborne deployable vehicles and a larger number of deployment locations in—all of which would potentially affect a larger number of properties and/or areas of airspace. Overall, these potential impacts would be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure, or satellites and other technologies. As a result, there would be no impacts to land use, recreation resources, or airspace. Environmental conditions would therefore be the same as those described in Section 15.1.7, Land Use, Recreation, and Airspace.

15.2.8. Visual Resources

15.2.8.1. Introduction

This section describes potential impacts to visual resources in South Dakota associated with deployment and operation of the Proposed Action and Alternatives. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.8.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on visual resources were evaluated using the significance criteria presented in Table 15.2.8-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to visual resources addressed in this section are presented as a range of possible impacts.

Table 15.2.8-1: Impact Significance Rating Criteria for Visual Resources

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Adverse change in aesthetic character of scenic resources or viewsheds	Magnitude or Intensity	Fundamental and irreversibly negative change in aesthetic character.	Effect that is potentially significant, but with mitigation is less than significant.	Intermittently noticeable change in aesthetic character that is marginally negative.	No visible effects.
	Geographic Extent	Regional impacts observed throughout the state/territory.		Effects realized at one or multiple isolated locations.	No visible effects.
	Duration or Frequency	Permanent or persistent changes to aesthetic character lasting throughout or beyond the construction or deployment phase.		Persisting through the construction and deployment phase, but aesthetics of the area would be returned to original state following the construction and deployment phase.	Transient or no visible effects.
Nighttime lighting	Magnitude or Intensity	Lighting dramatically alters night-sky conditions.	Effect that is potentially significant, but with mitigation is less than significant.	Lighting alters night-sky conditions to a degree that is only intermittently noticeable.	Lighting does not noticeably alter night-sky conditions.
	Geographic Extent	Regional impacts observed throughout the state/territory.		Effects realized at one or multiple isolated locations.	No visible effects.
	Duration or Frequency	Permanent or persistent changes to night-sky conditions lasting throughout or beyond the construction or deployment phase.		Persisting through the construction and deployment phase, but lighting would be removed and night-sky conditions would be returned to original state following the construction and deployment phase.	Transient or no visible effects.

15.2.8.3. Description of Environmental Concerns

Adverse Change in Aesthetic Character of Scenic Resources or Viewsheds

A primary concern during and following construction of structures, towers, roads or other permanent features is the long-term disruption of scenery and viewsheds. In South Dakota, residents and visitors travel to many NHLs, National Parks, and state parks, such as Mount Rushmore National Memorial to take in the massive granite monument to four great U.S. Presidents and to enjoy the vistas of the Black Hills. If lands considered visually significant or scenic were subject to vegetation loss or removal, short- or long-term effects to viewsheds or scenic resources could occur. Bare ground or interruption of a landscape due to vegetation removal could be considered an adverse change in the aesthetic character of scenic resources or viewsheds. New towers or structures constructed within scenic areas could disrupt the perceived aesthetic character or scenery of an area. South Dakota regulates impacts to visual resources for historic properties through their State Historic Society "to provide for the preservation of its historical, architectural, archaeological, paleontological, and cultural sites by protecting, restoring, and rehabilitating sites, buildings, structures, and antiquities of the state which are of historical significance" (South Dakota Legislature, 1972a). If new towers were constructed to a height that required lighting, nighttime vistas could be affected in areas where the night skies do not have light disruptions or are within unpopulated areas.

Based on the impact significance criteria presented in Table 15.2.8-1, impacts to the aesthetic character of scenic resources or viewsheds would be considered potentially significant if landscapes were permanently removed or fragmented, or if damage to historic or cultural resources occurred. Given the small scale of likely FirstNet activities, impacts are expected to be less than significant.

Nighttime Lighting

If new towers or facilities were constructed to a height that required lighting, nighttime vistas could be affected in areas where the night skies do not have light disruptions or are within unpopulated areas. If nighttime lighting were necessary for the operation or function of a facility that caused regional impacts or permanent changes to night sky conditions, those effects would be considered potentially significant.

Based on the impact significance criteria presented in Table 15.2.8-1, lighting that illuminates the night sky, diminishes night sky viewing over long distances, and persists over the long-term would be considered potentially significant. Although likely FirstNet actions are expected to be small-scale, certain discrete locations may experience potentially significant impacts to night skies, although potentially minimized to less than significant with implementation of BMPs and mitigation measures. BMPs and mitigation measures, as defined through consultation with the appropriate resources agency, would be implemented. Chapter 19, BMPs and Mitigation Measures, provides a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.8.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to visual resources and others would not. In addition, and as explained in this section, the same type of Proposed Action infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to visual resources under the conditions described below:

- Wired Projects
    - Collocation on Existing Aerial Fiber Optic Plant: While the addition of new aerial fiber optic plant to an existing aerial fiber optic transmission system would likely be visible, the change associated with this option is so small as to be essentially imperceptible. This option would involve no new nighttime lighting and pole replacement would be limited.
    - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that there would be no impacts to visual resources since the activities would be conducted at small entry and exit points and are not likely to produce perceptible changes, and would not require nighttime lighting.
    - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to visual resources because there would be no ground disturbance, would not require nighttime lighting, and would not produce any perceptible changes.
- Satellites and Other Technologies
    - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would not impact visual resources since those activities would not require ground disturbance or vegetation removal.

  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact visual resources, it is anticipated that this activity would have no impact on visual resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to visual resources as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur as a result of ground disturbance, vegetation removal, or installation of permanent structures if development occurs in scenic areas. The types of deployment activities that could be part of the Preferred Alternative and result in potential impacts to visual resources include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to visual resources. The degree of impact would depend on the timing, location, and type of project; installation of a hut or POP would be permanent, whereas ground-disturbing activities would be short-term. In most cases, development located next to existing roadways would not affect visual resources unless vegetation was removed or excavation occurred in scenic areas.
  - New Build – Aerial Fiber Optic Plant: Construction and installation of new or replacement poles and hanging cables could result in impacts to the aesthetic character of scenic resources or viewsheds depending on the location of the installation. In most cases, development in public rights-of-ways would not affect visual resources unless vegetation was removed or construction occurred in scenic areas. If new lighting were necessary, impacts to night skies could occur. Construction of new roadways could result in linear disruptions to the landscape, surface disturbance, and vegetation removal; all of which could impact the aesthetic character of scenic resources or viewsheds, depending on the location of the installation.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water would not impact visual resources. However, impacts to the aesthetic character of scenic resources or viewsheds could potentially occur as result of the construction of landings and/or facilities on shore to accept submarine cable.
  - Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment required grading, vegetation removal, or other ground disturbance to install small boxes or huts, or access roads, potential impacts to visual resources could occur but effects would be temporary and localized.

- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in impacts to visual resources. Land/vegetation clearing, excavation activities, landscape grading, and other surface disturbing activities during the installation of new wireless towers and associated structures or access roads could result in the degradation of the aesthetic character of scenic resources or viewsheds. Impacts may be experienced by viewers if new towers were located in or near a national park unit or other sensitive area. If new towers were constructed to a height that required aviation lighting, nighttime vistas could be impacted in areas where the night skies do not have light disruptions or are within unpopulated areas. If nighttime lighting were necessary for the operation or function of a facility, impacts to night sky conditions could occur.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower and would not likely result in additional impacts to visual resources. However, if additional power units are needed, structural hardening, or physical security measures required ground disturbance or removal of vegetation, impacts to the aesthetic character of scenic resources or viewsheds could occur.
  - Deployable Technologies: Implementation of deployable technologies could result in potential impacts to visual resources if long-term deployment occurs in scenic areas, or if the implementation requires minor construction of staging or landing areas, results in vegetation removal, areas of surface disturbance, or additional nighttime lightning.

In general, the abovementioned activities could potentially involve land/vegetation clearing, and potential scenic intrusion of towers, poles, roads, infrastructure, and other structures. Potential impacts to visual resources associated with deployment could include interruptions of landscapes, degradation of the aesthetic character of scenic resources or viewsheds, and overall changes in valued scenic resources, particularly for permanent fixtures such as towers or facilities. These impacts are expected to be less than significant due to the temporary and small-scale nature of deployment activities, although certain discrete locations could have potentially greater impacts to night skies or as a result of new towers. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. It is anticipated that there would be no impacts to visual resources associated with routine inspections of the Preferred

Alternative, assuming that the same access roads used for deployment are also used for inspections. Nighttime lighting in isolated rural areas or if sited near a national park would be less than significant with BMPs and mitigation measures incorporated during operations. Additionally, FirstNet would work closely with the NPS to address any concerns they might have if a tower needed to be placed in an area that might affect the nighttime sky at a NPS unit.

15.2.8.5. Alternatives Impact Assessment

The following section assesses potential impacts to visual resources associated with the Deployable Technologies Alternative and the No Action Alternative.

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 minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. 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. Therefore, potential impacts to infrastructure as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in potential impacts to visual resources if long-term deployment occurs in scenic areas. If staging or landing areas (depending on the type of technology) require surface disturbance or vegetation clearing, or if these areas were within scenic landscapes or required new nighttime lighting, impacts could occur to the aesthetic character of scenic resources or viewsheds. These impacts are expected to be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be no impacts to visual resources associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. The potential visual impacts—including aesthetic conditions and nighttime lighting—of the operation of deployable technologies would be less than significant. These potential impacts would be similar to the potential impacts described for the Deployable Technologies option of the Preferred Alternative, above, only likely with greater numbers of deployable units.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to visual resources as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 15.1.8, Visual Resources.

15.2.9. Socioeconomics

15.2.9.1. Introduction

This section describes potential impacts to socioeconomics in South Dakota associated with deployment and operation of the Proposed Action and Alternatives. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.9.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on socioeconomics were evaluated using the significance criteria presented in Table 15.2.9-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to socioeconomics addressed in this section are presented as a range of possible impacts.

Table 15.2.9-1: Impact Significance Rating Criteria for Socioeconomics

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Impacts to real estate (could be positive or negative)	Magnitude or Intensity	Changes in property values and/or rental fees, constituting a significant market shift.	Effect that is potentially significant, but with mitigation is less than significant.	Indiscernible impact to property values and/or rental fees.	No impacts to real estate in the form of changes to property values or rental fees.
	Geographic Extent	Regional impacts observed throughout the state/territory.		Effects realized at one or multiple isolated locations.	NA
	Duration or Frequency	Persists during the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA
Changes to spending, income, industries, and public revenues	Magnitude or Intensity	Economic change that constitutes a market shift.	Effect that is potentially significant, but with mitigation is less than significant.	Indiscernible economic change.	No change to spending, income, industries, and public revenues.
	Geographic Extent	Regional impacts observed throughout the state/ territory.		Effects realized at one or multiple isolated cities/towns.	NA
	Duration or Frequency	Persists during or beyond the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA
Impacts to employment	Magnitude or Intensity	High level of job creation at the state or territory level.	Effect that is potentially significant, but with mitigation is less than significant.	Low level of job creation at the state/territory level.	No job creation due to project activities at the state/territory level.
	Geographic Extent	Regional impacts observed throughout the state/territory.		Effects realized at one or multiple isolated cities/towns.	NA

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
	Duration or Frequency	Persists during the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA
Changes in population number or composition	Magnitude or Intensity	Substantial increases in population, or changes in population composition (age, race, gender).	Effect that is potentially significant, but with mitigation is less than significant.	Minor increases in population or population composition.	No changes in population or population composition.
	Geographic Extent	Regional impacts observed throughout the state or territory.		Effects realized at one or multiple isolated locations.	NA
	Duration or Frequency	Persists during the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA

NA = Not Applicable

15.2.9.3. Description of Environmental Concerns

This section discusses at a high level the types of socioeconomic impacts that could result from deployment of the NPSBN. Socioeconomic impacts could be negative or positive. Subsections below address socioeconomic impacts in four general areas, following the breakdown of the significance rating criteria in the table above:

- Impacts to Real Estate;
- Economic Benefits or Adverse Impacts Related to Changes in Spending, Income, Industries, and Public Revenues;
- Impacts to Employment; and
- Changes in Population Number or Composition.

In addition to the specific impacts noted below, the Proposed Action would likely have broad, beneficial impacts to all four areas in times of disaster, by improving the response of public safety personnel. Reduced damages and faster recovery would result. This would support property values; maintain corporate income, personal income, and government revenues; preserve jobs; and reduce disruptions to populations.

Impacts to Real Estate

Deployment of the NPSBN has the potential to improve property values in areas that have reduced property values due to below average public safety communication services. Improved services would reduce response times and improve responses (provide a better fit of the response to the need). These effects would reduce the potential for economic losses and thus support investments in property and greater market value for property. Any increases in property values are most likely in areas that have low property values and below average public safety communication services. Increases are less likely in areas that already have higher property value. As discussed in Affected Environment, property values vary across South Dakota. Median values of owner-occupied housing units in the 2009–2013 period ranged from over $160,000 in the Spearfish area, to approximately $80,000 in the Huron area. These figures are general indicators only. Property values are probably both higher and lower in specific localities. Any property value effects of deployment of the NPSBN would occur at a localized level.

Some telecommunications infrastructure, such as wireless communications towers, may adversely affect property values, depending on infrastructure location and other characteristics. Researchers believe these negative impacts relate to perceptions of the aesthetics of towers, or fears over electromagnetic radiation. Economists and appraisers have studied this issue and use a statistical analysis methodology known as hedonic pricing, or hedonic modelling, to assess how different attributes of properties such as distance from a tower affect property value (Bond, Sims, & Dent, 2013). Essentially, analysts compare the value of multiple properties while statistically controlling for differences in property attributes, in order to isolate the effect of a specific attribute such as proximity of a communications tower.

A recent literature review examined such studies in the U.S., Germany, and New Zealand (Bond, Sims, & Dent, 2013). These studies all focused on residential properties. One study identified a positive effect on price in one neighborhood due to the presence of a wireless communications tower. Most studies identified negative effects on price. Generally, these negative effects were small: an approximately two percent decrease in property price. In one case, the average reduction in price was 15 percent. In all cases, the effects declined rapidly with distance, with some cases showing no effect beyond 100 meters (328 feet) and one case showing effects up to about 300 meters (984 feet).

Based on review of the particulars of each study, the literature review authors hypothesize that many additional factors regarding communications towers, besides distance, may affect property value. These include the type, height, size, and appearance of communication towers; grouping of towers; the level of activity in the property market at the time properties are listed or sold; and the level of negative local media focus on potential health effects of communication towers at the time properties are listed or sold.

Economic Benefits or Adverse Impacts Related to Changes in Spending, Income, Industries, and Public Revenues

Developing the NPSBN may increase economic activity as governments and contractors make expenditures to deploy, operate, and maintain telecommunications and broadband infrastructure. Funds for such expenditures would come primarily from federal, state, and local government sources or through private entities under a written agreement with such governmental entities. FirstNet has three primary sources of funding to carry out its mission: (1) up to $7 billion in cash funded by proceeds of incentive auctions authorized by the Act; (2) network user or subscriber fees; and (3) fees from covered leasing agreements that allow FirstNet to permit a secondary users to access network capacity on a secondary basis for non-public safety services only. The use of NPSBN capacity on a secondary basis for non-public safety services, including commercial services, by parties entering into a covered leasing agreement with FirstNet may also increase economic activity and generation of income for such party.

Direct spending of federal, state, and private sector funds to deploy and operate the NPSBN would likely represent new income to businesses that provide goods and services for the network, resulting in a positive impact. This direct impact would lead to indirect impacts (as directly impacted businesses purchase supporting goods and services) and induced impacts (as the employees of all affected businesses spend the wages they have earned). Because most FirstNet infrastructure investments would be dispersed across the nation, the business income and wages generated in any particular state or community would generally be small relative to the overall state or community economy, but measurable. Based on the significance criteria above, the business income and wage impacts would be considered positive and less than significant. It is also highly unlikely that these impacts would lead to significant market shifts or other significant changes to local/regional economic structure.

Spending and income generation related to developing the NPSBN would also result in changes to public revenues. Property taxes may change as property values increase or decrease due to the installation of new infrastructure. General and selective sales taxes may change (most likely increase), reflecting expenditures during system development and maintenance. Public utility tax revenues may change. These taxes are a subcategory of selective sales taxes that includes taxes on providers of land and mobile telephone, telegraph, cable, and internet services (U.S. Census Bureau, 2006). These service providers may obtain new taxable revenues from operation of components of the public safety broadband network. In such cases, public utility tax revenues may increase, but they could also remain the same or decrease if providers are granted tax breaks in return for operating portions of the network. Individual and corporate income taxes may change as FirstNet infrastructure development and operation creates new taxable income for involved companies and workers.

FirstNet's partner(s) may be given the right to use excess NPSBN capacity commercially. This would result in additional economic activity and generation of income. In turn, this could have revenue implications for federal and state governments, through taxes on sales and on corporate income generated by commercial use of the network.

FirstNet may have an additional, non-revenue benefit to the public sector. The network is likely to create operational cost savings and increased productivity for public safety personnel.

