3.13 Noise and Vibration

This Programmatic Environmental Impact Statement (EIS) considers the adverse environmental impacts on noise[1] and vibration[2] that would result from the types of facilities described in Chapter 2, Overview of Transmission Facilities, Development Considerations, and Regulations. This section addresses the following topics related to the new construction, operation and maintenance, upgrade, and modification of high-voltage electric transmission facilities (transmission facilities) in Washington:

- Section 3.13.1 identifies regulatory, siting, and design considerations.
- Section 3.13.2 describes the affected environment.
- Section 3.13.3 describes the adverse environmental impacts.
- Section 3.13.4 describes Mitigation Measures.
- Section 3.13.5 identifies probable significant adverse environmental impacts on noise and vibration.
- Section 3.13.6 provides an environmental sensitivity map and criteria weighting for the siting of transmission facilities as it relates to noise and vibration, based on the identified considerations, adverse environmental impacts, and Mitigation Strategies.

3.13.1 Regulatory, Siting, and Design Considerations

This Programmatic EIS establishes a broad framework for compliance, outlining general laws, regulations, best management practices (BMPs), and design considerations. It is assumed that project-specific applications would be developed within this pre-established regulatory context and comply with existing laws and regulations. Any projects not complying with applicable laws and regulations or failing to adhere to design considerations or BMPs may require additional project-specific

[1] A sound that is "unwanted"—i.e., this term is based on human perception.
[2] The oscillating movement of a particle or object around its stationary reference position. Vibration can be caused by mechanical processes such as machinery operation, construction activities, or transportation systems.

environmental analyses and mitigation. The federal, state, and local laws and regulations that apply to noise and vibration are summarized in **Table 3.13-1**.

Note that only King County and Snohomish County have more stringent requirements than those defined in the Washington Administrative Code (WAC). Other county laws relevant to noise and vibration are summarized in **Appendix 3.13-1.** It is assumed that the WAC limits would be applied in counties that do not have their own noise limits. Many cities have adopted their own noise ordinances, which may include both decibel-based standards and subjective "public disturbance noise" (nuisance) standards. However, local ordinances associated with noise and vibration are not analyzed in this Programmatic EIS below the county level.

Table 3.13-1: Laws and Regulations for Noise and Vibration

Applicable Legislation	Agency	Summary Information
29 CFR 1910.95 – Occupational noise exposure	Occupational Safety and Health Administration	This regulation pertains to occupational noise exposure. OSHA is responsible for setting and enforcing standards to ensure safe working conditions, including those related to noise exposure and hearing conservation.
RCW 70A.20, Noise Control	Washington State Department of Ecology[(a)]	This chapter outlines the state's policy on noise control, including the powers and duties of Ecology to adopt rules for maximum permissible noise levels in different environments.
WAC 173-60, Maximum Environmental Noise Levels	Washington State Department of Ecology[(a)]	This section of the WAC sets noise control regulations, including permissible noise levels and requirements for noise abatement[3] during construction activities.
WAC 296-817, Hearing Loss Prevention (Noise)	Washington State Department of Labor and Industries[(a)]	This section of the WAC covers hearing loss prevention as it relates to noise. Key points of this section include noise exposure monitoring, hearing protection requirements, audiometric testing[4] requirements, training and education requirements, and recordkeeping.

[3] A set of strategies or techniques aimed at reducing and controlling annoying or harmful noise in an environment.
[4] A method used to evaluate a person's hearing ability. It involves a series of tests that measure how well a person can hear sounds of varying frequencies and intensities.

Applicable Legislation	Agency	Summary Information
Washington State Environmental Policy Act	▪ Washington State Agencies ▪ Local governments	This act is a process that identifies and analyzes environmental impacts that can be related to issuing permits. SEPA helps permit applicants and decision-makers understand how a proposed project will impact the environment. Certain projects, as defined in the SEPA Rules (WAC 197-11-704) and that are not exempt, are required to go through the SEPA process.
King County Code, Section 12.86, County Noise Ordinance	King County, County Council	This ordinance sets forth the county policy to minimize the exposure of citizens to the physiological and psychological dangers of excessive noise and to protect, promote, and preserve public health, safety, and welfare.
A Codification of the General Ordinances of Snohomish County, Chapter 10.01 Noise Control	Snohomish County, County Council	The purpose of this ordinance is to minimize the exposure of citizens to the physiological and psychological dangers of excessive noise and to protect, promote, and preserve public health, safety, and welfare.

Notes:

[a] The agency responsible for administering most permits or authorizations for the identified regulation. However, if EFSEC is determined to be the agency responsible for approving a proposal, EFSEC can administer several types of permits at the state and local levels. EFSEC provides a streamlined process for siting and licensing major energy facilities, including transmission facilities in Washington State. EFSEC coordinates all evaluation and licensing steps, specifies the conditions for new construction and operation, and issues a Site Certification Agreement, which assumes the responsibility for issuing individual state or local permits. By consolidating these permits into a single Site Certification Agreement, EFSEC can simplify the regulatory process for energy facility developers. While EFSEC itself does not directly administer federal permits, it works closely with federal agencies to ensure that all necessary federal requirements are met during the evaluation and licensing of energy facilities.

CFR = Code of Federal Regulations; **Ecology** = Washington State Department of Ecology; **EFSEC** = Energy Facility Site Evaluation Council; **OSHA** = Occupational Safety and Health Administration; **RCW** = Revised Code of Washington; **SEPA** = State Environmental Policy Act; **WAC** = Washington Administrative Code

3.13.1.1 State Regulations

WAC 173-60 establishes noise limits based on the Environmental Designation for Noise Abatement (EDNA)[5] of the sound source and the receiving properties.

- **Class A EDNA** – "Lands where people reside and sleep." These areas typically include residential property; multiple family living accommodations; recreational facilities with overnight accommodations, such as camps, parks, camping facilities, and resorts; and community service facilities, including

[5] A classification system used to establish maximum permissible noise levels within specific areas or zones. This system helps manage and control noise pollution by setting different noise limits based on the type of environment.

orphanages, homes for the aged, hospitals, and health and correctional facilities. These are commonly referred to as sensitive receptors.