Impacts to Employment

Private companies and government organizations that receive income from deploying and operating the NPSBN would use portions of that income to hire the employees they need to provide their support to the network. This generation of new employment is a direct, beneficial impact of expenditures on FirstNet. Additional, indirect employment increases would occur as additional businesses hire workers to provide supporting goods and services. For instance, FirstNet partner(s) and their subcontractors and vendors would need engineers and information technology professionals, project managers, construction workers, manufacturing workers, maintenance workers, and other technical and administrative staff. Further employment gains would occur as businesses throughout the economy benefit from consumer spending by wage-earners in direct and indirectly affected businesses.

For the most part, employment gains in any particular state or community would generally be measurable, but small relative to the overall state or community economy. This is because FirstNet infrastructure investments would be dispersed across the nation. Based on the significance criteria above, the employment impacts would be considered positive and less than significant. However, even small employment gains are beneficial, and would be especially welcomed in areas that have high unemployment. As discussed in Affected Environment, unemployment rates (as shown by the unemployment rate map and selected economic indicators table) vary across South Dakota. The average unemployment rate in 2014 was 3.4 percent, considerably lower than the national rate of 6.2 percent. The majority of counties in South Dakota had unemployment rates below the national average (that is, better employment performance). Only four counties, located outside of the 10 largest population concentrations, had unemployment rates above the national average.

Large companies that win major contracts for deploying and operating the NPSBN may have concentrations of employees in some specific locations; for instance, engineers and other system designers may be located in one or a few specific offices. While such employment concentrations could be important to specific communities, these and other employment impacts would still not be significant based on the criteria in Table 15.2.9-1 because they would not constitute a "high level of job creation at the state or territory level."

Changes in Population Number or Composition

In general, changes in population numbers occur when employment increases or decreases to a degree that affects the decisions of workers on where they can find employment; that is, when workers and their families move to or leave an area because of employment opportunities or the lack thereof. As noted above, deployment and operation of the NPSBN is likely to generate new employment opportunities (directly and indirectly), but employment changes would not be large enough in any state to be considered significant. Therefore, it is highly unlikely that the NPSBN would lead to significant changes in population numbers according to the significance criteria table above. Further, it is unlikely that the NPSBN would lead to any measurable changes in population numbers in any geographic areas, with the possible exception of cities where companies that win major NPSBN contracts establish centers for NPSBN deployment and operation activities. Smaller numbers of employees in any area would not produce measurable population changes because population is always in flux due to births, deaths, and in-migration and out-migration for other reasons.

Population composition refers to age, gender, race, ethnicity, and other characteristics of the individuals making up a population. Given the low potential for changes to population numbers, it is highly unlikely that the NPSBN would lead to any changes in population composition.

15.2.9.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could deploy various types of facilities or infrastructure. Almost all deployment activities would have socioeconomic impacts, because they represent economic activity that would result, for instance, in expenditures and generation of income. These effects are measurable by economists, even if very small, but their significance is determined by application of the criteria in Table 15.2.9-1.

Activities Likely to Have No Impacts

- Satellites and Other Technologies
  - 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. As adding equipment to an existing launch vehicle would be very unlikely to impact socioeconomics, it is anticipated that this activity would have no impact on socioeconomic resources.

Activities with the Potential to Have Impacts

Potential impacts to socioeconomics for the Preferred Alternative would encompass a range of impacts that could result from deployment activities. The discussion below summarizes how the four types of socioeconomic impacts discussed above and listed again here apply to each type of deployment activity. For detail on the nature of these impacts, see the Description of Environmental Concerns section above.

- Impacts to Real Estate;
- Changes to Spending, Income, Industries, and Public Revenues;
- Impacts to Employment; and
- Changes in Population Number or Composition.

Positive impacts on property values would generally not result from one or a few particular activities, but instead would result from the totality of the new NPSBN infrastructure and operational systems that enable improved public safety services to currently underserved areas. Similarly, any change to population numbers in a few locations as discussed above would result from large contract awards and contractor decisions about employee locations, not from specific deployment activities. Therefore, these types of impacts are not included in the activity-focused discussions below.

- Wired Projects
    - Use of Existing Conduit – New Buried Fiber Optic Plant: Installation of fiber optic cable in existing conduit would have the following types of socioeconomic impacts:
        - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant.
        - Impacts to Employment – Similarly, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.
    - Collocation on Existing Aerial Fiber Optic Plant: Collocation of new aerial fiber optic plant on existing utility poles and other structures would have the following types of socioeconomic impacts:
        - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be

small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant.

- Impacts to Employment – Similarly, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.

- Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting of dark fiber would be conducted electronically through existing infrastructure, and would have the following types of socioeconomic impacts:
  - Changes to Spending, Income, Industries, and Public Revenues – Labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant.
  - Impacts to Employment – Similarly, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.
- New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water, and associated onshore activities at existing or new facilities would have the following types of socioeconomic impacts:
  - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant.
  - Impacts to Employment – Similarly, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.
- Installation of Optical Transmission or Centralized Transmission Equipment: Installation of transmission equipment through existing or new boxes or huts would have the following types of socioeconomic impacts:
  - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant.
  - Impacts to Employment – Similarly, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.
- New Build – Buried Fiber Optic Plant: New fiber optic cable installation usually requires construction activities and would have the following types of socioeconomic impacts:
  - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help

support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant.

    - Impacts to Employment – Similarly, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.

  - New Build – Aerial Fiber Optic Plant: Pole/structure installation would have the following types of socioeconomic impacts:

    - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant.

    - Impacts to Employment – Similarly, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.

- Wireless Projects

  - New Wireless Communication Towers: Installation of new wireless towers and associated structures, such as generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads, or access roads would have the following types of socioeconomic impacts:

    - Impacts to Real Estate – As discussed above, communication towers sometimes have adverse impacts on nearby property values (Bond, Sims, & Dent, 2013). Such impacts, if they occur, would be limited to a small area around each project and would generally be a small percentage reduction in property value; thus, the impacts would be less than significant.

    - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant.

    - Impacts to Employment – Similarly, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.

  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would include mounting or installing equipment (such as antennas) on an existing facility would have the following types of socioeconomic impacts. While communication towers sometimes have adverse impacts on nearby property values (Bond, Sims, & Dent, 2013), the impacts of existing wireless towers are presumably already factored into property values and would not be affected by the addition of new equipment.

    - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant.
    - Impacts to Employment – Similarly, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.
  - Deployable Technologies: COWs, COLTs, and SOWs and aerial deployable technologies require storage, staging, and (for aerial deployables) launch/landing areas. Development of such areas, or enlargement of existing areas to accommodate FirstNet equipment, would have the following types of socioeconomic impacts:
    - Impacts to Real Estate – It is possible that development or enlargement of storage, staging, and launch/landing areas could have adverse impacts on nearby property values. This is because such facilities may have adverse aesthetic aspects (e.g., parked vehicles in new parking lots), equipment maintenance activities at such facilities may generate noise, and operational activities may generate traffic. Such factors could affect nearby property values. These impacts, if they occur, would occur within a limited distance of each site, and would be limited to a relatively small number of sites within the region and state. Therefore, these impacts would be less than significant.
    - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant.
    - Impacts to Employment – Similarly, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.
- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the deployment of such devices and equipment would be similar to collocation of wireless equipment on existing wireless towers, structures, or buildings, and would have the following types of socioeconomic impacts:
    - Changes to Spending, Income, Industries, and Public Revenues – Materials and labor for these projects would represent new expenditures that would generate income, help support industries, and may generate public revenues. All such effects would be small in scale relative to the regional and state economy and of limited duration; their impacts would be less than significant.
    - Impacts to Employment – Similarly, expenditures for these projects would generate temporarily a less than significant number of jobs regionally and statewide.

In general, the abovementioned activities would have less than significant beneficial socioeconomic impacts. To the extent that certain activities could have adverse impacts to property values, those impacts are also expected to be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

The discussion above characterized the impacts of each type of activity. The socioeconomic impacts of all activities considered together would also be less than significant. Even when considered together, the impacts would be very small relative to the total economic activity and property value of any region or the state. In addition, with the possible exception of property values, all deployment impacts would be limited to the construction phase.

Operation Impacts

Activities with the Potential to Have Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of primarily of routine maintenance and inspection of fixed infrastructure. As with deployment activities, all operational activities would have socioeconomic impacts, because all represent economic activity. All operational activities would be conducted by public or private sector employees, and therefore support employment and involve payment of wages. Even if these economic effects are a very small for each operational activity and not significant across the entire state, they are measurable socioeconomic impacts.

Potential socioeconomic impacts would primarily be beneficial, and generally of these types:

- Changes to Spending, Income, Industries, and Public Revenues – Operational activities would require expenditures, which then generate business income and employee wages, and may result in new public sector revenues such as taxes on sales and income. All such effects would be small in scale relative to the regional and state economy; their impacts would be less than significant.
- Impacts to Employment – Public and private sector organizations responsible for operating the NPSBN would sustain existing employees and/or hire new employees to carry out operational activities. They would generate a less than significant number of jobs regionally and statewide.

The potential negative impacts on property values mentioned above for deployment of new wireless communication towers and deployable technology storage, staging, and launch/landing areas are also potential concerns in the operations phase. The ongoing presence of such facilities has aesthetic and other effects that may reduce nearby property values, relative to values in the absence of such facilities. These impacts are expected to be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.9.5. Alternatives Impact Assessment

The following section assesses potential impacts to socioeconomics associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative, 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 new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. 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. Therefore, potential impacts to socioeconomics resulting from implementation of this alternative could be as described below.

Deployment Impacts

As explained above, all deployment activities represent economic activity and thus have socioeconomic impacts. These impacts would primarily be beneficial, such as generation of business income and employee wages, and creation or sustainment of jobs. The impacts would be small for each activity, but important at a larger scale, although less than significant based on the significance criteria table.

Deployable technologies such as COWs, COLTs, and SOWs, along with aerial deployable technologies, would require storage, staging, and launch/landing areas. Development or enlargement of these facilities could have adverse impacts on nearby property values. The potential for such impacts is higher under this alternative than the Preferred Alternative because it is likely that these facilities would be implemented in greater numbers and over a larger geographic extent. The potential adverse impacts of new wireless communication towers on property values would be avoided under the Deployable Technologies Alternative. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

All operational activities represent economic activity and thus have socioeconomic impacts. These impacts would primarily be beneficial, and while small individually, would be important at a larger scale, although less than significant.

The ongoing presence of facilities for housing and maintaining deployable technologies may have adverse aesthetic aspects (e.g., large areas of pavement and large numbers of parked vehicles) or other aspects (e.g., noise and traffic) that could negatively affect the value of surrounding properties. The potential for such impacts is higher under this alternative than the

Preferred Alternative because it is likely that these facilities would be more numerous, present over a larger geographic extent, and used with greater frequency and duration. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed. Therefore, there would be no associated deployment or installation activities to deploy wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to socioeconomics from deployment and operation of the No Action Alternative. Socioeconomic conditions would therefore be the same as those described in Section 15.1.9, Socioeconomics.

15.2.10. Environmental Justice

15.2.10.1. Introduction

This section describes potential impacts to environmental justice in South Dakota associated with construction/deployment and operation of the Proposed Action and Alternatives. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.10.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on environmental justice were evaluated using the significance criteria presented in Table 15.2.10-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to environmental justice addressed in this section are presented as a range of possible impacts.

Table 15.2.10-1: Impact Significance Rating Criteria for Environmental Justice

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Effects associated with other resource areas (e. g., human health and safety, cultural resources, socioeconomics) that have a disproportionately high and adverse impact on low-income populations and minority populations	Magnitude or Intensity	Direct and disproportionately high and adverse effects on environmental justice communities (as defined by EO 12898) that cannot be fully mitigated.	Effect that is potentially significant, but with mitigation is less than significant.	Direct effects on environmental justice communities (as defined by EO 12898) that are not disproportionately high and adverse, and therefore do not require mitigation.	No direct effects on environmental justice communities, as defined by EO 12898.
	Geographic Extent	Effects realized within counties at the Census Block Group level.		Effects realized within counties at the Census Block Group level.	Effects realized within counties at the Census Block Group level.
	Duration or Frequency	Persists during the life of the project.		Persists for as long as the entire construction phase or a portion of the operations phase.	NA

NA = Not Applicable

15.2.10.3. Description of Environmental Concerns

Effects Associated with Other Resource Areas That Have a Disproportionately High and Adverse Impact on Low-Income Populations and Minority Populations

EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (Executive Office of the President, 1994), and guidance from CEQ, require federal agencies to evaluate potential human health and environmental effects on environmental justice populations. Specifically, "Such effects may include ecological, cultural, human health, economic, or social impacts on minority communities, low-income communities, or Indian tribes when those impacts are interrelated to impacts on the natural or physical environment." (CEQ, 1997) Thus, effects associated with other resource areas are of interest from an environmental justice perspective. This includes Human Health and Safety, Cultural Resources, Socioeconomics, Noise, Aesthetics and Visual Resources, and other resources.

Potential concerns noted in the impact analyses for these resources include dust, noise, traffic, and other adverse impacts of construction activities. New wireless communication towers sometimes have adverse impacts on nearby property values (Bond, Sims, & Dent, 2013). (See Socioeconomics Environmental Consequences for additional discussion.) The presence and operation of large storage, staging, and launch/landing areas for deployable technologies could raise environmental justice concerns as described below. Indian tribes are considered environmental justice populations (CEQ, 1997); thus, impacts to tribal cultural resources (for instance) due to construction could be a concern from an environmental justice perspective.

Impacts are considered environmental justice impacts only if they are *both* "adverse" and "disproportionately high" in their incidence on environmental justice populations relative to the general population (CEQ, 1997). The focus in environmental justice impact assessments is always, by definition, on adverse effects. However, telecommunications projects, such as those proposed by FirstNet, could have beneficial effects. These effects may include better provision of police, fire, and emergency medical services; improvements in property values; and, the generation of jobs and income. These impacts are considered in the Socioeconomics Environmental Consequences.

Construction impacts are usually localized, and property value impacts of wireless telecommunications projects rarely extend beyond 300 meters (984 feet) of a communications tower (Bond, Sims, & Dent, 2013). In addition, impacts related to deployment are of short duration. The potential for significant environmental justice impacts from the FirstNet deployment activities would be limited. Most, but not all, of the FirstNet operational activities have very limited potential for impacts as these activities are limited in scale and short in their duration.

Before FirstNet deploys projects, additional site-specific analyses to identify specific environmental justice populations and assess specific impacts on those populations may be necessary. Such analyses could tier-off the methodology and results of this PEIS. The areas shown in the environmental justice screening map of Affected Environment (Section 15.1.10.4) as having moderate potential or high potential for environmental justice populations would particularly warrant further screening. As discussed in Section 15.1.10.3, Environmental Setting: Minority and Low-Income Populations, the American Indian / Alaska Native percentage of the population in South Dakota is considerably higher than that of the region and nation. The state's percentage of All Minorities is considerably lower than the percentage for the region or nation. The poverty rate of South Dakota is below the rates for the region and the nation. South Dakota has many areas with high potential for environmental justice populations. These high potential areas occur across the state, and occur both within and outside of the 10 largest population concentrations. A large portion of the area between Rapid City and Pierre is classified as having high potential. Areas with moderate potential for environmental justice populations also occur across the state. Further analysis using the data developed for the screening analysis in Section 15.1.10.4, Environmental Justice Screening Results, may be useful. In addition, USEPA's EJSCREEN tool and USEPA's lists of environmental justice grant and cooperative agreement recipients may help identify local environmental justice populations (USEPA, 2015b; USEPA, 2014).

A site-specific analysis would also evaluate whether an actual environmental justice impact on those populations would be likely to occur. Analysts can use the evaluation presented below under "Activities with the Potential to Have Impacts" as a starting point. Analysts should bear in mind that any such activities that are problematic based on the adverse impact criterion of environmental justice may also have beneficial impacts on those same environmental justice communities.

15.2.10.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including construction/deployment and operation activities.

Deployment Impacts

As described in Section 15.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could deploy various types of facilities or infrastructure. Depending on the physical nature and location of FirstNet facilities or infrastructure and the specific action, some activities would result in potential impacts to environmental justice communities and others would not. In addition, and as explained in this section, the same type of Proposed Action Infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 15.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to environmental justice under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: Installation of fiber optic cable in existing conduit would be through existing hand holes, pulling vaults, junction boxes,

huts, and POP structures. Activities at these small entry points would be limited and temporary and thus are not likely to produce perceptible changes affecting any surrounding communities. Therefore, they would not affect environmental justice communities.

- Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting of dark fiber would be conducted electronically through existing infrastructure, and therefore would have no impacts to environmental justice. If physical access is required to light dark fiber, it would likely be through existing hand holes, pulling vaults, junction boxes, huts, and similar existing structures, with no resulting impacts on environmental justice communities.

- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the deployment of such devices and equipment would not involve new ground disturbance, impacts to environmental justice communities would not occur. Impacts associated with satellite-enabled devices requiring construction activities are addressed below.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact environmental justice communities, it is anticipated that this activity would have no impact on environmental justice issues.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to environmental justice for the Preferred Alternative would encompass a range of impacts that could occur as a result of disturbance to communities from construction activities, such as noise, dust, and traffic. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential impacts to environmental justice communities include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: New fiber optic cable installation usually requires construction activities such as trenching, plowing (including vibratory plowing), or directional boring, as well as construction of hand holes, pulling vaults, junction boxes, huts, and POP structures. These activities could temporarily generate noise and dust, or disrupt traffic. If such impacts occur disproportionately to environmental justice communities, they would be considered environmental justice impacts.
  - New Build – Aerial Fiber Optic Plant: Pole/structure installation could temporarily generate noise and dust, or disrupt traffic. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts.

- New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water would not impact environmental justice because there would be no ground disturbance or other impacts associated with this activity that would adversely impact communities. Associated onshore activities occurring at existing facilities such as staging of equipment and materials, or connection of cables, would be small in scale and temporary; thus, they would not impact environmental justice communities. Construction of new landings and/or facilities onshore to accept submarine cable could temporarily generate noise and dust, or disrupt traffic. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts.
- Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment would occur in existing boxes or huts, there would be no adverse impacts on surrounding communities, and thus no potential for environmental justice impacts. Installation of optical transmission equipment or centralized transmission equipment requiring construction of new utility poles, hand holes, pulling vaults, junction boxes, huts, and POP structures could generate noise and dust, or disrupt traffic. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts.

- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures, such as generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads, or access roads requires construction activities that could temporarily generate noise and dust, or disrupt traffic. New communication towers sometimes have adverse impacts on nearby property values (Bond, Sims, & Dent, 2013). (See Socioeconomics Environmental Consequences for additional discussion.) If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would include mounting or installing equipment (such as antennas) on an existing facility. This activity would be small in scale, temporary, and highly unlikely to produce adverse human health or environmental impacts on the surrounding community. Thus, it would not impact environmental justice communities. If collocation requires construction for additional power units, structural hardening, and physical security measures, the construction activity could temporarily generate noise and dust and disrupt traffic. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts.
  - Deployable Technologies: COWs, COLTs, and SOWs and aerial deployable technologies require storage, staging, and (for aerial deployables) launch and landing areas. To the extent such areas require new construction, noise and dust could be generated, and traffic could be temporarily disrupted. If these effects occur disproportionately in

environmental justice communities, they would be considered environmental justice impacts.

In general, the impacts from the abovementioned activities would be short-term and could potentially involve objectionable dust, noise, traffic, or other localized impacts due to construction activities. In some cases, these effects and aesthetic effects could potentially impact property values, particularly from new towers. These impacts are expected to be less than significant, but are problematic from an environmental justice perspective if they occur disproportionately in environmental justice communities. Since environmental justice impacts occur at the site-specific level, analyses of individual proposed projects would help determine potential impacts to specific environmental justice communities. BMPs and mitigation measures may be required to address potential impacts to environmental justice communities at the site-specific level. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

Activities to Have No Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of primarily of routine maintenance and inspection of fixed infrastructure. It is anticipated that such activities would not result in environmental justice impacts, as the intensity of these activities would be low (low potential for objectionable effects such as noise and dust) and their duration would be very short. Routine maintenance and inspection would not adversely affect property values, for the same reasons. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment activities that involve construction.

Impacts are expected to be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.10.5. Alternatives Impact Assessment

The following section assesses potential impacts to environmental justice associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative, 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 minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. 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. Therefore, potential impacts to environmental justice communities resulting from implementation of this alternative could be as described below.

Deployment Impacts

As explained above, deployable technologies such as COWs, COLTs, and SOWs, along with aerial deployable technologies, could require storage, staging, and launch/landing areas. To the extent such areas require new construction, noise and dust could be generated temporarily, and traffic could be disrupted. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts. Impacts are expected to be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

The ongoing presence of facilities for housing and maintaining deployable technologies may have adverse aesthetic aspects (e.g., large areas of pavement and large numbers of parked vehicles) that could negatively affect the value of surrounding properties. In addition, equipment maintenance activities at such facilities may temporarily generate noise, and operational activities may generate traffic. These effects may be adverse in themselves, and may impact property values. If these effects occur disproportionately in environmental justice communities, they would be considered environmental justice impacts. Impacts are expected to be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed. Therefore, there would be no associated construction or installation activities to deploy wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to environmental justice as a result of deployment and operation of the No Action Alternative. Environmental conditions would therefore be the same as those described in Section 15.1.10, Environmental Justice.

15.2.11. Cultural Resources

15.2.11.1. Introduction

This section describes potential impacts to cultural resources in South Dakota associated with deployment and operation of the Proposed Action and Alternatives. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.11.2. Impact Assessment Methodology and Significance Criteria

The potential impacts of the Proposed Action on cultural resources were evaluated using the significance criteria presented in Table 15.2.11-1. As described in Section 15.2, Environmental Consequences, the categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to cultural resources addressed in this section are presented as a range of possible impacts.

Table 15.2.11-1: Impact Significance Rating Criteria for Cultural Resources

Type of Effect	Effect Characteristics	Impact Level			
		Adverse Effect	**Mitigated Adverse Effect[1]**	**Effect, but Not Adverse**	**No Effect**
Physical damage to and/or destruction of historic properties[2]	Magnitude or Intensity	Effects to a contributing portion of a single or many historic properties.	Adverse effect that has been procedurally mitigated through Section 106 process.	Effects to a non-contributing portion of a single or many historic properties.	No direct effects to historic properties.
	Geographic Extent	Direct effects Area of Potential Effect (APE).		Direct effects APE.	Direct effects APE.
	Duration or Frequency	Permanent direct effects to a contributing portion of a single or many historic properties.		Permanent direct effects to a non-contributing portion of a single or many historic properties.	No direct effects to historic properties.
Indirect effects to historic properties (i.e. visual, noise, vibration, atmospheric)	Magnitude or Intensity	Effects to a contributing portion of a single or many historic properties.	Adverse effect that has been procedurally mitigated through Section 106 process.	Effects to a contributing or non-contributing portion of a single or many historic properties.	No indirect effects to historic properties.
	Geographic Extent	Indirect effects APE.		Indirect effects APE.	Indirect effects APE.
	Duration or Frequency	Long-term or permanent indirect effects to a single or many historic properties.		Infrequent, temporary, or short- or long-term or permanent indirect effects to a single or many historic properties.	No indirect effects to historic properties.
Loss of character defining attributes of historic properties	Magnitude or Intensity	Effects to a contributing portion of a single or many historic properties.	Adverse effect that has been procedurally mitigated through Section 106 process.	Effects to a non-contributing portion of a single or many historic properties.	No direct or indirect effects to historic properties.
	Geographic Extent	Direct and/or indirect effects APE.		Direct and/or indirect effects APE	Direct and/or indirect effects APE.

Type of Effect	Effect Characteristics	Impact Level			
		Adverse Effect	**Mitigated Adverse Effect[1]**	**Effect, but Not Adverse**	**No Effect**
	Duration or Frequency	Long-term or permanent loss of character defining attributes of a single or many historic properties.		Infrequent, temporary, or short-term changes to character defining attributes of a single or many historic properties.	No direct or indirect effects to historic properties.
Loss of access to historic properties	Magnitude or Intensity	Effects to a contributing portion of a single or many historic properties.	Adverse effect that has been procedurally mitigated through Section 106 process.	Effects to a non-contributing portion of a single or many historic properties.	No segregation or loss of access to historic properties.
	Geographic Extent	Any area surrounding historic properties that would cause segregation or loss of access to a single or many historic properties.		Any area surrounding historic properties that could cause segregation or loss of access to a single or many historic properties.	No segregation or loss of access to historic properties.
	Duration or Frequency	Long-term or permanent segregation or loss of access to a single or many historic properties.		Infrequent, temporary, or short-term changes in access to a single or many historic properties.	No segregation or loss of access to historic properties.

[1] Whereas mitigation measures for other resources discussed in this PEIS may be developed to achieve an impact that is "Less than Significant with Mitigation Incorporated," historic properties are considered to be "non-renewable resources," given their very nature. As such, any and all unavoidable adverse effects to historic properties, per Section 106 of the NHPA (as codified in 36 CFR Part 800.6), would require FirstNet to consult with the SHPO/THPO and other consulting parties, including Indian tribes and Native Hawaiian Organizations, to develop appropriate mitigation.

[2] Per NHPA, a "historic property" is defined as any district, archaeological site, building, structure, or object that is either listed or eligible for listing in the NRHP. Cultural resources present within a 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(ies), may or may not be eligible for listing in the NRHP. These sites may also be considered TCPs. 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.

15.2.11.3. Description of Environmental Concerns

Physical Damage to and/or Destruction of Historic Properties

One of the primary environmental concerns during deployment activities is damage to or destruction of historic and cultural resources. Deployment involving ground disturbance has the potential to damage or destroy archaeological sites, and the attachment of communications equipment to historic building and structures has the potential to cause damage to features that are historically significant.

Based on the impact significance criteria presented in Table 15.2.11-1, direct deployment impacts could be potentially significant if FirstNet's deployment locations were in areas with moderate to high probabilities for archaeological deposits, within historic districts, or at historic properties. To the extent practicable, FirstNet would attempt to minimize activities in areas with archaeological deposits or within historic districts. However, given that archaeological sites and historic properties are present throughout South Dakota, some deployment activities may be in these same areas, in which case BMPs (see Chapter 19, BMPs and Mitigation Measures) would help avoid or minimize the potential impacts.

Indirect Effects to Historic Properties (i.e., visual, noise, vibration, atmospheric)

The potential for indirect effects to historic properties would be present during deployment of the proposed facilities/infrastructure and during trenching, grading, and/or foundation excavation activities. Indirect effects include the introduction of visual, noise, atmospheric, and/or vibration effects that diminish a property's historic integrity. The greatest likelihood of potentially significant impacts from indirect effects would be from the deployment of equipment in areas that would cause adverse visual effects to historic properties. To the extent practicable, FirstNet would attempt to minimize activities in areas within or adjacent to historic districts or properties.

Loss of Character Defining Attributes of Historic Properties

Deployment of FirstNet equipment has the potential to cause the loss of character defining attributes of historic properties; such attributes are the features of historic properties that define their NRHP eligibility. Examples of such impacts would be the loss of integrity of archaeological sites through ground disturbing activities, and direct impacts to historic buildings from equipment deployment that adversely alter historic architectural features. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Loss of Access to Historic Properties

The deployment of equipment requiring a secure area has the potential to cause the loss of access to historic properties. The highest potential for this type of significant impact would be from the deployment of equipment in secure areas that impact the access to sites of cultural importance to Native Americans. It is anticipated that FirstNet would identify potential impacts to such areas by conducting research on particular areas and through the NHPA consultation process, and would minimize deployment activities that would cause such loss of access.

15.2.11.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to cultural resources, while others would not. In addition, and as explained in this section, the same type of Proposed Action infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to cultural resources under the conditions described below:

- Wired Projects
    - Use of Existing Conduit – New Buried Fiber Optic Plant: Disturbance associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit in previously disturbed areas. It is anticipated that there would be no impacts to cultural resources since the activities that would be conducted at these small entry and exit points are not likely to produce impacts.
    - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to cultural. If required, and if done in existing huts with no ground disturbance, installation of new associated equipment would also have no impacts to cultural resources. The section below addresses potential impacts to cultural resources if deployment of new huts or other equipment is required.
    - Collocation on Existing Aerial Fiber Optic Plant: Installing new fiber on existing utility poles would not have the potential to cause effects to historic properties.
    - Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment would occur in existing boxes or huts and require no ground disturbance, there would be no impacts to cultural resources. The section below addresses potential impacts to cultural resources if deployment of new boxes, huts, or other equipment is required.

- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: It is anticipated that the installation of permanent equipment on existing structures and the use of portable devices that use satellite technology would not impact cultural resources because those activities would not require ground disturbance or create new visual effects.
  - 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. As adding equipment to an existing launch vehicle would be very unlikely to impact cultural resources, it is anticipated that this activity would have no impact on cultural resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to cultural resources as a result of implementation of the Preferred Alternative would encompass a range of impacts that could occur as a result of ground disturbance activities, including destruction of cultural or historic artifacts. The types of infrastructure deployment activities that could be part of the Preferred Alternative and result in potential impacts to cultural resources include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POP, huts, or other associated facilities or hand-holes to access fiber could result in potential impacts to cultural resources. Soil disturbance and heavy equipment use associated with plowing, trenching, or directional boring as well as land/vegetation clearing, excavation activities, and landscape grading associated with construction of POPs, huts, or other associated facilities or hand-holes to access fiber could result in the disturbance of archaeological sites, and the associated structures could have visual effects on historic properties.
  - New Build – Aerial Fiber Optic Plant: Ground disturbance during the installation of new utility poles and the use of heavy equipment during the installation of new utility poles and hanging of cables could result in the disturbance of archaeological sites, and the associated structures could have visual effects on historic properties.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Although lighting up of dark fiber would have no impacts to cultural resources as mentioned above, installation of new associated huts or equipment, if required, could the disturbance of archaeological sites, and the associated structures could have visual effects on historic properties.
  - New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water could impact cultural resources, as coastal areas, shorelines and creek banks in South Dakota have the potential to contain prehistoric archaeological sites, as well as sites associated with the state's significant maritime history since European colonization, such as shipwrecks. Impacts to cultural resources could also potentially occur as result

of the construction of landings and/or facilities on shore to accept submarine cable, which could result in the disturbance of archaeological and historical sites (archaeological deposits tend to be located in association with bodies of water, and South Dakota has numerous maritime and riverine archaeological sites associated with its 18th and 19th century commercial expansion), and the associated network structures could have visual effects on historic properties.

  - Installation of Optical Transmission or Centralized Transmission Equipment: If installation of transmission equipment required grading or other ground disturbance to install small boxes or huts, or access roads, there could potentially be impacts to cultural resources. Ground disturbance could impact archaeological sites, and the associated structures could have visual effects on historic properties.

- Wireless Projects
  - New Wireless Communication Towers: Deployment of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in impacts to historic properties. Land/vegetation clearing, excavation activities, landscape grading, and other ground disturbance activities during the deployment of new wireless towers and associated structures or access roads, could result in the disturbance of archaeological sites. The deployment of new wireless communication towers and their associated structures could result in visual impacts to historic properties or the loss of access to historic properties.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower could result in impacts to historic properties. Ground disturbance activities could result in impacts to archaeological sites, and the deployment of collocated equipment could result in visual impacts or physical damage to historic properties, especially in urban areas, such as Camden, that have larger numbers of historic buildings.
  - Deployable Technologies: Implementation of deployable technologies could result in potential impacts to cultural resources if deployment occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. In addition, impacts to historic properties could occur if the deployment is long-term, or if the deployment involves aerial technologies with the potential for visual or other indirect impacts.

In general, the abovementioned activities could potentially involve ground disturbance, construction of access roads and other impervious surfaces, landscape grading, and heavy equipment movement. Potential impacts to cultural resources associated with deployment could include physical damage to or destruction of historic properties, indirect impacts including visual effects, the loss of access to historic properties, or the loss of character-defining features of historic properties. These impacts are expected to be less than significant, and mitigation measures, as defined through consultation with the relevant tribe(s) or SHPO(s), would be implemented. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of additional BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major communications infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned deployment impacts. It is anticipated that there would be no impacts to cultural resources associated with routine inspections of the Preferred Alternative. If usage of heavy equipment as part of routine maintenance or inspections occurs off established access roads or corridors, or if the acceptable load of the surface is exceeded, ground disturbance impacts on archaeological sites could result as explained above.

15.2.11.5. Alternatives Impact Assessment

The following section assesses potential impacts to cultural resources associated with the Deployable Technologies Alternative and the No Action Alternative.

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 minimal new construction. 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. Therefore, potential impacts to cultural resources as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in impacts to cultural resources if deployment occurs in unpaved areas, or if the implementation results in paving of previously unpaved surfaces. Some staging or landing areas (depending on the type of technology) may require land/vegetation clearing, excavation, and paving. These activities could result in impacts to archaeological sites.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be no impacts to cultural resources associated with routine inspections of the Preferred Alternative, assuming that the same access roads used for deployment are also used for inspections. If usage of heavy equipment as part of routine maintenance or inspections occurs off established access roads or corridors, impacts to archaeological sites could occur.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to cultural resources as a result of deployment and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 15.1.11, Cultural Resources.

15.2.12. Air Quality

15.2.12.1. Introduction

This section describes potential impacts to South Dakota's air quality from deployment and operation of the Proposed Action and Alternatives. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.12.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on South Dakota's air quality were evaluated using the significance criteria presented in Table 15.2.12-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to South Dakota's air quality addressed in this section are presented as a range of possible impacts.