- **Class B EDNA** – "Lands involving uses requiring protection against noise interference with speech." These areas typically include commercial living accommodations; commercial dining establishments; motor vehicle services; retail services; banks and office buildings; recreation and entertainment property not used for human habitation, such as theaters, stadiums, fairgrounds, and amusement parks; and community service facilities not used for human habitation (e.g., educational, religious, governmental, cultural and recreational facilities).
- **Class C EDNA** – "Lands involving economic activities of a nature that noise levels higher than those experienced in other areas are normally to be anticipated." Typical Class A EDNA uses generally are not permitted in such areas. Typically, Class C EDNA uses include storage, warehouse, and distribution facilities; industrial property used for the production and fabrication of durable and nondurable manufactured goods; and agricultural and silvicultural property used for the production of crops, wood products, or livestock.

WAC 173-60 also classifies land into different categories of "receiving properties." A receiving property is defined as "real property within which the maximum permissible noise levels specified herein shall not be exceeded from sources outside such property." Land used for agricultural purposes is defined as Class C receiving property. Agricultural properties principally used for residential purposes with no clearly visible farming or ranching activities are identified as Class A receiving properties. The WAC does maintain flexibility for interpretation in the classification of the appropriate EDNA on both the state and local levels. In this assessment, receiving properties consist of Class A lands and Class C lands containing Class A residential structures. At night, defined as the hours between 10:00 p.m. and 7:00 a.m., the noise limitations are reduced by 10 A-weighted decibels (dBA)[6] for receiving property within Class A EDNAs. WAC 173.60.050 exempts temporary construction noise from the state noise limits.

For this assessment, the most limiting noise levels by EDNA classifications are considered, given that the WAC maintains flexibility for interpretation in the classification of EDNA at both state and local levels. The most limiting noise levels are

[6] A scale expressing relative loudness as perceived by the human ear. The A-weighting curve de-emphasizes low and very high frequencies, to which the human ear is less sensitive, and emphasizes frequencies in the mid-range, to which the human ear is most sensitive, making dBA a more accurate representation of perceived loudness.

at Class A lands: 45 dBA at night and 55 dBA during the daytime, defined as 7 a.m. to 10 p.m.

The WAC regulatory limits are absolute and independent of the existing acoustic environment; therefore, a baseline noise survey is not required to determine conformance. Additionally, WAC regulatory limits do not prevent local governments from regulating noise from any source as a nuisance; therefore, local regulations will need to be considered.

WAC 296-817 focuses on hearing loss prevention and requires employers to conduct noise exposure monitoring if employees are exposed to noise levels at or above 85 dBA over an 8-hour time-weighted average. Employees must use hearing protection when noise exposure equals or exceeds 85 dBA. The primary goal of this regulation is to prevent occupational hearing loss by minimizing noise exposure in the workplace. It sets clear standards for monitoring, controlling, and mitigating noise levels. The regulation mandates that employers conduct regular noise exposure monitoring, provide audiometric testing, and maintain detailed records.

3.13.1.2 County Regulations

As part of this Programmatic EIS process, county ordinances were reviewed to determine if any had more restrictive noise limits than the WAC standards. Additionally, county-level exemptions were reviewed to identify any that would be applicable to transmission facilities and/or utility services in general.

King and Snohomish Counties are neighboring counties in northwestern Washington with similar regulatory purpose, language, and limitations. These counties have more restrictive limits than WAC regulations and include a land use category for rural areas that is more restrictive than residential land uses. The regulations for rural and residential land uses are outlined below:

- Rural receptor limits: 49 dBA daytime and 39 dBA nighttime
- Residential receptor limits: 52 dBA daytime and 42 dBA nighttime

Based on the review of the county noise regulations, the following counties have exemptions that would be applicable, at least in part, to transmission facilities:

- Douglas County – Nighttime noise exemption for substations
- Grant County – Noise exemption for substations

- Jefferson County – Noise exemption for electrical substations
- King County – Noise exemption for electrical substations
- Kitsap County – Noise exemption for electrical substations
- Pierce County – Noise exemption for electrical substations
- Skagit County – Noise exemption for operation of existing electrical substations
- Snohomish County – Nighttime, pure tone,[7] and impulsive noise[8] exemption for substations and transmission lines

The siting of transmission facilities is determined by engineering, technical, environmental, and socioeconomic factors. **Table 3.13-2** summarizes guidance documents and management plans that outline the design considerations and BMPs generally used to avoid or minimize adverse environmental impacts on noise and vibration.

Table 3.13-2: Siting and Design Considerations for Noise and Vibration

Siting and Design Consideration	Description
Federal Energy Regulatory Commission Guidelines	FERC provides comprehensive guidelines for assessing and mitigating noise and vibration impacts during the construction and operation of energy infrastructure projects, including transmission facilities. FERC also provides detailed guidance on HDD, emphasizing the importance of monitoring noise levels during HDD operations.
American National Standards Institute Guidelines and Standards, including ANSI/ASSP A10.46 and ANSI/ASA S2.71	ANSI provides standards for noise and vibration control, which can be applied to transmission projects to ensure compliance with acceptable levels.
U.S. Environmental Protection Agency Noise Guidelines (EPA 1974)	The EPA offers guidelines for exposure to protect human health and guidelines for noise control, which include BMPs for minimizing noise impacts during construction activities.
IEEE 1829-2017 (IEEE 2017)	The IEEE provides a uniform procedure for conducting corona tests on hardware for overhead transmission lines and substations.
Washington State Department of Transportation Environmental Manual	This manual includes guidelines for assessing and mitigating noise and vibration impacts during construction projects. It provides detailed procedures for noise measurement, prediction, and mitigation.

[7] A sound that consists of a single frequency.
[8] Short bursts of sound that are significantly louder than the ambient noise level.