Table 15.2.12-1: Impact Significance Rating Criteria for South Dakota

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Increased air emissions	Magnitude or Intensity	Pollutant concentrations would exceed one or more NAAQS in nonattainment and maintenance areas. Emissions in attainment areas would cause an area to be out of attainment for any NAAQS. Projects do not conform to the SIP covering nonattainment and maintenance areas.	Effect that is potentially significant, but with mitigation is less than significant.	Negligible emissions would occur for any criteria pollutants within an attainment area but would not cause a NAAQS exceedance.	Action would not cause pollutant concentrations to exceed the NAAQS in nonattainment and maintenance areas. Emissions in attainment areas would not cause air quality to go out of attainment for any NAAQS. Projects are *de minimis* or conform to the SIP covering nonattainment and maintenance areas.
	Geographic Extent/Context	NA		NA	NA
	Duration or Frequency	Permanent or long-term.		Short term.	Temporary.

NA = Not Applicable

15.2.12.3. Description of Environmental Concerns

Increased Air Emissions

The Proposed Action has the potential to generate air pollutant emissions. These emissions could be above and beyond what is typically generated in a given area and may alter ambient air quality. Deployment activities may involve the use of vehicles, heavy equipment, and other equipment that could emit exhaust and create fugitive dust in localized areas. During operations, routine maintenance and other use of generators at tower facilities may emit exhaust for specific durations (maintenance) or unpredictable timeframes (if power is lost to a site, for example). Impacts are likely to be less than significant due to the mobile nature of the sources and the temporary and short-term duration of deployment activities. Although unlikely, the emissions of criteria pollutants could impair the air quality of the region and potentially affect human health. Potential impacts to air quality from emissions may occur in areas where the current air quality exceeds, or has a history of exceeding, one or more NAAQS. Areas exist in South Dakota that are in maintenance or nonattainment for one or more criteria pollutants; particularly, ozone is a statewide issue (see Section 15.1.12, Air Quality, Figure 15.1.12-1).

15.2.12.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including construction, deployment, and operation activities.

Deployment and Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementing the Preferred Alternative could result in deploying various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to air quality and others would not. The potential impacts could range from no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to air quality under the conditions described below:

- Wired Projects
    - Use of Existing Conduit – New Buried Fiber Optic Plant: Activities associated with the installation of fiber optic cable in existing conduit would be limited to entry and exit points of the existing conduit. Gaining access to the conduit and installing the cable may result in minor disturbance at entry and exit points; however, this activity would be temporary and infrequent, and is not expected to produce any perceptible changes in air emissions.

  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up dark fiber would require no construction and have no short- or long-term emissions to air quality because it would create no new sources of emissions.
- Satellites and Other Technologies
  - Satellite Enabled Devices and Equipment: The duration of construction activities associated with installing permanent equipment on existing structures would most likely be short-term. It is anticipated that insignificant concentrations of criteria pollutants would be emitted during installment of this equipment from the use of machinery. Deployment and operation of satellite-enabled devices and portable equipment are expected to have minimal to no impact on ambient air quality concentrations.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact air quality resources, it is anticipated that this activity would have no impact on those resources.

Activities with the Potential to Impact Air Quality

Construction, deployment, and operation activities related to the Preferred Alternative could impact air quality by generating various quantities of criteria and air pollutant emissions. It is expected that such impacts would be less than significant due to the shorter duration and localized nature of the activities. The types of infrastructure deployment scenarios or deployment activities that could be part of the Preferred Alternative and result in potential impacts to air quality include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber as well as land/vegetation clearing, excavation activities, and landscape grading could result in fugitive dust and products of combustion from the use of vehicles and heavy equipment.
  - New Build – Aerial Fiber Optic Plant: The use of heavy equipment during the installation of new poles and hanging cables, as well as constructing access roads, POP huts, or other associated facilities to house plant equipment could result in products of combustion from the use of vehicles and machinery, as well as fugitive dust emissions from site preparation.
  - Collocation on Existing Aerial Fiber Optic Plant: Excavation equipment used during pole replacement, and other heavy equipment used for structural hardening or reinforcement, could result in products of combustion from the use of vehicles and heavy equipment, as well as fugitive dust from site preparation.

  - New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water could generate products of combustion from vessels used to lay the cable. In addition, the construction of landings and/or facilities on shore to accept submarine cable could result in products of combustion and fugitive dust from heavy equipment used for grading, foundation excavation, or other ground disturbing activities.
  - Installation of Optical Transmission or Centralized Transmission Equipment: Emissions associated with the installation of optical transmission or centralized transmission equipment would be limited to the short-term, temporary use of vehicle and construction equipment. Long-term impacts are unlikely, as the power requirements for optical networks are relatively low.
- Wireless Projects
  - New Wireless Communication Towers: Activities associated with installing new wireless towers and associated structures (e.g., generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in products of combustion. Operating vehicles and other heavy equipment, running generators while conducing excavation activities and landscape grading to install new wireless towers and associated structures or access roads could result in products of combustion and fugitive dust.
  - Collocation on Existing Wireless Tower, Structure, or Building: Vehicles and equipment used to mount or install equipment, such as antennas or microwave dishes, on an existing tower could impact air quality. If additional power units are needed, structural hardening, and physical security measures required grading or excavation, then exhaust and fugitive dust from heavy equipment used for these activities could also result in increased air emissions.
  - Deployable Technologies: The type of deployable technology used would dictate the types of air pollutants generated. For example, mobile equipment deployed via heavy trucks could generate products of combustion from the internal combustion engines associated with the vehicles and onboard generators. These units may also generate fugitive dust depending on the type of road traveled during deployment (i.e., paved versus unpaved roads). Aerial platforms (e.g., UASs or other aircraft) would generate pollutants during all phases of flight.

In general, the pollutants of concern from the abovementioned activities would be products of combustion from burning fossil fuels in internal combustion engines and fugitive dust from site preparation activities and vehicles traveling on unpaved road surfaces. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the construction impacts. These impacts are anticipated to be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.12.5. *Alternatives Impact Assessment*

The following section assesses potential impacts to air quality associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative, 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 minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific equipment associated with the Deployable Technologies Alternative could include heavy trucks with onboard generators, aerial vehicles (e.g., UASs or other aircraft), and ground support vehicles and other equipment for aerial deployment. The stand-alone Deployable Technologies Alternative differs from the Preferred Alterative in the number of mobile and aerial vehicles likely to deploy, the distances traveled from storage locations, and the duration of deployment. The potential impacts to air quality are as follows:

Deployment and Operation Impacts to Air Quality

Implementing deployable technologies could result in products of combustion from mobile equipment deployed via heavy trucks using internal combustion engines associated with the vehicles and onboard generators. While a single deployable vehicle may have an insignificant impact, multiple vehicles operating for longer periods, in close proximity, may have a greater cumulative impact, although this is expected to be less than significant based on the defined significance criteria, since activities would be temporary and short-term. These vehicles may also produce fugitive dust if traveling on unpaved roads. Some staging or landing areas (depending on the type of technology) may require excavation, site preparation, and paving. Heavy equipment used for these activities could emit products of combustion as a result of burning fossil fuels in internal combustion engines. The deployment and operation of aerial technology is anticipated to generate pollutants during all phases of flight, except for balloons. The products of combustion from ground support vehicles, as well as the duration of ground support operations and travel between storage and deployment locations would dictate the concentrations and associated impacts. Additionally, routine maintenance and inspections of the deployable technologies are anticipated to be less than significant, given that these activities are of low-intensity and short duration.

No Action Alternative

Under the No Action Alternative, FirstNet would not deploy the NPSBN and there would be no impact to ambient air quality. By not deploying NPSBN, FirstNet would avoid generating emissions from construction, installation, or operation of wired, wireless, or deployable infrastructure or technologies; satellites; and other technologies.

15.2.13. Noise

15.2.13.1. Introduction

This section describes potential noise impacts from construction, deployment, and operation of the Proposed Action and Alternatives in South Dakota. See Chapter 19, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.13.2. Impact Assessment Methodology and Significance Criteria

The noise impacts of the Proposed Action were evaluated using the significance criteria presented in Table 15.2.13-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential noise impacts to South Dakota addressed in this section are presented as a range of possible impacts.

Table 15.2.13-1: Impact Significance Rating Criteria for Noise

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	Less than Significant with BMPs and Mitigation Measures Incorporated	Less than Significant	No Impact
Increased noise levels	Magnitude or Intensity	Noise levels would exceed typical noise levels from construction equipment and generators. Noise levels at noise sensitive receptors (such as residences, hotels/motels/inns, hospitals, and recreational areas) would exceed 55 dBA or specific state noise limits. Noise levels plus baseline noise levels would exceeds 10 dBA increase from baseline noise levels (i.e., louder). Project noise levels near noise receptors at National Parks would exceed 65 dBA.	Effect that is potentially significant, but with mitigation is less than significant.	Noise levels resulting from project activities would exceed natural sounds, but would not exceed typical noise levels from construction equipment or generators.	Natural sounds would prevail. Noise generated by the action (whether it be construction or operation) would be infrequent or absent, mostly immeasurable.
	Geographic Extent/Context	County or local.		County or local.	County or local.
	Duration or Frequency	Permanent or long-term.		Short term.	Temporary.

15.2.13.3. Description of Environmental Concerns

Increased Noise Levels

The Proposed Action has the potential to generate noise during construction and operation of various equipment used for deployment. These noise levels could be above what is typically generated in a given area and may alter the ambient acoustical environment. If significant, the noise could cause impacts on residential areas, or other facilities that are sensitive to noise, such as churches, hospitals, or schools. The construction activities for deploying some of the various equipment evaluated under the Proposed Action could cause short-term impacts to nearby populations. However, it is likely that there would be less long-term effects from operational use of the proposed equipment.

Based on the significance criteria presented in Table 15.2.13-1, noise impacts would likely be less than significant given the size and nature of the majority of the proposed deployment activities. The majority of FirstNet's deployment activities would not be located in sensitive areas nor would a large number of noise sources be deployed/operated long-term in the same area. Noise levels from deployment activities are not expected to exceed typical noise levels for short-term/temporary construction equipment or generators.

To the extent practicable, FirstNet would attempt to mitigate or minimize noise effects during construction or operation. BMPs and mitigation measures would be followed to limit impacts on nearby noise-sensitive receptors. However, given that much of the concentration and setup of equipment would often occur in populated areas, FirstNet operations would not be able to completely avoid noise impacts due to construction and operations at various receptors.

15.2.13.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including construction, deployment, and operation activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementing the Preferred Alternative could result in deploying various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential noise impacts and while others would not.

In addition, the same type of Proposed Action infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no noise impacts under the conditions described below:

- Wired Projects
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up dark fiber would require no construction and have no noise impacts. Impacts that may result if any construction activity is required are discussed below.
- Wireless Projects
  - Deployable Technologies: The type of deployable technology used would dictate the types of noise generated. For example, balloons are expected to have minimal to no impact on the noise environment.
- Satellites and Other Technologies
  - Satellite Enabled Devices and Equipment: The duration of construction activities associated with installing permanent equipment on existing structures would most likely be short-term. It is anticipated that insignificant levels of noise would be emitted during installment of this equipment. Noise caused by these construction and installation activities would be similar to other construction activities in the area, such as the installation of cell phone towers or other communication equipment. Deployment and operation of satellite-enabled devices and equipment are expected to have minimal to no impact on the noise environment.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it may could include equipment on satellites that are already being launched for other purposes. As adding equipment to an existing launch vehicle would be very unlikely to impact noise resources, it is anticipated that this activity would have no impact on those resources.

Activities with the Potential for Noise Impacts

Construction, deployment, and operation activities related to the Preferred Alternative could create noise impacts from either the construction or operation of the infrastructure. The types of infrastructure deployment scenarios or deployment activities that could be part of the Preferred Alternative and result in potential impacts to air quality include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber as well as land/vegetation clearing, excavation activities, and landscape grading could result in high noise levels from the use of heavy equipment and machinery.
  - New Build – Aerial Fiber Optic Plant: The use of heavy equipment during the installation of new poles and hanging cables, as well as constructing access roads, POP huts, or other associated facilities to house plant equipment would be short-term and could result in increased noise levels from the use of vehicles and machinery.

- Collocation on Existing Aerial Fiber Optic Plant: Excavation equipment used during potential pole replacement, and other heavy equipment used for structural hardening or reinforcement, could result in temporary increased in noise levels from the use of heavy equipment and machinery.
- Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Installation of new associated huts or equipment, if required, could result in short-term and temporarily higher noise levels if the activity required the use of heavy equipment for grading or other purposes.
- New Build – Submarine Fiber Optic Plant: The installation of cables in or near bodies of water could generate noise if vessels are used to lay the cable. In addition, the construction of landings and/or facilities on shore to accept submarine cable could result in short-term and temporarily increased noise levels to local residents and other noise sensitive receptors from heavy equipment used for grading, foundation excavation, or other ground disturbing activities.
- Installation of Optical Transmission or Centralized Transmission Equipment: Noise associated with the installation of optical transmission or centralized transmission equipment would be limited to the short-term, temporary use of vehicle and construction equipment. Long-term impacts are unlikely, as the noise emissions from optical networks are relatively low. Heavy equipment used to grade and construct access roads could generate increased levels of noise over baseline levels temporarily.

- Wireless Projects
  - New Wireless Communication Towers: Activities associated with installing new wireless towers and associated structures (e.g., generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in localized construction noise. Operating vehicles, other heavy equipment, and generators would be used on a short-term basis and could increase noise levels.
  - Collocation on Existing Wireless Tower, Structure, or Building: Vehicles and equipment used to mount or install equipment, or to grade or excavate additional land on sites for installation of equipment, such as antennas or microwave dishes on an existing tower, could impact the local noise environment temporarily.
  - Deployable Technologies: The type of deployable technology used would dictate the types of noise generated. For example, mobile equipment deployed via heavy trucks could generate noise from the internal combustion engines associated with the vehicles and onboard generators. With the exception of balloons, aerial platforms (e.g., UASs or other aircraft, except balloons) generate noise during all phases of flight, including takeoff, landing, and flight operations over necessary areas that could impact the local noise environment.

In general, noise from the abovementioned activities would be products of site preparation, installation, and construction activities, as well as additional construction vehicles traveling on nearby roads and localized generator use. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the construction impacts. These impacts are expected to be less than significant due to the temporary duration of deployment activities. Additionally, pre-existing noise levels could be achieved after some months (typically less than a year but could be a few hours for linear activities such as pole construction). See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

Operation activities associated with the Preferred Alternative would be less than significant and similar to several of the deployment activities related to routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. It is anticipated that potential noise impacts would be similar to or less than those described for the deployment activities. If usage of vehicles or heavy equipment as part of routine maintenance or inspections or onsite generator use occurs, potential noise impacts could result as explained above.

15.2.13.5. Alternatives Impact Assessment

The following section assesses potential noise impacts associated with the Deployable Technologies Alternative and the No Action Alternative.

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 minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. The specific equipment associated with the Deployable Technologies Alternative would be heavy trucks with onboard generators, aerial vehicles (e.g., UASs or other aircraft), and ground support vehicles and equipment for aerial deployment. The stand-alone Deployable Technologies Alternative differs from the Preferred Alterative in the number of mobile and aerial vehicles likely to deploy, the distances traveled from storage locations and the duration of deployment. The potential noise impacts are as follows:

Deployment Noise Impacts

Implementing deployable technologies could result in noise from mobile equipment deployed via heavy trucks, including not only onboard generators, but also the vehicles themselves. While a single deployable vehicle may have an insignificant impact, multiple vehicles operating for longer periods, in close proximity, may have a cumulative impact of potential significance. Several vehicles traveling together could also create short-term noise impacts on residences or other noise-sensitive receptors as they pass by. With the exception of balloons, the deployment of aerial technology is anticipated to generate noise during all phases of flight. Aerial technologies would have the highest level of noise impact if they are required to fly above residential areas, areas with a high concentration of noise-sensitive receptors (i.e., schools or churches), or over national parks or other areas where there is an expectation of quiet and serenity on their way to their final destinations. Residences near deployment areas for aerial technologies (i.e., airports or smaller airfields) could also be affected during takeoff and landing operations. Additionally, routine maintenance and inspections of the deployable technologies are anticipated to be less than significant, given that these activities are of low-intensity and short duration. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

Operation activities associated with the Deployable Technologies Alternative would be similar to several of the deployment activities related to routine maintenance and inspection of the facilities. Operation of generators could also generate noise in the area. However, deployable technologies would likely be deployed to areas with low amounts of existing facilities, so noise impacts would be minimal in these areas. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. It is anticipated that potential noise impacts would be the same as those described for the deployment activities. If usage of vehicles or heavy equipment as part of routine maintenance or inspections occurs, potential noise impacts could result as explained above.

Operational impacts from aerial technologies would include repeated flyovers by UAS vehicles while they are needed in the area. This could generate less than significant short-term impacts on any residential areas or other noise-sensitive receptors under the flight path of these vehicles. However, once these operations cease, noise levels would quickly return to baseline levels. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, FirstNet would not deploy the NPSBN and there would be no impact to ambient noise. By not deploying the NPSBN, FirstNet would avoid generating noise from construction, installation, or operation of wired, wireless, deployable infrastructure or satellites and other technologies.