Siting and Design Consideration	Description
Federal Transit Administration Transit Noise and Vibration Impact Assessment Manual, FTA Report No. 0123 (FTA 2018)	This manual outlines guidelines and standards for construction noise, including recommended nighttime levels and methodology to calculate noise and vibration.
Federal Highway Administration Construction Noise Handbook (FHWA 2017)	While not specific to Washington, this handbook is widely used and provides comprehensive guidance on measuring, predicting, and mitigating construction noise.
U.S. Department of Defense Unified Facilities Criteria 3-450-01 (DOD 2022)	This document provides criteria for noise and vibration control in the design and construction of facilities, including transmission projects.
Recommended Siting Practices for Electric Transmission Developers (Americans for a Clean Energy Grid 2023)	This document outlines best practices for siting electric transmission facilities. Recommended practices include: ▪ Early and transparent engagement ▪ Respect and fair dealing ▪ Environmental considerations ▪ Interagency coordination ▪ Use of existing infrastructure

ANSI = American National Standards Institute; **ASA** = American Standards Association; **ASSP** = American Society of Safety Professionals; **DOD** = U.S. Department of Defense; **EPA** = U.S. Environmental Protection Agency; **FERC** = Federal Energy Regulatory Commission; **FHWA** = Federal Highway Administration; **FTA** = Federal Transit Administration; **HDD** = horizontal directional drilling; **IEEE** = Institute of Electrical and Electronics Engineers

3.13.1.3 Guidelines and Standards

Construction noise is typically regulated by different standards due to its temporary nature and the fact that it is primarily a daytime issue (limited potential for sleep disturbance). Many noise regulations focus on time-of-day restrictions. Daytime construction on public roadways and for public utilities is typically exempt from noise limits due to the temporary and necessary nature of the noise source. This exemption can even extend into nighttime hours for some counties in Washington. Given the nature of the work, nighttime work is not anticipated as part of a typical transmission facility construction schedule.

For informational purposes, the Federal Transit Administration (FTA) has published guidelines and standards for construction noise, with recommended nighttime levels of 70 dBA as an equivalent continuous sound level (L_{eq}) over 8 hours ($L_{eq(8hr)}$) and 80 dBA L_{eq} over 1 hour at the exterior of a residence (FTA 2018).

Construction noise levels can be estimated based on noise calculation methodologies or noise modeling. Typical noise levels generated by construction equipment have been published in various reference documents, including the following:

- The Federal Highway Administration (FHWA) Roadway Construction Noise Model User's Guide, version 2, is one of the more complete and recent references for this type of evaluation (FHWA 2017). This guide provides a comprehensive assessment of noise levels from construction equipment and a detailed noise source database. Noise levels from construction methods can be calculated or modeled using project-specific schedules, equipment lists, and construction layouts/areas. When detailed construction methodologies are unavailable, proxy source sound power levels can be estimated using the FHWA's detailed noise source database. This involves using average third octave spectra[9] and assuming hemispherical propagation,[10] along with a detailed project description. These proxy sources can then be utilized in noise attenuation calculations or as inputs for noise propagation modeling software.
- The FTA Transit Noise and Vibration Impact Assessment Manual outlines methodologies to calculate both construction noise and vibration at varying distances from construction areas (FTA 2018).

An alternative to noise attenuation calculation is to conduct predictive noise modeling. The most typically used environmental noise model is the CadnaA noise modeling software developed by DataKustik. CadnaA is an industry-standard, state-of-the-art modeling tool that evaluates environmental noise propagation from a vast array of noise sources. It implements International Organization for Standardization Standard 9613 for outdoor noise and is approved for use in predicting noise propagation by many federal agencies and state and local authorities (ISO 1993).

Predictive noise modeling ideally uses noise source input data from established sources, like equipment vendors. However, vendor-provided equipment specifications and noise source input data are often not known at the time of conducting such assessments. Consequently, through discussions between the State Environmental Policy Act (SEPA) Lead Agency and the applicant, experience on similar electrical infrastructure projects, and professional engineering judgment, proxy noise source

[9] The division of the audible frequency range into smaller bands, each spanning one-third of an octave.
[10] A decrease in level that occurs when a sound wave propagates away from a source uniformly in all directions aboveground.

levels[11] for the proposed noise-emitting equipment can be identified and calculated. For example, noise emissions from transformers can be calculated using Method 2, Table 4.5, Sound Power Levels of Transformers, Electric Power Plant Environmental Noise Guide, as found in Bolt Beranek and Newman (1984). In accordance with this method, the National Electrical Manufacturers Association (NEMA) standard equipment can be adjusted up to an attenuation of -6 dBA from the calculated noise level based on field measurements. While more modern transformers are quieter on average, compared to when the above methodology was created, the NEMA-5 dBA or NEMA-6 dBA calculation can be used as a noise source for modeling.

These modeling results can be used to quantify noise levels at neighboring sensitive receptors and can be combined with existing baseline noise environments to calculate an overall predicted noise level during operation. These predicted noise levels can then be compared with state or local standards and limits, federal guidelines, and project/location-specific design goals. These comparisons can be used to identify the potential for health concerns from noise exposure, risks of a noise-related nuisance, and/or whether mitigation of noise sources is needed. Substation operations are typically assumed to be constantly operating at 100 percent capacity, though cooling equipment would not be operating continuously during cooler hours (nighttime) or winter (cooler) months.

3.13.2 Affected Environment

This section describes noise and vibration within the Study Area (see Chapter 1, Introduction). The analysis of the affected environment incorporates the following:

- Noise
- Existing Conditions
- Climate and Transmission Line Noise
- Ground-Borne Vibration

[11] Noise source levels used in acoustic modeling to estimate the sound levels produced by various activities or equipment when direct measurements are not available. These proxy levels are derived from similar activities or equipment in comparable environments.

3.13.2.1 Noise

Noise is generally defined as unwanted and/or harmful sound that is typically associated with the environment and workplace. Environmental noise is considered unwanted and/or harmful outdoor sound created by human activities, including noise from road traffic, railway traffic, airports, and industrial sites. Occupational noise is distinct from environmental noise in that it is associated with the workplace (APHA 2021).

Loud noise can cause hearing loss and tinnitus, and can also contribute to non-auditory health problems. Chronic noise, even at low levels, can cause annoyance, sleep disruption, and stress that contribute to cardiovascular disease, cerebrovascular disease, metabolic disturbances, exacerbation of psychological disorders, and premature mortality. Noise interferes with cognition and learning, contributes to behavior problems, and reduces achievement and productivity (APHA 2021).

The degree of audibility of a new or modified source of noise depends, in part, on the relative level of the existing ambient noise.[12] Variations in a noise environment are typically due to existing land uses, population density, and proximity to transportation corridors. Elevated existing ambient sound levels in the region occur near major transportation corridors such as interstate highways and in areas with higher population densities. Principal contributors to the existing noise environment likely include motor vehicle traffic on parkways and local roadways; typical rural/agricultural noise sources; and natural sounds from birds, insects, and leaf or vegetation rustling during elevated wind conditions. Diurnal effects result in sound levels that are typically quieter at night than during the daytime, except during periods when evening and nighttime insect noise dominate in warmer seasons.