15.2.14. Climate Change

15.2.14.1. Introduction

This section describes potential impacts to climate and climate change-vulnerable FirstNet installations and infrastructure in South Dakota associated with deployment and operation of the

Proposed Action and Alternatives. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.14.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on climate and potential climate change impacts on the Proposed Action's installations and infrastructure were evaluated using the significance criteria presented in Table 15.2.14-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to climate and climate change-vulnerable resources addressed in this section are presented as a range of possible impacts.

CEQ requires the consideration of climate change from two perspectives. The first is the potential for impacts on climate change through GHG emissions resulting from the Proposed Action or Alternatives. The second is related to the implications and possible effects of climate change on the environmental consequences of the Proposed Action or Alternatives. This extends to the impacts of climate change on facilities and infrastructure that would be part of the Proposed Action or Alternatives (CEQ, 2014).

CEQ has established the significance criteria for GHG emissions at 25,000 MT CO_2e on an annual basis, with the requirement that if projected emissions exceed this threshold, a GHG emissions quantitative analysis is warranted (CEQ, 2014). Although 25,000 MT is a very small fraction (one 266,920th) of the total U.S. emissions of 6,673 MMT in 2013 (USEPA, 2015), the sum of additional emissions as a consequence of the deployment of FirstNet, combined with multiple new sources of CO_2 and other GHGs from other projects and human activities, could be significant.

CEQ guidance for the consideration of effects of climate change on the environmental consequences of the Proposed Action is more general. In addition to the consideration of climate change's effects on environmental consequences, it also includes the impact that climate change may have on the projects themselves (CEQ, 2014). Projects located in areas that are vulnerable to the effects of climate change (e.g., sea level rise) may be at risk. Analysis of these risks through the NEPA process can provide useful information to the project planning to ensure these projects are resilient to the impacts of climate change.

Table 15.2.14-1: Impact Significance Rating Criteria for Climate

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
Contribution to climate change through GHG emissions	Magnitude or Intensity	Exceedance of 25,000 metric tons of CO_2e/year, and global level effects observed.	Effect that is potentially significant, but with mitigation is less than significant.	Only slight change observed.	No increase in greenhouse gas emissions or related changes to the climate as a result of project activities.
	Geographic Extent	Global impacts observed.		Global impacts observed.	NA
	Duration or Frequency	Long-term changes. Changes cannot be reversed in a short term.		Changes occur on a longer time scale. Changes cannot be reversed in the short term.	NA
Effect of climate change on FirstNet installations and infrastructure	Magnitude or Intensity	Climate change effects (such as sea level rise or temperature change) negatively impact FirstNet infrastructure.	Effect that is potentially significant, but with mitigation is less than significant.	Only slight change observed.	No measurable impact of climate change on FirstNet installations or infrastructure.
	Geographic Extent	Local and regional impacts observed.		Local and regional impacts observed.	NA
	Duration or Frequency	Long-term changes. Changes cannot be reversed in a short term.		Changes occur on a longer time scale. Changes cannot be reversed in the short term.	NA

NA = Not Applicable

15.2.14.3. Projected Future Climate

Climate model forecasts of future temperatures are highly dependent on emissions scenarios (low versus high), particularly in projections beyond 2050. For an average of seven days per year, maximum temperatures reach more than about 95 °F in the Northern Plains. These high temperatures are projected to occur much more frequently with days over 100 °F projected to double in number in the Northern Plains even in a low emissions scenario. Increases are also expected in the number of nights with minimum temperatures higher than 60 °F in the north part of the plains. These increases in extreme heat will have many negative consequences, including increases in surface water losses, heat stress, and demand for air conditioning. (USGCRP, 2014d)

Air Temperature

Figures 15.2.14.3-1 and 15.2.14.3-2 illustrate the anticipated temperature changes for low and high GHG emission scenarios for South Dakota from a 1969 to 1971 baseline.

Bsk – Figure 15.2.14.3-1 shows that by mid-century (2040 to 2059), temperatures in the Bsk region of South Dakota under a low emissions scenario would increase by approximately 4 °F, and by the end of the century (2080 to 2099) under a low emissions scenario temperatures in the entire state of South Dakota would increase by approximately 6 °F. (USGCRP, 2009)

Figure 15.2.14.3-2 shows that under a high emissions scenario for the period (2040 to 2059), temperatures would increase by approximately 5 °F. Under a high emissions scenario for the period (2080 to 2099) in the Bsk region of South Dakota, temperatures would increase by approximately 9 °F. (USGCRP, 2009)

Dfa – Temperatures in this region are expected to increase by mid-century (2040 to 2059) under a low emissions scenario by approximately 4 or 5 °F depending on the portion of the region. By the end of the century (2080 to 2099), temperatures are expected to increase by 6 °F in the Dfa region under a low emissions scenario. (USGCRP, 2009)

Under a high emissions scenario, temperatures are expected to increase by 5 °F by mid-century, and by the end of the century temperatures will increase 9 or 10 °F depending on the portion of the region. (USGCRP, 2009)

Dfb – Temperatures in this region are expected to increase by mid-century and by the end of the century at the same rate as the Dfa region under both low and high emissions scenarios. (USGCRP, 2009)

Dsc – Temperatures in this region are expected to increase by mid-century and by the end of the century at the same rate as the Bsk region under both low and high emissions scenarios. (USGCRP, 2009)

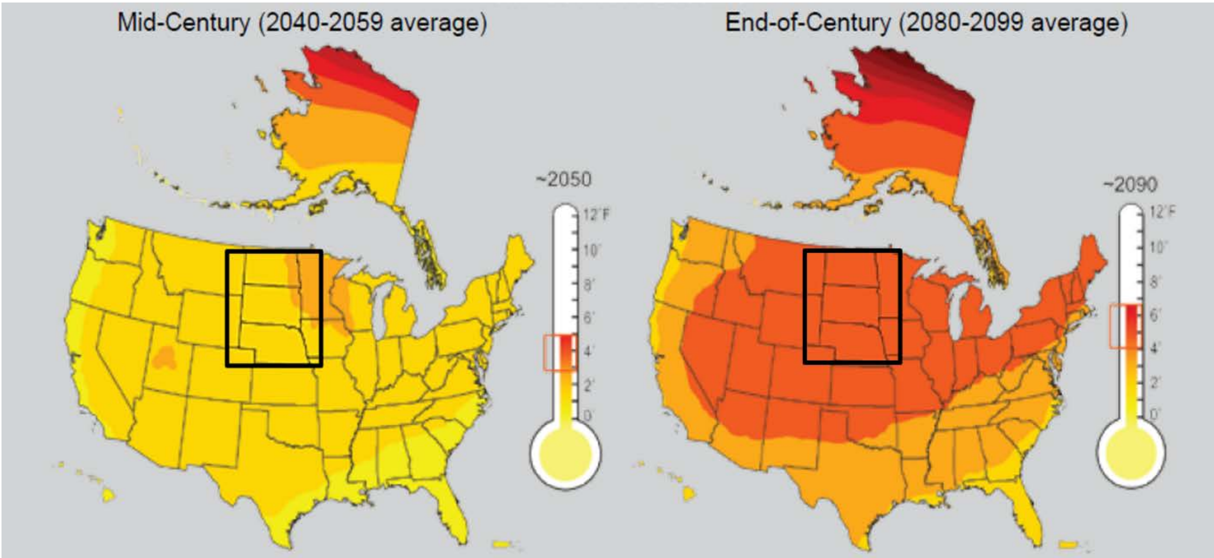

Figure 15.2.14-1: South Dakota Low Emission Scenario Projected Temperature Change

Source: (USGCRP, 2009)

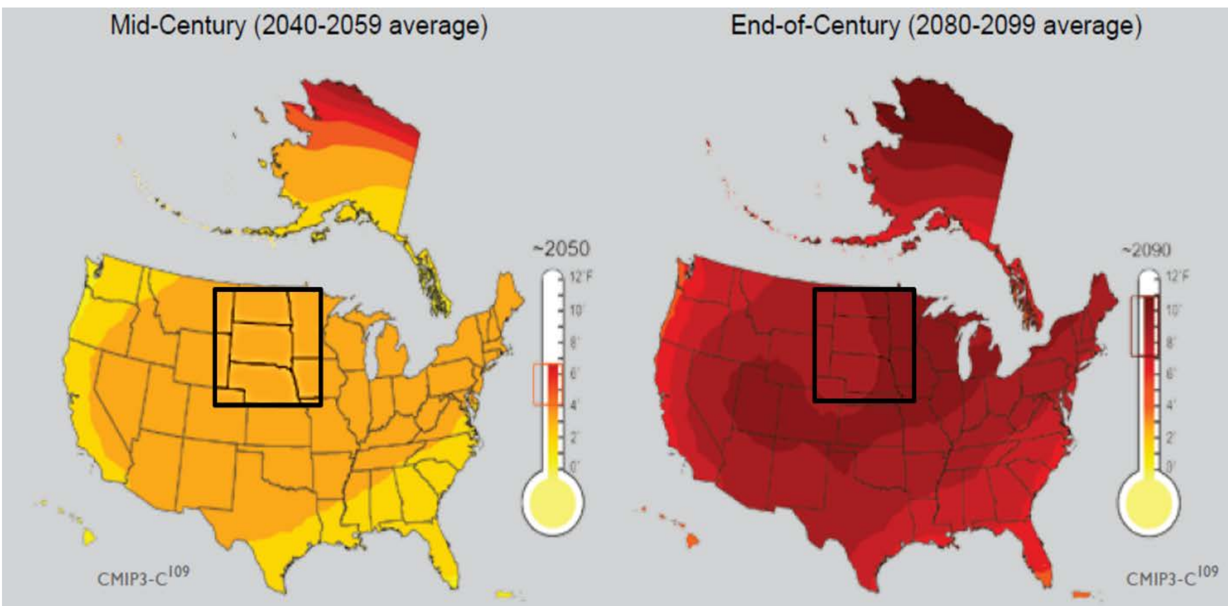

Figure 15.2.14-2: South Dakota High Emission Scenario Projected Temperature Change

Source: (USGCRP, 2009)

Precipitation

Winter and spring precipitation is projected to increase in the northern states of the Great Plains region relative to a 1971-2000 average. In central areas, changes are projected to be small relative to natural variations. Projected changes in summer and fall precipitation are also small except for summer drying in the central Great Plains. The number of days with heavy precipitation is expected to increase by mid-century, especially in the Northern Plains. (USGCRP, 2014c)

Total seasonal snowfall has generally increased in the northern Great Plains although snow is melting earlier in the year and more precipitation is falling as rain versus snow. Overall snow cover has decreased in the Northern Hemisphere, due in part to higher temperatures that shorten the time snow spends on the ground. (USGCRP, 2014b)

In much of South Dakota, there is an expected decrease in the number of consecutive dry days while the rest of the state will have an increase in these numbers under a low emissions scenarios by mid-century (2041 to 2070) as compared to the period (1971 – 2000). Under a high emissions scenario, the majority of the state is projected to have an increase in the number of consecutive dry days. An increase in consecutive dry days can lead to drought. (USGCRP, 2014c)

Figures 15.2.14.3-3 and 15.2.14.3-4 show predicted seasonal precipitation change for an approximate 30-year period of 2071 to 2099 compared to a 1970 to 1999 approximate 30-year baseline. Figure 15.2.14.3-3 shows seasonal changes in a low emissions scenario, which assumes rapid reductions in emissions where rapid reductions means more than 70 percent cuts from current levels by 2050. (USGCRP, 2014e)

Figure 15.2.14.3-4 shows a high emissions scenario, which assumes continued increases in emissions, with associated large increases in warming and major precipitation changes. (Note: white areas in the figures indicate that the changes are not projected to be larger than could be expected from natural variability.) (USGCRP, 2014e)

Bsk – Figure 15.2.14.3-3 shows that in a low emissions scenario in the 30-year period for 2071 to 2099, precipitation would increase by 10 percent in winter in the majority of the region while a small portion is expected to have a 20 percent increase. Spring precipitation is expected to increase 10 percent for the entire state of South Dakota. However, there are no expected changes in precipitation in summer or fall other than fluctuations due to natural variability. (USGCRP, 2014e)

Figure 15.2.14.3-4 shows that if emissions continue to increase, winter precipitation could increase as much as 30 percent or more over the period 2071 to 2099. In spring, precipitation in this scenario could increase as much as 20 to 30 percent depending on the portion of the region. Summer precipitation is expected to decrease 10 or 20 percent depending on the portion of the Bsk region. No significant change to fall precipitation is anticipated over the same period. (USGCRP, 2014e)

Dfa – Under a low emissions scenario precipitation is expected to increase 10 percent in winter and spring in the Dfa region. Summer precipitation is expected to remain constant. Precipitation in fall is expected to remain constant or increase 10 percent depending on the portion of the region. (USGCRP, 2014e)

Under a high emissions scenario precipitation is expected to increase 30 percent. In spring, precipitation will increase 20 or 30 percent depending on the portion of the Dfa region. Summer precipitation is expected to decrease 10 or 20 percent depending on the portion of the region. Fall precipitation will remain constant. (USGCRP, 2014e)

Dfb – Precipitation changes for the Dfb region are consistent with projected changes for the (Dfa) region of South Dakota under a low emissions scenario. (USGCRP, 2014e)

Under a high emissions scenario, winter and spring precipitation is expected to increase 30 percent in the Dfb region of South Dakota. In summer, precipitation will decrease 10 percent. Fall precipitation is expected to remain constant or increase 10 percent depending on the portion of the region. (USGCRP, 2014e)

Dsc – Precipitation in spring, summer and fall in the Dsc region are consistent with projected changes for the (Bsk) region of South Dakota under a low emissions scenario. In winter, precipitation in this region is expected to increase 10 percent. (USGCRP, 2014e)

Under a high emissions scenario precipitation changes in winter, spring and fall are consistent with the Bsk region. Summer precipitation is expected to decrease 10 percent. (USGCRP, 2014e)

Severe Weather Events

It is difficult to forecast the impact of climate change on severe weather events such as winter storms and thunderstorms. Trends in thunderstorms are subject to greater uncertainties than trends in temperature and associated variables directly related to temperature such as sea level rise. Climate scientists are studying the influences of climate change on severe storms. Recent research has yielded insights into the connections between warming and factors that cause severe storms. For example, atmospheric instability and increases in wind speed with altitude link warming with tornadoes and thunderstorms. Additionally, research has found a link between warming and conditions favorable for severe thunderstorms. However, more research is required to make definitive links between severe weather events and climate change. (USGCRP, 2014b)

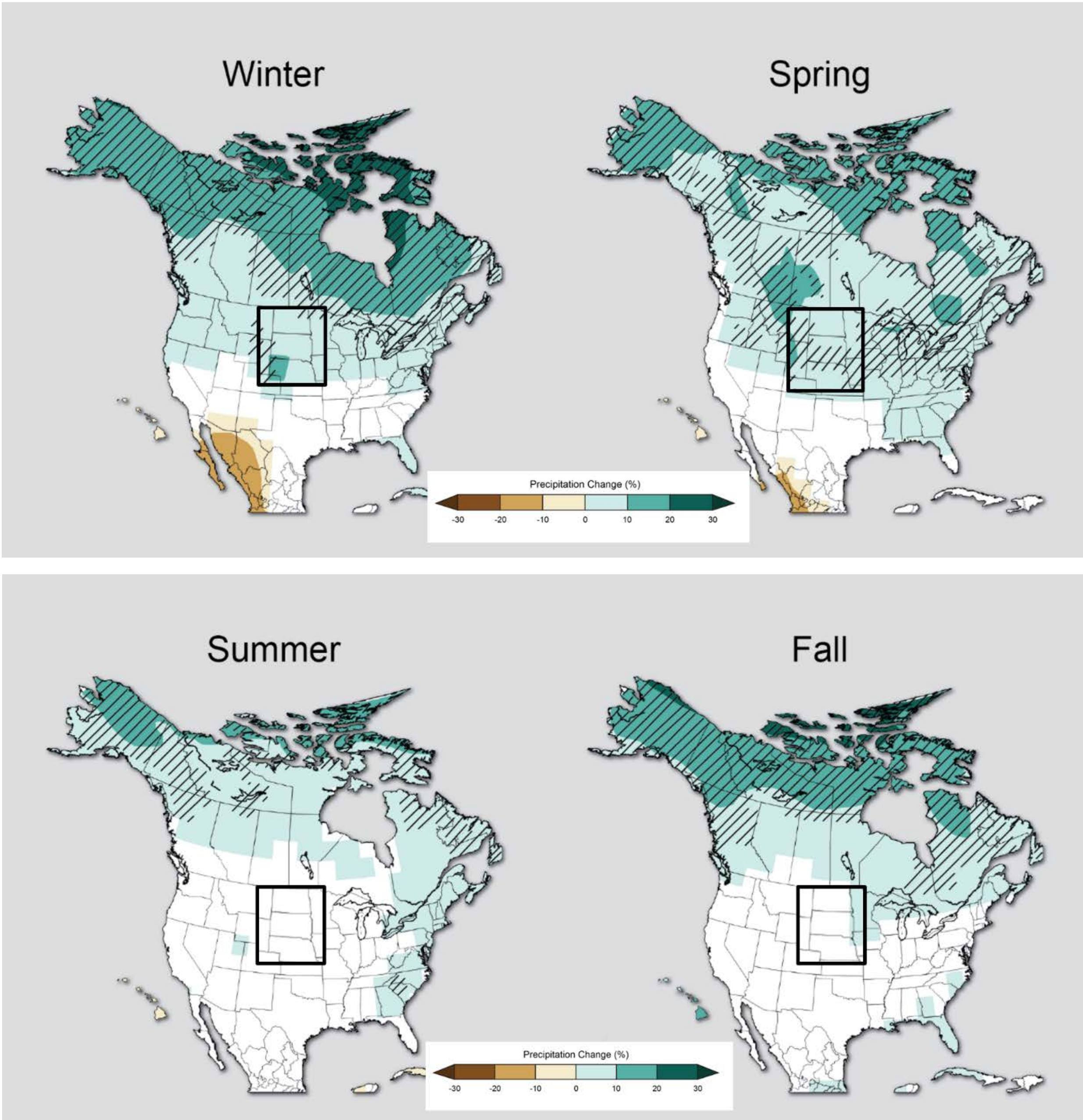

Figure 15.2.14-3: Predicted Seasonal Precipitation Change for 2071 to 2099 Compared to 1970 to 1999 Baseline in a Low Emissions Scenario

Source: (USGCRP, 2014e)

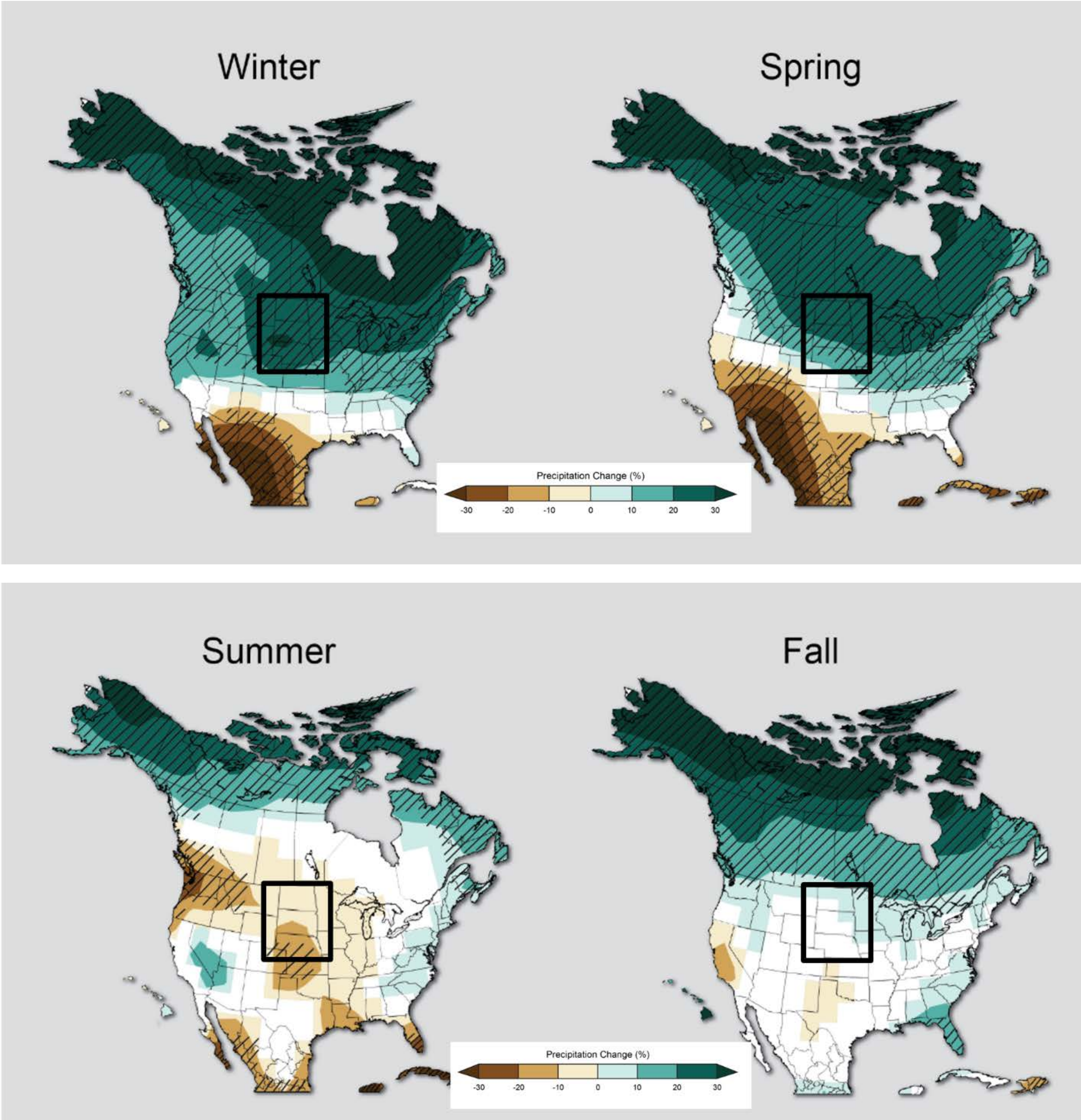

Figure 15.2.14.3-4: Predicted Seasonal Precipitation Change for 2071 to 2099 Compared to 1970 to 1999 Baseline in a High Emissions Scenario

Source: (USGCRP, 2014e)

15.2.14.4. Description of Environmental Concerns

Greenhouse Gas Emissions

Increases in GHG emissions have altered the global climate, leading to generalized temperature increases, weather disruption, increased droughts and heatwaves, and may have potentially catastrophic long-term consequences for the environment. Although GHGs are not yet regulated by the federal government, many states have set various objectives related to reducing GHG emissions, particularly CO_2 emissions from fossil fuels.

Based on the impact significance criteria presented in Table 15.2.14-1, climate change impacts as a result of GHG emissions could be significant and require a quantitative analysis if FirstNet's deployment of technology was responsible for increased emissions of 25,000 MT/year or more. The GHG emissions resulting from FirstNet activities fall into two categories: short-term and long-term. Short-term emissions could be associated with deployment activities (vehicles and other motorized construction equipment) and would have no long-term or permanent impact on GHG emissions or climate change. Long-term (both temporary and permanent) emission increases could result from operations, including the use of grid-provided electricity by FirstNet equipment such as transmitters and optical fiber, and from the temporary use of portable or onsite electric generators (a less efficient, more carbon-intensive source of electricity), during emergency situations when the electric grid was down, for example after a hurricane.

A single large cell tower would typically require 20-60kW of power to operate (Balshe, 2011). The CO_2 emissions associated with the operation of the tower would depend on whether it was supplied by a stand-alone power source, such as a generator, or from the grid, and whether it was operating at full power on a continuous basis. A standard 60kW 3-phase diesel generator consumes approximately 5.0 gallons of diesel per hour (Diesel Service & Supply, 2016) . Diesel fuel combustion emits 22.38 lbs of CO_2 per gallon (EIA, 2015d). A 60kW transmitter running on a generator would therefore be responsible for 1,221 kg of CO_2/day. Running continuously, the tower would cause the emission of 446 MT of CO_2 per year.

However, grid-provided electricity would result in less CO_2 emissions than on-site provided energy. Using the average carbon intensity of grid-provided electricity of 1,136.53 lbs/MWh (USEPA 2015), the same transmitter would be responsible for approximately 271 MT of CO_2 per year running continuously. Actual emissions would depend on the fuel mix and efficiency of the systems from which electricity was generated. Some may even run on low/no-emissions renewable energy. Therefore, this scenario is a "worst-case" for GHG emissions. If the system deployment resulted in the operation of more than 50 60 kW towers operating at maximum power in remote locations on diesel generators on a continuous basis, the 25,000 MT/year threshold may be exceeded and a quantitative analysis required. By comparison optical fiber is considerably more energy efficient and consumes considerably less power than transmitters (Vereecken, et al., 2011), and would not impact GHG emissions in such a way as to require a quantitative analysis.

Impact of Climate Change on Project-Related Resource Effects

Climate change may impact project-related effects by magnifying or otherwise altering impacts in other resources areas. For example, climate change may impact air quality, water resource availability, and recreation. These effects would vary from state to state depending on the resources in question and their relationship to climate change. Climate change is expected to alter precipitation patterns, seasons, and temperatures in the Great Plains states in ways that will put pressure on the agricultural sector as well as natural ecosystems, stressing the growth cycles of traditional crop, livestock, and wild species, exacerbating competition for water resources, and putting increased economic pressure on rural communities. (USGCRP, 2014c)

Impact of Climate Change on FirstNet Installations and Infrastructure

Climate change impacts on FirstNet installations and infrastructure will vary from state to state, depending on the placement and vulnerability of the installations and infrastructure, and the impacts that climate change is anticipated to have in that particular location.

For areas of South Dakota at risk for flooding, climate change is projected to increase overall precipitation in the great plains (USGCRP, 2014c), and also the frequency and severity of torrential downpours which in turn will increase the potential for flash floods (USGCRP, 2014a). Increased flooding may threaten FirstNet infrastructure and installations located in or near floodplains.

Climate change may expose areas of South Dakota to increased intensity and duration of heat waves (USGCRP, 2014a). Extended periods of extreme heat may increase general demand on the electric grid, impede the operation of the grid, and overwhelm the capacity onsite equipment needed to keep microwave and other transmitters cool.

15.2.14.5. Potential Impacts of the Preferred Alternative

Greenhouse Gas Emissions

The following section assesses potential GHG emission impacts associated with implementation of the Preferred Alternative in South Dakota, including deployment and operation activities.

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment and operation of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to GHG emissions, climate impacts in other resource areas, and FirstNet infrastructure and operations, and others would not. In addition, and as explained in this section, the same type of Proposed Action infrastructure could result in a range of no impacts to less than significant impacts depending on the deployment scenario or site-specific conditions.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to climate change under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: There would be no short-term emissions associated with construction, as construction would not take place. The equipment required to blow or pull fiber through existing conduit would be used temporarily and infrequently, resulting in no perceptible generation of GHG emissions.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up dark fiber would require no construction and have no short- or long-term emissions. This would create no perceptible change in GHG emissions.
- Satellites and Other Technologies
  - Satellite Enabled Devices and Equipment: The installation of satellite-enabled equipment on existing structures, or the use of portable satellite-enabled devices would not create any perceptible changes in GHG emissions because they would not create any new emissions sources.
  - Deployment of Satellites: FirstNet does not anticipate launching satellites as part of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes. Therefore, it is anticipated that there would be no GHG emissions or any climate change effects on the project because of these activities.

Activities with the Potential to Have Impacts

The deployment and use of energy-consuming equipment as a result of the implementation of the Preferred Alternative would result in GHG emissions whose significance would vary depending on their power requirements, duration and intensity of use, and number. The types of infrastructure deployment scenarios that could be part of the Preferred Alternative and result in potential impacts to GHG emissions and climate change include the following:

- Wireless Projects
  - New Build - Buried Fiber Optic Plant: This activity would include plowing (including vibratory plowing), trenching, and directional boring, and could involve construction of POPs, huts, or other facilities to house outside plant equipment or hand holes to access fiber. These activities could generate GHG emissions.
  - New Build Aerial Fiber Optic Plant: These projects would require construction equipment for installing or replacing new poles and hanging cables as well as excavation and grading for new or modified right-of-ways or easements. It could also include construction of POPs, huts, or other facilities to house outside plant equipment. These activities could generate GHG emissions.

- Collocation on Existing Aerial Fiber Optic Plant: These projects would require equipment for replacement of existing wiring and poles. GHG emissions associated with these projects would arise from use of machinery and vehicles to complete these activities.
- New Build – Submarine Fiber Optic Plant: The deployment of small workboats with engines similar to recreational vehicle engines may be required to transport and lay small-wired cable. The emissions from these small marine sources would contribute to GHGs.
- Installation of Optical Transmission or Centralized Transmission Equipment: The construction of small boxes or huts or other structures would require construction equipment, which could generate GHG emissions.

- Wireless Projects
  - New Wireless Tower Construction: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads could result in short-term, temporary GHG emissions from vehicles and construction equipment. Long-term, permanent or temporary increases in GHG emissions would result from the electricity requirements of the towers (both grid-provided and back-up), and would depend on their size, number, and the frequency and duration of their use.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on existing towers. There would be no short-term GHG emissions associated with construction, as construction would not take place. Minor, short-term, temporary GHG emissions may result from any associated equipment used for installation, such as cranes or other equipment. Long-term, permanent or temporary increases in GHG emissions would result from the electricity requirements of the towers (both grid-provided and back-up), and would depend on their size, number, and the frequency and duration of their use.
- Deployable Technologies
  - COWs, COLTs, or SOWs: The long-term operations of these mobile systems have the potential to have GHG emission impacts in excess of 25,000 MT if operated in large numbers over the long-term. However, this would be highly dependent on their size, number, and the frequency and duration of their use.
  - Emissions associated with the deployment and maintenance of a complete network solution of this type may be significant if large numbers of piloted or unmanned aircraft were used for a sustained period of time (i.e. months to years). Emissions would depend on the type of platforms used, their energy consumption, and the duration of the network's operation.

Potential climate change impacts associated with deployment activities as a result of implementation of the Preferred Alternative include increased GHG emissions. GHG emissions would arise from the combustion of fuel used by equipment during construction and changes in land use. Land use emissions occur as a result of soil disturbance and loss of vegetation. Impacts are expected to be less than significant. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

Climate Change Impacts on FirstNet Infrastructure or Operations

Climate change effects on the Preferred Alternative could be potentially significant to less than significant with BMPs and mitigation measures incorporated because climate change may potentially impact FirstNet installations or infrastructure during periods of extreme heat, severe storms, and other weather events. FirstNet installations should be evaluated in the design and planning phase through tiering to this analysis, in the context of their local geography and anticipated climate hazards to ensure they are properly hardened or there is sufficient redundancy to continue operations in a climate-affected environment. Mitigation measures could minimize or reduce the severity or magnitude of a potential impact resulting from the project, while adaptation refers to anticipating adverse effects of climate change and taking appropriate action to prevent and minimize the damage climate change effects could cause.

Anticipated impact from climate change on extreme weather events such as hurricanes or heat waves may increase the severity of the emergencies to which first responders are responding in vulnerable areas, and thus the extent and duration of their dependence on FirstNet resources. FirstNet would likely prepare to sustain these operations in areas experiencing climate and weather extremes through the design and planning process for individual locations and operations.

15.2.14.6. Alternatives Impact Assessment

The following section assesses potential impacts to climate associated with the Deployable Technologies Alternative and the No Action Alternative.

Deployable Technologies Alternative

Under the Deployable Technologies Alternative, 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 associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. 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.

Potential Deployment Impacts

As explained above, implementation of deployable technologies could involve use of fossil-fuel-powered vehicles, powered generators, and/or aerial platforms. There could be some emissions and soil and vegetation loss as a result of excavation and grading for staging and/or landing areas depending on the type of technology. GHG emissions are expected to be less than significant based on the defined significance criteria, since activities would be temporary and short-term.

Potential Operations Impacts

Implementing land-based deployable technologies (COW, COLT, SOW) could result in emissions from mobile equipment on heavy trucks using internal combustion engines associated with the vehicles and onboard generators. While a single deployable vehicle may have an insignificant impact, multiple vehicles operating for longer periods, in close proximity, may have a cumulative impact, although this impact is expected to be less than significant. Some staging or landing areas (depending on the type of technology) may require excavation, site preparation, and paving. Heavy equipment used for these activities could produce emissions as a result of burning fossil fuels in internal combustion engines. The deployment and operation of aerial technology is anticipated to generate pollutants during all phases of flight, except for balloons. The products of combustion from ground support vehicles, as well as the duration of ground support operations and travel between storage and deployment locations would dictate the concentrations and associated impacts.

Additionally, routine maintenance and inspections of the deployable technologies are anticipated to be less than significant, given that these activities are of low-intensity and short duration.

Climate Change Impacts on FirstNet Infrastructure or Operations

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. These projects may also consist of deploying aerial vehicles including, but not limited to, drones, balloons, blimps, and piloted aircraft, which could involve fossil fuel combustion. Climate change effects have the most noticeable impacts over a long period of time. Climate change effects such as temperature, precipitation changes, and extreme weather during operations would be expected but could have little to no impact on the deployed technology if the technologies are deployed within a short period of time (less than a decade). If there are no permanent structures, particularly near coastal areas, there would be little to no impacts as a result of sea-level rise. However, if these technologies are deployed continuously (at the required location) for a period greater than a decade, climate change effects on infrastructure could be similar to the Proposed Action, as explained above.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure, or satellites and other technologies. As a result, there would be no impacts to GHG emissions or climate as a result of deployment and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 15.1.14, Climate Change.