3.13.2.2 Existing Conditions

The Study Area for this statewide assessment includes all variations of typical ambient noise environments. It is typical for large projects with significant noise sources to implement a baseline noise study to collect measurements of existing noise levels over days, weeks, or longer to assess the existing noise environment. However, in the absence of ambient measurement data, the existing (baseline) noise environment in the vicinity of a facility can be estimated with a method published by the FTA in

[12] Also known as background noise, ambient noise refers to the surrounding sounds in an environment that are not the primary focus of attention.

Table 4-17 of its *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018). This document presents a general assessment of baseline noise levels based on population density per square mile and proximity to area noise sources such as roadways and rail lines.

Washington has a variety of population densities and proximity to existing noise sources, such as roadways and rail lines. **Tables 3.13-3** and **3.13-4** summarize the ranges of daytime and nighttime noise levels based on population density and proximity to roadways, respectively.

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Table 3.13-3: Daytime Baseline Noise Levels Based on Population Density and Proximity to Roadways

Distance from Highway (feet) [a]	Interstate Highway Noise (dBA) [b]	Population Density Noise Level (dBA)							Other Roadway Noise (dBA) [c]	Distance from Roadway (feet) [a]
		1–100	100–300	300–1,000	1,000–3,000	3,000–10,000	10,000–30,000	30,000 and up		
		35	40	45	50	55	60	65		
Insignificant	0	35	40	45	50	55	60	65	0	Insignificant
800 and up	50	50	50	51	53	56	60	65	50	400–800
400–800	55	55	55	55	56	58	61	65	55	200–400
200–400	60	60	60	60	60	61	63	66	60	100–200
100–200	65	65	65	65	65	65	66	68	65	50–100
50–100	70	70	70	70	70	70	70	71	70	10–50
10–50	75	75	75	75	75	75	75	75	-	-

Notes: Population density is based on the number of people per square mile. An insignificant distance from the roadway means that the roadway noise level would be insignificant compared to existing conditions. Noise levels are calculated by logarithmically adding the noise levels based on population density across the top of the table, with the corresponding roadway noise levels down the table.

[a] Distances do not include shielding[13] from intervening rows of buildings. Generally, for estimating shielding attenuation in populated areas, assume one row of buildings every 100 feet, 4.5 dBA for the first row, and 1.5 dBA for every subsequent row up to a maximum of 10 dBA attenuation.

[b] Roadways with four or more lanes that permit trucks, with traffic at 60 mph.

[c] Parkways with traffic at 55 mph, but without trucks, and city streets with the equivalent of 75 or more heavy trucks per hour and 300 or more medium trucks per hour at 30 mph.

dBA = A-weighted decibels; **mph** = miles per hour

[13] Reduction in noise levels that occurs when buildings are positioned between the noise source and the receiver.

Table 3.13-4: Nighttime Baseline Noise Levels Based on Population Density and Proximity to Roadways

Distance from Roadway (feet) [a]	Interstate Highway Noise (dBA) [b]	Population Noise Level (Population / Square Mile)							Other Roadway Noise (dBA) [c]	Distance from Roadway (feet) [a]
		1–100	100–300	300–1,000	1,000–3,000	3,000–10,000	10,000–30,000	30,000 and up		
		25	30	35	40	45	50	55		
Insignificant	0	25	30	35	40	45	50	55	0	Insignificant
800 and up	40	40	40	41	43	46	50	55	40	400–800
400–800	45	45	45	45	46	48	51	55	45	200–400
200–400	50	50	50	50	50	51	53	56	50	100–200
100–200	55	55	55	55	55	55	56	58	55	50–100
50–100	60	60	60	60	60	60	60	61	60	10–50
10–50	65	65	65	65	65	65	65	65	-	-

Notes: Population density is based on the number of people per square mile. An insignificant distance from the roadway means that the roadway noise level would be insignificant compared to existing conditions. Noise levels are calculated by logarithmically adding the noise levels based on population density across the top of the table, with the corresponding roadway noise levels down the table.

[a] Distances do not include shielding from intervening rows of buildings. Generally, for estimating shielding attenuation in populated areas, assume one row of buildings every 100 feet, 4.5 dBA for the first row, and 1.5 dBA for every subsequent row up to a maximum of 10 dBA attenuation.

[b] Roadways with four or more lanes that permit trucks, with traffic at 60 mph.

[c] Parkways with traffic at 55 mph, but without trucks, and city streets with the equivalent of 75 or more heavy trucks per hour and 300 or more medium trucks per hour at 30 mph.

dBA = A-weighted decibel; **mph** = miles per hour

Based on projected population densities per square mile, no cities in Washington have a population density greater than 10,000 (Seattle has a population density of 9,047) (World Population Review 2024). Washington can generally be categorized into five noise environments based on population densities and proximity to roadways:

- **Remote/Natural** – Population density less than 100 with little to no anthropogenic[14] sources of noise
- **Rural/Agricultural** – Population density less than 300 with moderate anthropogenic sources of noise
- **Suburban** – Population density between 300 and 3,000 with constant anthropogenic sources of noise
- **Urban** – Population density greater than 3,000 with constant anthropogenic sources of noise
- **Travel Corridor** – Varying population density with constant audible noise from roadway or train traffic

In Washington, there are 90 cities with a population density between 3,000 and 10,000; 208 cities with a population density between 1,000 and 3,000; 192 cities with a population density between 300 and 1,000; 84 cities with a population density between 100 and 300; and 60 cities with a population density of less than 100. **Figure 13.3-1** shows the state's population densities.

[14] Caused or created by humans.

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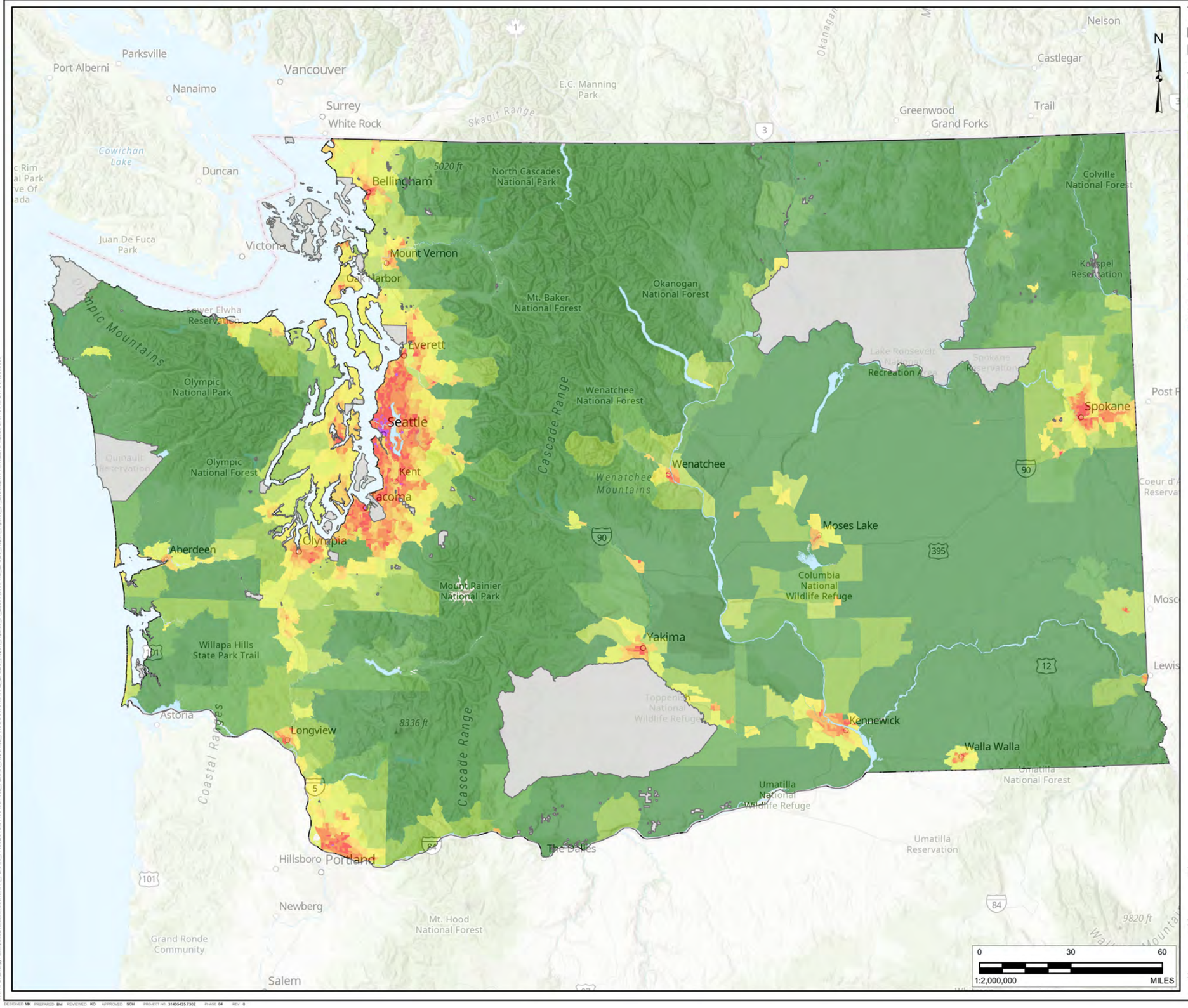

LEGEND

- Study Area
- Exclusion Areas

Population Density (People per square mile)

- < 5
- 5 - 10
- 10 - 25
- 25 - 50
- 50 - 100
- 100 - 250
- 250 - 500
- 500 - 1000
- 1000 - 2000
- 2000 - 5000
- > 5000

REFERENCES AND NOTES

1. SERVICE LAYER CREDITS: SOURCES: ESRI, TOMTOM, GARMIN, FAO, NOAA, USGS, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY, ESRI, USGS
2. U.S. CENSUS BUREAU. 2020. USA_CENSUS_2020_DHC_TOTAL_POPULATION. ACCESSED OCTOBER 3, 2024. HTTPS://SERVICES.ARCGIS.COM/P3EPLMYS2RVCHKJX/ARCGIS/REST/SERVICES/USA_CENSUS_2020_DHC_TOTAL_POPULATION/FEATURESERVER

Washington State Energy Facility Site Evaluation Council

PROJECT

PROGRAMMATIC EIS
HIGH-VOLTAGE TRANSMISSION

TITLE

STATE OF WASHINGTON POPULATION DENSITY

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3.13.2.3 Climate and Transmission Line Noise

Overhead transmission lines can generate noise by interacting with the surrounding environment and creating the phenomenon known as corona. Corona is the ionization of the air that occurs at the surface of the energized conductor and suspension hardware attributable to very high electric field strength at the surface of the metal during certain conditions. Corona may cause radio and television reception interference, audible noise, light, and the production of ozone. Corona noise[15] is generally a principal concern with transmission lines of 345 kilovolts (kV) and greater, and with lines that are at higher elevations. Corona is also significantly influenced by weather—specifically, rain, fog, dew, or any other event that places moisture on the transmission lines. These events can generally be considered "foul weather" events during which the conductor produces the greatest amount of corona noise. However, during heavy rain, the ambient noise generated by the rain is typically greater than the ambient noise generated by corona. Audible noise from a transmission line during typical fair-weather conditions is not predicted to exceed noise limits or create a nuisance.