15.2.15. Human Health and Safety

15.2.15.1. Introduction

This section describes potential impacts to human health and safety in South Dakota associated with deployment of the Proposed Action and Alternatives. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.15.2. Impact Assessment Methodology and Significance Criteria

The impacts of the Proposed Action on human health and safety were evaluated using the significance criteria presented in Table 15.2.15-1. The categories of impacts are defined as potentially significant, less than significant with mitigation incorporated, less than significant, or no impact. Characteristics of each impact type, including magnitude or intensity, geographic extent, and duration or frequency, were used to determine the impact significance rating associated with each potential impact.

Given the nature of this programmatic evaluation, and because the Proposed Action could potentially cover a wide variety of actions that would take place in various landscapes, the potential impacts to human health and safety addressed in this section are presented as a range of possible impacts.

Table 15.2.15-1: Impact Significance Rating Criteria for Human Health and Safety

Type of Effect	Effect Characteristics	Impact Level: Potentially Significant	Impact Level: Less than Significant with BMPs and Mitigation Measures Incorporated	Impact Level: Less than Significant	Impact Level: No Impact
Exposure to Worksite Occupational Hazards as a Result of Activities at Existing or New FirstNet Sites	Magnitude or Intensity	Exposure to concentrations of chemicals above occupational regulatory limits and time weighted averages. A net increase in the amount of hazardous or toxic materials or wastes generated, handled, stored, used, or disposed of, resulting in unacceptable risk, exceedance of available waste disposal capacity and probable regulatory violations. Exposure to recognized workplace safety hazards (physical and chemical). Violations of various regulations including: OSHA, RCRA, CERCLA, TSCA, EPCRA.	Effect is potentially significant, but with mitigation is less than significant.	No exposure to chemicals above health-protective screening levels. Hazardous or toxic materials or wastes could be safely and adequately managed in accordance with all applicable regulations and policies, with limited exposures or risks. No exposure to unsafe working conditions or other workplace safety hazards.	No exposure to chemicals, unsafe working conditions, or other workplace safety hazards.
	Geographic Extent	Regional impacts observed ("regional" assumed to be at least a county or county-equivalent geographical extent, could extend to state/territory).		Impacts only at a local/neighborhood level.	NA
	Duration or Frequency	Occasional frequency during the life of the project.		Rare event.	NA

Type of Effect	Effect Characteristics	Impact Level: Potentially Significant	Impact Level: Less than Significant with BMPs and Mitigation Measures Incorporated	Impact Level: Less than Significant	Impact Level: No Impact
Exposure to Hazardous Materials, Hazardous Waste, and Mine Lands as a Result of FirstNet Site Selection and Site-Specific Land Disturbance Activities	Magnitude or Intensity	Exposure to concentrations of chemicals above regulatory limits, or USEPA chemical screening levels protective of the general public. A net increase in the amount of hazardous or toxic materials or wastes generated, handled, stored, used, or disposed of, resulting in unacceptable risk, exceedance of available waste disposal capacity and probable regulatory violations. Site contamination conditions could preclude development of sites for the proposed use. Violations of various regulations including: OSHA, RCRA, CERCLA, TSCA, EPCRA. Unstable ground and seismic shifting.	Effect is potentially significant, but with mitigation is less than significant.	No exposure to chemicals above health-protective screening levels. Hazardous or toxic materials or wastes could be safely and adequately managed in accordance with all applicable regulations and policies, with limited exposures or risks. No exposure to unstable ground conditions or other workplace safety hazards.	No exposure to chemicals, unstable ground conditions, or other workplace safety hazards.
	Geographic Extent	Regional impacts observed ("regional" assumed to be at least a county or county-equivalent geographical extent, could extend to state/territory).		Impacts only at a local/neighborhood level.	NA
	Duration or Frequency	Occasional frequency during the life of the project.		Rare event.	NA
Exposure to Hazardous Materials, Hazardous Waste, and Occupational Hazards as a Result of Natural And Manmade Disasters	Magnitude or Intensity	Exposure to concentrations of chemicals above regulatory limits, or USEPA chemical screening levels protective of the general public. Site contamination conditions could preclude development of sites for the proposed use. Physical and biologic hazards. Loss of medical, travel, and utility infrastructure.	Effect is potentially significant, but with mitigation is less than significant.	No exposure to chemicals above health-protective screening levels. Hazardous or toxic materials or wastes could be safely and adequately managed in accordance with all applicable regulations and policies, with limited exposures or risks. No	No exposure to chemicals, unsafe conditions, or other safety and exposure hazards.

Type of Effect	Effect Characteristics	Impact Level			
		Potentially Significant	**Less than Significant with BMPs and Mitigation Measures Incorporated**	**Less than Significant**	**No Impact**
				exposure to unsafe conditions. No loss of medical, travel, or utility infrastructure.	
	Geographic Extent	Regional impacts observed ("regional" assumed to be at least a county or county-equivalent geographical extent, could extend to state/territory).		Impacts only at a local/neighborhood level.	NA
	Duration or Frequency	Occasional frequency during the life of the project.		Rare event.	NA

NA = Not Applicable

15.2.15.3. Description of Environmental Concerns

Worksite Physical Hazards, Hazardous Materials, and Hazardous Waste

The human health and safety concern having the greatest likelihood to occur during FirstNet deployment activities is occupational injury to telecommunication workers. The nature of telecommunication work requires workers to execute job responsibilities that are inherently dangerous. Telecommunication work activities present physical and chemical hazards to workers. The physical hazards have the potential to cause acute injury, long-term disabilities, or in the most extreme incidents, death. Other occupational activities such as handling hazardous materials and hazardous waste often do not result in acute injuries, but may compound over multiple exposures, resulting in increased morbidity. Based on the impact significance criteria presented in Table 15.2.15-1, occupational injury impacts could be potentially significant if the FirstNet deployment locations require performing occupational activities that have the highest relative potential for physical injury and/or chemical exposure. Examples of activities that may present increased risk and higher potential for injury include working from heights (i.e., from towers and roof tops), ground-disturbing activities like trenching and excavating, confined space entry, operating heavy equipment, and the direct handling of hazardous materials and hazardous waste. Predominately, these hazards are limited to occupational workers, but may impact the general public if there are trespassers or if any physical of chemical hazard extends beyond the restricted access of proposed FirstNet work sites. For example, if fuel is spilled from an onsite fuel tank, the spilled fuel could migrate down gradient and infiltrate underground drinking water sources. The public may then be exposed to hazardous chemicals in their drinking water if they utilize the same groundwater aquifer.

To protect occupational workers, OSHA mandates that employers be required to protect their employees from occupational hazards that could result in injury. Depending on the source of the hazard and the site-specific work conditions, OSHA generally recommends the following hierarchy for protecting onsite workers (OSHA, 2015).

1.) Engineering controls,

2.) Work practice controls,

3.) Administrative controls, and

4.) Personal protective equipment (PPE).

Engineering controls are often physical barriers that prevent access to a worksite, areas of a worksite, or from idle and operating equipment. Physical barriers take many forms like perimeter fences, trench boxes,[131] chain locks, bollards, storage containers (for storing equipment and chemicals), or signage and caution tape. Other forms of engineering controls could include machinery designed to manipulate the quality of the work environment, such as ventilation blowers. Whenever practical, engineering controls may result in the complete removal of the

[131] Trench boxes are framed metal structures inserted into open trenches to support trench faces, to protect workers from cave-ins and similar incidents. (OSHA, 2016b)

hazard from the work site, an example of which would be the transport and offsite disposal of hazardous waste or asbestos containing materials.

Work practice controls could be implemented as abiding by specific OSHA industry standards, such as the Confined Space Entry standard (29 CFR 1910.146) or thru the development of employer specific workplace rules and operational practices (OSHA, 2015). To the extent practicable, FirstNet partner(s) would likely implement and abide by work practice controls through employee safety training and by developing site-specific health and safety plans (HASP). The HASPs would identify all potential hazardous materials and hazardous wastes, potential physical hazards, and applicable mitigation steps. Other components of a HASP identifying appropriate PPE for each task and the location of nearby medical facilities. Safety Data Sheets (SDS) describing the physical and chemical properties of hazardous materials used during FirstNet deployment and maintenance activities, as well as the physical and health hazards, routes of exposure, and precautions for safe handling and use would be kept and maintained at all FirstNet project sites. In addition to HASPs and SDSs, standard operating procedures (SOP) would be developed and implemented by FirstNet partner(s) for critical and/or repetitive tasks that require attention to detail, specialized knowledge, or clear step-wise directions to prevent worker injury and to ensure proper execution.

Administrative controls are employer-initiated methods to reduce the potential for injury and physical fatigue (OSHA, 2015). Administrative controls may take the form of limiting the number of hours an employee is allowed to work per day, requiring daily safety meetings before starting work, utilizing the buddy system for dangerous tasks and any other similar activity or process that is designed to identify and mitigate unnecessary exposure to hazards. When engineering controls, work practice controls, and administrative controls are not feasible or do not provide sufficient protection, employers must also provide appropriate PPE to their employees and ensure its proper use. PPE is the common term used to refer to the equipment worn by employees to minimize exposure to chemical and physical hazards. Examples of PPE include gloves, protective footwear, eye protection, protective hearing devices (earplugs, muffs), hard hats, fall protection, respirators, and full body suits. PPE is the last line of defense to prevent occupational injuries and exposure.

The South Dakota Department of Labor and Regulation (SDDLR) is not authorized by OSHA to administer a state program for public or private sector employers. Therefore, SDDLR defers all regulatory authority and enforcement for occupational safety relating to FirstNet site work to the leadership and interpretation of OSHA.

Hazardous Materials, Hazardous Waste, and Mine Lands

The presence of environmental contamination at FirstNet deployment sites has the potential to negatively impact health and safety of workers and the general public. Past or present contaminated media, such as soil and groundwater, may be present and become disturbed as a result of site activities. Mines may cause unstable surface and subsurface conditions as a result of underground shaft collapses or seismic shifting. Based on the impact significance criteria presented in Table 15.2.15-1, human health impacts could be significant if FirstNet deployment sites are near contaminated properties. Prior to the start of any FirstNet deployment project, potential site locations should be screened for known environmental contamination and/or mining activities using federal resources such as the USEPA Cleanups in My Community database and U.S. Department of Interior's Abandoned Mine Lands inventory, through the SD DENR, or through an equivalent commercial resource.

By screening sites for environmental contamination, and reported environmental liabilities, the presence of historic contamination and unsafe ground conditions could be evaluated and may influence the site selection process. In general, the lower the density of environmental contamination, the more favorable the site will be for proposed FirstNet deployment projects. If sites containing known environmental contamination are selected for FirstNet deployment activities it may be necessary to implement additional controls (e.g., engineering, work practice, administrative, and/or PPE) to ensure workers, and the general public, are not unnecessarily exposed to the associated hazards. Additionally, for any proposed FirstNet deployment site, it is possible undocumented environmental contamination is present.

During FirstNet deployment activities, if any soil or groundwater is observed to be stained or emitting an unnatural odor, it may be an indication of environmental contamination. When such instances are encountered, it may be necessary to stop work until the anomaly is further assessed through record reviews or environmental sampling. Proposed FirstNet deployment would attempt to avoid known contaminated sites. However, in the event that FirstNet is unable to avoid a contaminated site, then site analysis and remediation would be required under RCRA, CERCLA, Superfund, and applicable South Dakota state laws in order to protect workers and the general public from direct exposure or fugitive contamination.

Exposure assessments identify relevant site characteristics, temporal exposure parameters, and toxicity data to determine the likelihood of adverse health effects. More formally known as a human health risk assessment (HHRA), these studies provide mathematical justification for implementing controls at the site to protect human health. If the HHRA determines the potential for adverse health effects is too great SD DENR may require FirstNet to perform environmental clean-up actions at the site to lower the existing levels of contamination. HHRAs help determine which level of PPE (i.e., Level D, Level C, Level B, or Level A) is necessary for a work activity. HHRAs take into account all exposure pathways: absorption, ingestion, inhalation, and injection. Therefore, specific protective measures (e.g., controls and PPE) that disrupt the exposure pathways could be identified, prioritized, and implemented.

Natural and Manmade Disasters

FirstNet is intended to improve connectivity among public safety entities during disasters, thereby improving their ability to respond more safely and effectively during such events. The addition of towers, structures, facilities, equipment, and other deployment activities is expected to allow for expedited responses during natural and manmade disasters. The impacts of natural and manmade disasters are likely to present unique health and safety hazards, as well as exacerbate pre-existing hazards, such as degrading occupational work conditions and disturbing existing environmental contamination. The unique hazards presented by natural and manmade disasters may include, fire, weather incidents (e.g., floods, tornadoes, hurricanes, etc.), earthquakes, vandalism, large- or small-scale chemical releases, utility disruption, community evacuations, or any other event that abruptly and drastically denudes the availability or quality of transportation infrastructure, utility infrastructure, medical infrastructure, and sanitation infrastructure. Additionally, such natural and manmade disasters could directly impact public safety communication infrastructure assets through damage or destruction.

Based on the impact significance criteria presented in Table 15.2.15-1, human health impacts could be significant if FirstNet deployment sites are located in areas that that are directly impacted by natural and manmade disasters that could lead to exposure to hazardous wastes, hazardous materials, and occupational hazards. FirstNet's emphasis on public safety-grade communications infrastructure may result in a less than significant beneficial impact, as new infrastructure could be deployed with additional structural hardening, and existing infrastructure may also be hardened as appropriate and feasible, in an effort to reduce the possibility of infrastructure damage or destruction to some degree.

Potential mitigation measures for natural disasters is to be aware of current weather forecasts, forest fire activities, seismic activities, and other news worthy events that may indicate upcoming disaster conditions. Awareness provides time and opportunity to plan evacuation routes, to relocate critical equipment and parts, and to schedule appropriate work activities preceding and after the natural disaster. These mitigation steps reduce the presence of workers and dangerous work activities to reduce the potential for injury or death. Manmade disasters could be more difficult to anticipate due to the unexpected or accidental nature of the disaster. Though some manmade disasters are due to malicious intentions, many manmade disasters result from human error or equipment failure. The incidence of manmade disasters affecting FirstNet deployment sites would be difficult to predict and diminish because the source of such disasters is most likely to originate from sources independent of FirstNet activities. Therefore, FirstNet partner(s) would develop disaster response plans that outline specific steps employees should take in the event of a natural or manmade disaster.

15.2.15.4. Potential Impacts of the Preferred Alternative

The following section assesses potential impacts associated with implementation of the Preferred Alternative, including deployment and maintenance activities.

Deployment Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, implementation of the Preferred Alternative could result in the deployment of various types of facilities or infrastructure. Depending on the physical nature and location of the facility/infrastructure and the specific deployment requirements, some activities would result in potential impacts to human health and safety and others would not. In addition, and as explained in this section, the same type of Proposed Action infrastructure could result in a range of no impacts to less than significant with mitigation, depending on the deployment scenario or site-specific activities.

Activities Likely to Have No Impacts

Of the types of facilities or infrastructure deployment scenarios described in Section 2.1.2, Proposed Action Infrastructure, the following are likely to have no impacts to human health and safety under the conditions described below:

- Wired Projects
  - Use of Existing Conduit – New Buried Fiber Optic Plant: the pulling or blowing of fiber optic cable would be performed through existing conduit. Use of mechanical equipment would be limited to pulley systems and blowers. Some locations with no existing power supply may require the use of electrical generators. Hazardous materials needed for this work would include fiber optical cable lubricants, mechanical oil/grease, and fuel for electrical generators although these materials are expected to be used infrequently and in small quantities. These activities are not likely to result in serious injury or chemical exposure, or surface disturbances since work would be limited to existing entry and exit points, would be temporary, and intermittent. It is anticipated that there would be no impacts to human health and safety.
  - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable: Lighting up of dark fiber would have no impacts to human health and safety because there would be no ground disturbance or heavy equipment used.
- Satellites and Other Technologies
  - 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. As adding equipment to an existing launch vehicle would be very unlikely to impact human health and safety resources, it is anticipated that this activity would have no impact on those resources.

Activities with the Potential to Have Impacts

Potential deployment-related impacts to human health and safety as a result of implementation of the Preferred Alternative would encompass a range of impacts that occur as a result of ground disturbance activities, construction activities, equipment upgrade activities, management of hazardous materials and/or hazardous waste, and site selection. The types of infrastructure development scenarios or deployment activities that could be part of the Preferred Alternative and result in potential impacts to human health and safety include the following:

- Wired Projects
  - New Build – Buried Fiber Optic Plant: Plowing (including vibratory plowing), trenching, or directional boring and the construction of POPs, huts, or other associated facilities or hand-holes to access fiber could require the use of heavy equipment and hazardous materials. The additional noise and activity at the site would require workers to demonstrate a high level of situational awareness. Failure to follow OSHA and industry controls could result in injuries. Excavation of soil at proposed sites known to

contain environmental contamination has the potential to expose workers to harmful chemicals or releases that could impact the general public in the immediate vicinity. Additionally, some of this work would likely be performed along road ROWs, increasing the potential for vehicle traffic to collide with site workers or equipment. If a proposed deployment activity involves the operation of heavy equipment, managing hazardous materials and hazardous waste management, or other site location challenges, there could be potential human health and safety impacts to consider.