For larger transmission facilities, audible corona noise from transmission lines can be modeled using the following two main programs:

- Electric and Magnetic Fields (EMF) Workstation: ENVIRO
- Corona and Field Effects (CAFE) program

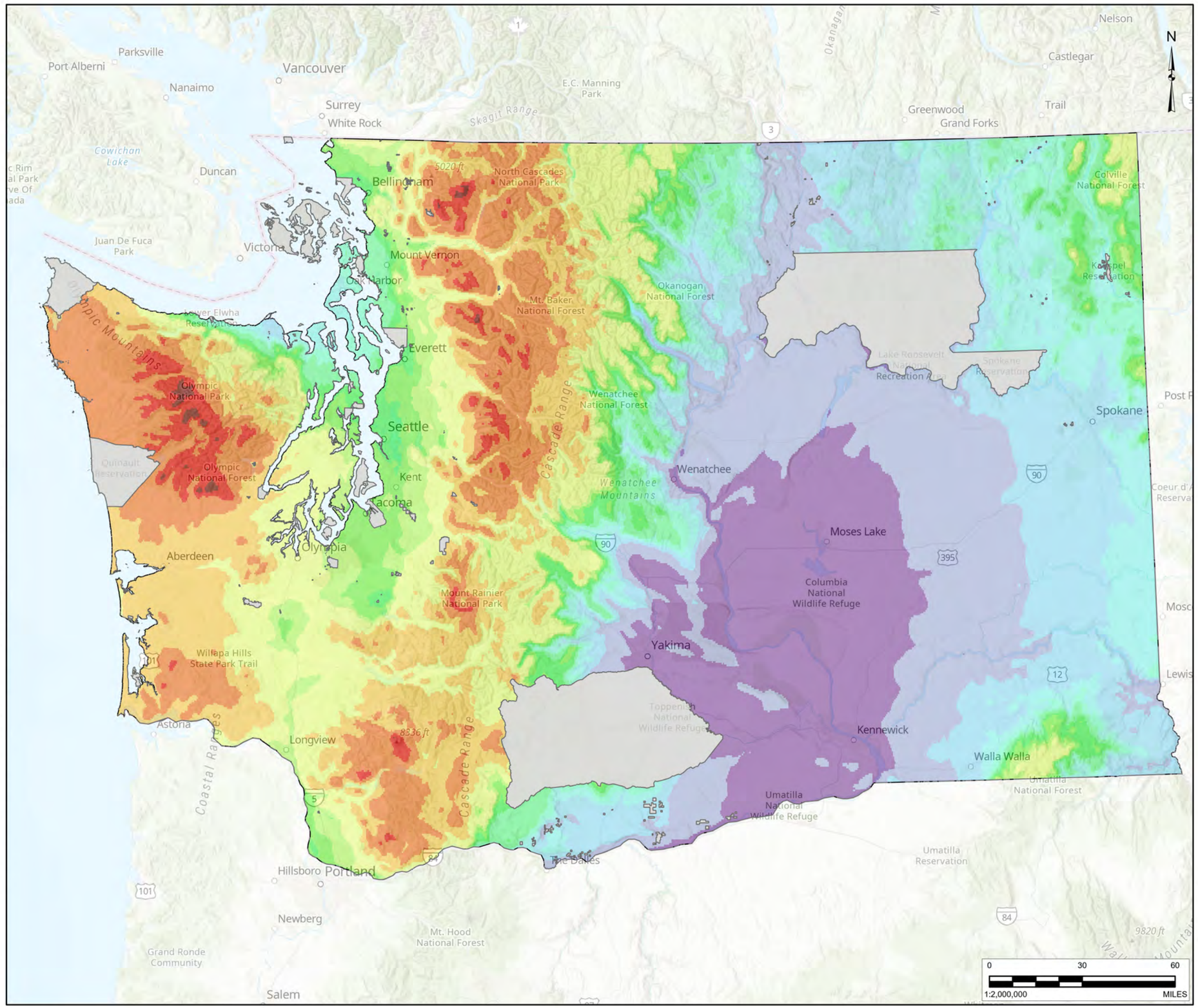
The ENVIRO program is a Windows-based model developed by the Electric Power Research Institute and uses algorithms from the U.S. Department of Energy and Bonneville Power Administration (BPA). These algorithms were originally described in the CAFE program that BPA developed. Both programs calculate expected levels of audible noise from transmission lines based on project-specific inputs like tower and conductor configurations and line voltage (Idaho Power 2018). The programs predict noise levels at identified sensitive receptors within a project's analysis area.

To determine the frequency of foul weather conditions in a project's specific analysis area, an analysis of representative and most recent historical meteorological data would be conducted at available data collection stations located near the project. Verified meteorological data can be obtained from the Western Regional Climate

[15] Ionization of the air that occurs at the surface of electrical conductors and power lines under some conditions, leading to loss of energy, audible noise, and release of ozone gas.

Center, which is one of six regional climate centers in the United States and provides meteorological monitoring data for the Pacific Northwest region. The regional climate center program is administered by the National Oceanic and Atmospheric Administration, with oversight by the National Climatic Data Center of the National Environmental Satellite, Data, and Information Service. The data would be analyzed to effectively determine the frequency of relevant foul weather conditions in the vicinity of potentially impacted receptors.

Foul weather events generally follow precipitation events and periods of high humidity. The greater the amount of rainfall and the higher the humidity of an area, the greater the percentage of time that noise generated by weather events would affect the environment. Annual average rainfall for Washington is presented below in **Figure 3.13-2**. Similar to rainfall, relative humidity levels vary greatly across the state, as well as from west to east. Foul weather events are likely above average in the western half of the state and below average in the central and eastern areas.



LEGEND

- Study Area
- Exclusion Areas

Annual Precipitation 30-Year Normal (1991-2020)

- > 200 in
- 150 - 200 in
- 100 - 150 in
- 75 - 100 in
- 50 - 75 in
- 45 - 50 in
- 40 - 45 in
- 35 - 40 in
- 30 - 35 in
- 25 - 30 in
- 20 - 25 in
- 15 - 20 in
- 10 - 15 in
- 5 - 10 in
- < 5 in

REFERENCES AND NOTES

1. SERVICE LAYER CREDITS: SOURCES: ESRI, TOMTOM, GARMIN, FAO, NOAA, USGS, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY, ESRI, USGS
2. NACSE. 2020. UNITED STATES AVERAGE TOTAL PRECIPITATION, 1991-2020 (800M; BIL). ACCESSED OCTOBER 3, 2024. HTTPS://PRISM.OREGONSTATE.EDU/NORMALS/

Washington State Energy Facility Site Evaluation Council

PROJECT

PROGRAMMATIC EIS
HIGH-VOLTAGE TRANSMISSION

TITLE

STATE OF WASHINGTON MEAN ANNUAL PRECIPITATION

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3.13.2.4 Ground-Borne Vibration

Ground-borne vibration can result from common construction activities such as blasting, pile-driving, and operating heavy earth-moving equipment. The effects of ground-borne vibration can vary from detectable movement of building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. In some extreme cases, the vibration can damage buildings or structures. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by only a small margin.

3.13.3 Impacts

For this Programmatic EIS, adverse environmental impacts were assessed for the new construction, operation and maintenance, upgrade, and modification of transmission facilities within the Study Area.

3.13.3.1 Method of Analysis

The study area for a project-specific application would typically encompass several key regions and features, such as the following:

- **Project Site and Immediate Vicinity:** This includes the specific location of a project and the surrounding area that might be directly affected by new construction, operation and maintenance, upgrade, and modification activities. The site characteristics that can affect noise propagation[16] include, but are not limited to, topography, foliage, ground cover, and surrounding barriers/buildings.
- **Existing Noise Environment:** The existing noise environment encompasses all existing noise sources and is generally affected by population density, proximity to travel corridors, and the natural soundscape.[17]
- **Climate and Elevation:** Weather-related conditions can influence noise propagation in general and can be a source of noise, such as wind or—specific to transmission lines—corona noise. Additionally, corona noise is generally a principal concern with lines that are at higher elevations.

[16] The way sound waves travel through different environments.
[17] The acoustic environment as perceived by humans, encompassing all the sounds within a particular area.

This Programmatic EIS analyzes the affected environment and adverse environmental impacts on noise and vibration within the Study Area, as defined in Chapter 1, Introduction. Four project stages for each transmission facility type (overhead or underground) were considered: new construction, operation and maintenance, upgrade, and modification.

This evaluation considers both overhead and underground transmission facilities for each stage. Overhead transmission facilities consist of transmission lines, substations, and ancillary infrastructure. Overhead and underground transmission facilities may involve similar above-ground infrastructure. Underground transmission facilities consist of underground transmission lines, underground access vaults, and other infrastructure located below the ground surface. The new construction of underground transmission facilities could include both open trench and trenchless construction methods.

Impact Determination

The discussion of adverse environmental impacts is qualitative, given the high-level nature of a Programmatic EIS; quantification would require project-specific details to analyze. **Table 3.13-5** describes the criteria used to evaluate adverse environmental impacts from the Action Alternative and No Action Alternative. Information reviewed to identify adverse environmental impacts on noise and vibration in the Study Area was obtained from federal agencies, state agencies, local planning documents, and public scoping.

Table 3.13-5: Criteria for Assessing the Impact Determination on Noise and Vibration

Impact Determination	Description
Nil	No foreseeable adverse environmental impacts are expected. A project would not adversely affect noise and vibration levels.
Negligible	A project would result in minimal adverse environmental impacts on noise and vibration. Changes would either be non-detectable or, if detected, would have only slight effects. A project would have very slight increases in noise and vibration levels, but they would not be perceivable by sensitive receptors. There would be no potential for hearing loss to occur. Negligible impacts would be short-term in duration. BMPs and design considerations are expected to be effective.

Impact Determination	Description
Low	A project would result in noticeable adverse environmental impacts on noise and vibration, even with the implementation of BMPs and design considerations. These adverse environmental impacts may include slight temporary increases in noise and vibration levels, but they would be limited and controlled. There would be no potential for hearing loss to occur. Adverse impacts on noise and vibration would be localized. Adverse environmental impacts may be short or long-term in duration.
Medium	A project would result in adverse environmental impacts on noise and vibration, even with the implementation of BMPs and design considerations. A project would result in prolonged increases of noise and vibration levels that cause annoyance and stress on sensitive receptors, minor damage to structures, and disruptions to sensitive environments. The potential for hearing loss to occur would be limited to construction workers on-site. Medium impacts may be short or long-term in duration.
High	A project would result in adverse and potentially severe environmental impacts on noise and vibration, even after implementation of BMPs and design considerations. A project would cause permanent adverse noise or vibration impacts on sensitive receptors or structures. There may be a higher risk of hearing loss for sensitive receptors in close proximity to the construction site. Adverse environmental impacts related to noise and vibration may affect a larger area, not just localized to the construction site. High impacts may be short or long-term.

BMP = best management practice

To clearly understand the potential severity of adverse environmental impacts without any interventions, the following impact determinations exclude the use of Avoidance Criteria and Mitigation Measures. The ratings assume compliance with all federal, state, and local laws and regulations, as well as standardized BMPs and design considerations. Assessing adverse environmental impacts without Avoidance Criteria or Mitigation Measures offers a baseline understanding of potential environmental effects, helping to identify the true extent of these impacts. Environmental laws often require that initial impact assessments be conducted without considering mitigation to maintain the integrity of the environmental review process.

When impact determinations are identified as medium or high, then either the applicant would adopt applicable Mitigation Measures from this Programmatic EIS, or the SEPA Lead Agency may require applicable mitigation measures to be implemented

to reduce project-specific impacts. When impact determinations are low, applicable Mitigation Measures should still be considered by the applicant and the SEPA Lead Agency, as these measures would help to further reduce adverse environmental impacts, including the project's contribution to cumulative impacts. These Mitigation Measures would be implemented in addition to compliance with laws, regulations, environmental permits, plans, and design considerations required for transmission facilities.

3.13.3.2 Action Alternative

New Construction

Overhead Transmission Facilities

Activities for the new construction of overhead transmission facilities would vary and depend on the scale of the facility and site characteristics. New construction could include a relatively short site preparation period (e.g., a few months), followed by a longer construction and start-up period. It is assumed that the new construction of overhead transmission, per mile, would have a shorter duration than underground construction. Overhead transmission facilities could have the following adverse environmental impacts related to noise and vibration during new construction:

- Increased Noise at Sensitive Receptors
- Hearing Loss
- Ground-borne Vibration at Off-Site Structures

Increased Noise at Sensitive Receptors

Noise from general construction activities would be similar to other infrastructure projects and would include activities such as the following:

- Transportation of materials
- Staging of materials
- Assembly of transmission facility towers and other project features
- Construction and repair of access roads
- Vehicle traffic from commuting workers and trucks moving material to and from the work sites

The new construction of overhead transmission facilities would typically generate noise levels ranging from 80 to 90 dBA at 50 feet, depending on the equipment used (FHWA 2017). The construction equipment that would be used for the new construction of overhead transmission facilities is similar to that used during typical public works projects and tree service operations (e.g., road resurfacing, storm-sewer installation, natural gas line installation, and tree removal). Some atypical sources of noise that could be associated with new overhead transmission facility construction are blasting and rock breaking, implosive devices used during conductor stringing, and helicopter operations. These temporary increases in noise could have adverse environmental impacts on sensitive receptors. However, the impacts on sensitive receptors would depend on a variety of factors, including the distance from the new construction activities, equipment type, and natural soundscape.