- New Build – Aerial Fiber Optic Plant: Installation of new poles and fiber optic lines could require excavation activities, working from heights, use of hazardous materials, and site locations in ROWs. Hazards associated with the site work include injury from heavy equipment, fall hazards, chemical hazards, and the potential for vehicle traffic to collide with site workers or equipment. Excavation of soil at proposed sites known to contain environmental contamination has the potential to expose workers to harmful chemicals or releases that could impact the general public in the immediate vicinity. If a proposed deployment activity involves the operation of heavy equipment, hazardous materials and hazardous waste management, or other site location challenges, there could be potential human health and safety impacts to consider.
- Collocation on Existing Aerial Fiber Optic Plant: Installation of overhead fiber optic lines would require work from height. In some instances, new poles would be installed requiring excavation activities with heavy equipment. Hazards associated with the site work include injury from heavy equipment, fall hazards, chemical hazards, and the potential for vehicle traffic to collide with site workers or equipment. Excavation of soil at proposed sites known to contain environmental contamination has the potential to expose workers to harmful chemicals or releases that could impact the general public in the immediate vicinity. If a proposed deployment activity involves the operation of heavy equipment, hazardous materials and hazardous waste management, or other site location challenges, there could be potential human health and safety impacts to consider.
- New Build – Submarine Fiber Optic Plant: The installation of fiber optic cables in or near bodies of water requires workers to operate over aquatic and/or marine environments, which presents opportunities for drowning. When working over water exposure to sun, high or low temperatures, wind, and moisture could impact worker safety. Construction of landings and/or facilities on shore to accept submarine cable would require site preparation, construction, and management of hazardous materials and hazardous waste. Excavation of soils or sediments at proposed sites known to contain environmental contamination may result in workers being exposed to harmful chemicals or releases that could impact the general public in the immediate vicinity. If a proposed deployment activity involves the operation of heavy equipment, hazardous materials and hazardous waste management, or other site location challenges, there could be potential human health and safety impacts to consider.

  - Installation of Optical Transmission or Centralized Transmission Equipment: Installation of transmission equipment would require site preparation, construction activities, and management of hazardous materials and hazardous waste. Excavation of soils at proposed sites known to contain environmental contamination may result in workers being exposed to harmful chemicals or releases that could impact the general public in the immediate vicinity. If a proposed deployment activity involves the operation of heavy equipment, hazardous materials and hazardous waste management, or other site location challenges, there could be potential human health and safety impacts to consider.
- Wireless Projects
  - New Wireless Communication Towers: Installation of new wireless towers and associated structures (generators, equipment sheds, fencing, security and aviation lighting, electrical feeds, and concrete foundations and pads) or access roads would require site preparation, construction activities, and management of hazardous materials and hazardous waste. Communication towers would be erected, requiring workers to perform their duties from heights sufficient to result in serious injury or death in the event of falling. Working from heights may also result in additional overhead hazards and falling objects. Excavation of soils at proposed sites known to contain environmental contamination may result in workers being exposed to harmful chemicals or releases that could impact the general public in the immediate vicinity. If a proposed deployment activity involves the operation of heavy equipment, hazardous materials and hazardous waste management, or other site location challenges, there could be potential human health and safety impacts to consider. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions.
  - Collocation on Existing Wireless Tower, Structure, or Building: Collocation would involve mounting or installing equipment (such as antennas or microwave dishes) on an existing tower. This would require workers to perform their duties from heights sufficient to result in serious injury or death in the event of falling not result in impacts to soils. Working from heights may also result in additional overhead hazards and falling objects. Excavation of soils at proposed sites known to contain environmental contamination may result in workers being exposed to harmful chemicals or releases that could impact the general public in the immediate vicinity. If a proposed deployment activity involves the operation of heavy equipment, hazardous materials and hazardous waste management, or other site location challenges, there could be potential human health and safety impacts to consider. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions.
- Deployable Technologies
  - The use of deployable technologies could result in soil disturbance if land-based deployables are deployed on unpaved areas or if the implementation results in paving of previously unpaved surfaces. The use of heavy machinery presents the possibility for spills and soil and water contamination, and noise emissions could potentially impact

human health; and vehicles and heavy equipment present the risk of workplace and road traffic accidents that could result in injury. Set-up of a cellular base station contained in a trailer with a large expandable antenna mast is not expected to result in impacts to human health and safety. However, due to the larger size of the deployable technology, site preparation or trailer stabilization may be required to ensure the self-contained unit is situated safely at the site. Additionally, the presence of a dedicated electrical generator would produce fumes and noise. The possibility of site work and the operation of a dedicated electrical generator have the potential for impacts to human health and safety. For a discussion of radio frequency emissions, refer to Section 2.4, Radio Frequency Emissions. Use of aerial vehicles would not involve telecommunication site work. Prior to deployment and when not in use, the aerial vehicles would likely require preventive maintenance. Workers responsible for these activities may handle hazardous materials, not limited to fuel, solvents, and adhesives.

- Satellites and Other Technologies
  - Satellite-Enabled Devices and Equipment: The use of portable devices that utilize satellite technology would not impact human health and safety because there are no construction activities or use of hazardous materials. The installation of permanent equipment on existing structures may require workers to operate from heights or in sensitive environments. As a result, the potential for falling, overhead hazards, and falling objects is greater and there is a potential to impact human health and safety.

In general, the abovementioned FirstNet activities could potentially involve site preparation work, construction activities, work in dangerous environments (road ROWs, work over water, historic environmental contamination, and mine lands), management of hazardous materials and hazardous waste, and weather exposure. Potential impacts to human health and safety associated with deployment of this infrastructure could include injury from site preparation and operating heavy equipment, construction activities, falling/overhead hazards/falling objects, exposure to hazardous chemicals and hazardous waste, and release of historic contamination to the surrounding environment. It is anticipated that potential health impacts associated with human exposure to environmental hazardous materials in air, water, or soil, the risk of road traffic, workplace accidents and injuries, noise exposure, and risk of infectious disease transmission would be less than significant due to the small scale of likely FirstNet activities that would be temporary and of short duration. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As described in Section 2.1.2, Proposed Action Infrastructure, operation activities associated with the Preferred Alternative would consist of routine maintenance and inspection of the facilities. Any major infrastructure replacement as part of ongoing system maintenance would result in impacts similar to the abovementioned construction impacts. It is anticipated that there would be less than significant impacts to human health and safety associated with routine inspections of the Preferred Alternative, assuming that the inspections do not require climbing towers or confined space entry. In those instances, PPE or other mitigation measures could be necessary to adequately protect workers. If usage of heavy equipment is part of routine maintenance, the potential for impacts to human health and safety would also increase. It is anticipated that potential health impacts associated with human exposure to environmental hazardous materials in air, water, or soil, the risk of road traffic, workplace accidents and injuries, noise exposure, and risk of infectious disease transmission would be less than significant due to the small scale of likely FirstNet activities that would be temporary and of short duration. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

15.2.15.5. Alternatives Impact Assessment

The following section assesses potential impacts to human health and safety associated with the Deployable Technologies Alternative and the No Action Alternative.

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 land-based infrastructure. There would be no collocation of equipment and minimal new construction associated with wired or wireless projects discussed above under the Preferred Alternative. Some limited construction could be associated with implementation such as land clearing or paving for parking or staging areas. 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. Therefore, potential impacts to human health and safety as a result of implementation of this alternative could be as described below.

Deployment Impacts

As explained above, implementation of deployable technologies could result in less than significant impacts to human health and safety. The largest of the land-based deployable technologies may require site preparation work or stabilization work to ensure the self-contained trailers are stable. Heavy equipment may be necessary to complete the site preparation work. However, in general, the deployable technologies are small mobile units that could be transported as needed. While in operation, the units are parked and operate off electrical generators or existing electrical power sources. Connecting deployable technology to a power supply may present increased electrocution risk during the process of connecting power. If the power source is an electrical generator, then there would also be a need to manage hazardous materials (fuel) onsite. These activities could result in less than significant impacts to human health and safety. It is anticipated that potential health impacts associated with human exposure to environmental hazardous materials in air, water, or soil, the risk of road traffic, workplace accidents and injuries, noise exposure, and risk of infectious disease transmission would be less than significant due to the small scale of likely FirstNet activities that would be temporary and of short duration. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partner(s) would require, as practicable or feasible, to avoid or minimize potential impacts.

Operation Impacts

As explained above, operation activities would consist of implementation/running of the deployable technology and routine maintenance and inspections. As with the Preferred Alternative, it is anticipated that there would be no impacts to human health and safety associated with routine inspections of the Preferred Alternative, assuming that the inspections do not require climbing towers or confined space entry. In those instances, PPE or other mitigation measures may be necessary to adequately protect workers. If usage of heavy equipment is part of routine maintenance, the potential for impacts to human health and safety would also increase. These impacts would be less than significant because of the small scale of likely FirstNet activities; activities associated would routine maintenance, inspection, and deployment of deployable technologies would be temporary and often of limited duration. See Chapter 19, BMPs and Mitigation Measures, BMPs and Mitigation Measures, for a listing of BMPs and mitigation measures that FirstNet and/or its partners would require, as practicable or feasible, to avoid or minimize potential impacts.

No Action Alternative

Under the No Action Alternative, the NPSBN would not be deployed; therefore, there would be no associated construction or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be no impacts to human health and safety as a result of construction and operation of the Proposed Action. Environmental conditions would therefore be the same as those described in Section 15.1.15, Human Health and Safety.

SD Appendix A – Communities of Concern

Table A-1: NNHP S1 Ranked Terrestrial Communities of Concern in South Dakota

Vegetative Community Type	USEPA Ecoregion(s)	Description	Distribution
Big Bluestem – Yellow Indiangrass – Porcupine Grass Loess Hills Herbaceous Vegetation	Northern Glaciated Plains, Northwestern Glaciated Plains, Western Corn Belt Plains	An herbaceous community that mostly lacks trees and shrubs, and occurs on moderately steep hillsides and ridges with well-drained, loess[132] soils. Tall grasses dominate this community, and typically include big bluestem, Indiangrass (*Sorghastrum nutans*), porcupine grass (*Hesperostipa spartea*), and little bluestem. Graminoids typically exceed 3.28 ft. in height.	Found in southeastern South Dakota.
Bur Oak Northern Tallgrass Wooded Herbaceous Vegetation	Northwestern Great Plains, High Plains	An herbaceous woodland community with scattered trees and a graminoids-dominated understory found on clay loam to sandy loam soils. This community occurs on glaciated gently to moderately rolling hills. The most dominant trees species is bur oak (*Quercus macrocarpa*), but quaking aspen (*Populus tremuloides*) may also be present in significant quantities. Graminoids present include Indiangrass, little bluestem, big bluestem, prairie dropseed (*Sporobolus heterolepis*), and porcupine grass. The shrub layer may contain chokecherry, prairie willow (*Salix humilis*), western snowberry, (*Corylus americana*), and stiff dogwood (*Cornus foemina*).	Found in eastern South Dakota.
Great Plains Marl Fen	Lake Agassiz Plain, Northern Glaciated Plains, Northwestern Glaciated Plains	A wetland fen community found in areas with mineral-rich groundwater emerging from glacial till and often found on the peripheral slopes of wetlands and along river valley slopes. A defining characteristic of this community is the presence or marl, a sedimentary rock made of clay and calcium carbonate. Common herbaceous species include fewflower spikerush (*Eleocharis quinqueflora*), needle beaksedge (*Rhynchospora capillacea*), Ontario lobelia (*Lobelia kalmii*), and fen grass of Parnassus (*Parnassia glauca*). Algae species such as *Chara* spp. Taller vegetation such as prairie sedge (*Carex prairea)* may also be present.	Found in the western half of South Dakota.

[132] Loess: A "fine, mineral-rich material" that is loosely packed and readily crumbles. It can be formed by wind carrying dust and silt into large mounds, or when "glaciers grind rock into find powder." (National Geographic 2015)

ACRONYMS

Acronym	Definition
AGL	Above Ground Level
AML	Abandoned Mine Lands
AQCR	Air Quality Control Region
ARPA	Archaeological Resources Protection Act of 1979
ASL	Above Sea Level
ASPM	Aviation System Performance Metrics
ATC	Air Traffic Control
ATO	Air Traffic Organization
BGEPA	Bald and Golden Eagle Protection Act
BLS	Bureau of Labor Statistics
BYA	Billion Years Ago
CAA	Clean Air Act
CCMP	Comprehensive Conservation and Management Plan
CEQ	Council On Environmental Quality
CFR	Code of Federal Regulations
CGP	Construction General Permit
CH4	Methane
CIAC	Community Involvement Advisory Council
CIMC	Cleanups In My Community
CO	Carbon Monoxide
CO2	Carbon Dioxide
COLT	Cell On Light Trucks
COW	Cell On Wheels
CPCN	Certificate of Public Convenience and Necessity
CRS	Community Rating System
CWA	Clean Water Act
EFH	Essential Fish Habitats
EIA	Energy Information Agency
EMS	Emergency Medical Services
EOP	Emission Offset Provisions
EPCRA	Community Right To Know Act
FAA	Federal Aviation Administration
FAQ	Frequently Asked Questions
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FFC	Fossil Fuel Combustion
FGDC	Federal Geographic Data Committee
FLM	Federal Land Manager
FSD	Sioux Falls Regional Airport

Acronym	Definition
FSDO	Flight Standards District Offices
FSS	Flight Service Station
GHG	Greenhouse Gas
HAP	Hazardous Air Pollutant
HASP	Health and Safety Plans
HHRA	Human Health Risk Assessment
IFR	Instrument Flight Rules
IPCC	Intergovernmental Panel On Climate Change
LBS	Locations-Based Services
LRR	Land Resource Regions
LTE	Long Term Evolution
LULUCF	Land Use Change, and Commercial Forestry
MACINAC	Mid-Atlantic Consortium For Interoperable Nationwide Advanced Communications
MBTA	Migratory Bird Treaty Act
MHI	Median Household Income
MLRA	Major Land Resource Areas
MMPA	Marine Mammal Protection Act
MMT	Million Metric Tons
MSL	Mean Sea Level
MYA	Million Years Ago
N2O	Nitrous Oxide
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NAICS	North American Industry Classification System
NAS	National Airspace System
NEP	National Estuary Program
NEPA	National Environmental Policy Act
NERR	National Estuarine Research Reserve
NFIP	National Flood Insurance Program
NHA	National Heritage Areas
NHL	National Historic Landmarks
NHPA	National Historic Preservation Act of 1966, As Amended
NM	Nautical Miles
NOAA	National Ocean and Atmospheric Administration
NOTAM	Notices To Airmen
NOX	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS	National Park Service
NRCS	National Resources Conservation Service

Acronym	Definition
NRHP	National Register of Historic Places
NSA	National Security Areas
NWI	National Wetlands Inventory
OCH2CH2	Ethylene Glycol, Diethylene Glycol, and Triethylene Glycol R
OE/AAA	Obstruction Evaluation / Airport Airspace Analysis
OSHA	Occupational Safety and Health Act
OTR	Ozone Transport Region
PEM	Palustrine Emergent Wetlands
PFO	Palustrine Forested Wetlands
PGA	Peak Ground Acceleration
PHL	Philadelphia International Airport
PLUS	Preliminary Land Use Service
PPE	Personal Protective Equipment
PSAP	Public Safety Answering Point
PSC	Public Service Commission
PSCR	Public Safety Communications Research
PSD	Prevention of Significant Deterioration
PSS	Palustrine Scrub-Shrub Wetlands
RAP	Rapid City Regional Airport
RCRA	Resource Conservation and Recovery Act
RF	Radio Frequency
RFI	Request For Information
RGGI	Regional Greenhouse Gas Initiative
SAA	Sense and Avoid
SAIPE	Small Area Income and Poverty Estimates
SASP	State Aviation System Plan
SD	South Dakota
SD DENR	South Dakota Department of Environment and Natural Resources
SDCL	South Dakota Codified Law
SDDA	South Dakota Department of Agriculture
SDDLR	South Dakota Department of Labor and Regulation
SDDOH	South Dakota Department of Health
SDDOT	South Dakota Department of Transportation
SDGFP	South Dakota Department of Game, Fish and Parks
SDNHD	South Dakota Natural Heritage Database
SDR	South Dakota Rule
SDS	Safety Data Sheets
SDSU	South Dakota State University
SDWPCC	South Dakota Weed and Pest Control Commission
SGCN	Species of Greatest Conservation Need

Acronym	Definition
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SO2	Sulfur Dioxide
SOC	Standard Occupational Classification
SOP	Standard Operating Procedures
SOW	System On Wheels
SOX	Sulfur Oxides
SPL	Sound Pressure Level
SSA	Sole Source Aquifer
SUA	Special Use Airspace
SWAP	State Wildlife Action Plan
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load
TRI	Toxics Release Inventory
TWA	Time Weighted Average
UA	Unmanned Aircraft
UAS	Unmanned Aircraft Systems
UHF	Ultra High Frequency
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VFR	Visual Flight Rules
VHF	Very High Frequency
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds
VR	Visual Route
WCS	Wetlands Classification Standard
WSLS	Wetlands and Subaqueous Lands Section
WWI	World War I
WWII	World War II

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