Increased noise could also disturb wildlife, leading to changes in feeding, mating, and rearing behaviors. Some species may avoid noisy areas, resulting in changes to habitat use and migration patterns and leading to ecological imbalances. See Section 3.6, Habitat, Wildlife, and Fish, regarding adverse environmental impacts on biological resources.

Impact Determination: Adverse environmental impacts on noise and vibration resulting from increased noise at sensitive receptors during the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from negligible to high.

Hearing Loss

Both on-site and off-site hearing loss can be caused by high noise levels from various construction activities and equipment. Sources of noise that can cause hearing loss can be impulsive or continuous in nature. Construction activities such as drilling and the use of heavy machinery can produce levels exceeding 85 dBA $L_{eq(8hr)}$, which is the threshold for potential hearing damage.

It is expected that projects meeting the FTA Noise and Vibration Impact Assessment guidelines and standards would not have the potential to cause hearing loss. Additionally, the Occupational Safety and Health Administration (OSHA) sets standards to protect workers from hazardous conditions, including excessive noise. These standards require workplaces to implement a Hearing Conservation Program when employees are exposed to noise levels that reach or exceed 85 dBA. OSHA also

requires employers to use feasible engineering or administrative controls to reduce noise levels for employees and the public.

Impact Determination: Adverse environmental impacts on noise and vibration resulting from hearing loss during the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from negligible to low.

Ground-borne Vibration at Off-Site Structures

Ground-borne vibration during the new construction of overhead transmission facilities can be caused by heavy machinery, helicopters, and increased traffic. Vibration can be a concern for off-site structures for several reasons, including the following:

- **Structural Damage:** Vibration can cause minor damage such as cracks in plaster, drywall, or paint. Prolonged or intense vibration can affect the structural integrity of buildings, potentially leading to more severe damage.
- **Impact on Sensitive Equipment:** Facilities with sensitive equipment, such as hospitals and research labs, can experience disruptions. Vibration can interfere with the operation of delicate instruments and machinery. Industries that rely on precision manufacturing may face operational challenges due to vibration affecting the accuracy of their processes.
- **Human Perception and Comfort:** Continuous or high levels of vibration can cause discomfort, annoyance, and stress to occupants of nearby buildings. Vibration, especially during nighttime construction, can disrupt sleep patterns, leading to health issues.

The effects of ground-borne vibration depend on several factors, such as the intensity, frequency, duration, geology, and soil type of the site, and the design and material of the off-site structure. New construction activities that may generate ground-borne vibration could have adverse environmental impacts on both the structures and those who inhabit them.

Impact Determination: Adverse environmental impacts on noise and vibration resulting from ground-borne vibration at off-site structures during the new construction of overhead transmission facilities are expected to vary depending on the

scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from negligible to medium.

Underground Transmission Facilities

Activities for the new construction of underground transmission facilities would vary and depend on the scale of the facility and site characteristics. New construction could include a site preparation period of relatively short duration (e.g., a few months), followed by a longer construction and start-up period. It is assumed that the new construction of overhead transmission, per mile, would have a shorter duration than underground construction. Underground transmission facilities could have the following adverse environmental impacts related to noise and vibration during new construction:

- Increased Noise at Sensitive Receptors
- Hearing Loss
- Ground-borne Vibration at Off-Site Structures

Construction noise impacts at above-ground substations and switchyards for underground transmission facilities would be assessed the same way as overhead transmission facility projects and are not analyzed for underground transmission.

Increased Noise at Sensitive Receptors

New construction of underground transmission facilities would typically generate similar noise levels as overhead transmission facilities, ranging from 80 to 90 dBA at 50 feet, depending on the equipment used (FHWA 2017). While open trenching would likely occur only during daytime hours, trenchless crossings could require continuous 24-hour operations. While these sites would likely involve typical construction equipment, they could also incorporate other equipment specific to drilling or tunneling operations. Similar to new overhead transmission facility construction, underground transmission facility construction could occur in sequential phases, including site preparation, drilling, pulling pipe, and final site work. The drilling and pulling pipe phases could be conducted continuously until completion and require nighttime operations.

Temporary increases in noise due to the new construction of underground transmission facilities could have adverse environmental impacts on sensitive receptors. Although these impacts would be similar to those described for the construction of overhead transmission facilities, they would be more severe due to

potential nighttime operations, longer construction durations, and different construction methods.

Impact Determination: Adverse environmental impacts on noise and vibration resulting from increased noise at sensitive receptors during the new construction of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from low to high.

Hearing Loss

The potential for hearing loss resulting from the new construction of underground transmission facilities is comparable to that of overhead transmission facilities. Underground transmission facility projects that meet the FTA Noise and Vibration Impact Assessment guidelines and standards, as well as OSHA requirements, are not anticipated to cause hearing loss.

Impact Determination: Adverse environmental impacts on noise and vibration resulting from hearing loss during the new construction of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from negligible to low.

Ground-borne Vibration at Off-Site Structures

It is expected that the new construction of underground transmission facilities would result in adverse environmental impacts similar to those described for the new construction of overhead transmission facilities. However, the new construction of underground transmission facilities is expected to have more severe impacts due to the likelihood of blasting, tunneling, and extensive earthwork activities. Blasting is expected to be one of the greatest concerns as it relates to impacts from ground-borne vibration. Blasting could be required where hard rock or soils need to be precisely demolished or penetrated with minimal effort. These activities could result in immediate and intense ground-borne vibration.

The effects of ground-borne vibration on off-site structures depend on several factors, such as the intensity, frequency, duration, geology, and soil type of the site, and the design and material of the off-site structure. Ground-borne vibration could affect those within the building and could cause damage to the structure, such as cracks in the foundation, walls, and ceilings. Ground-borne vibration could also affect the operation of sensitive equipment or instruments, such as microscopes, medical

imaging machines, and lasers. New construction activities that may generate ground-borne vibration could have adverse environmental impacts on both the structures and those who inhabit them.

Impact Determination: Adverse environmental impacts on noise and vibration resulting from ground-borne vibration at off-site structures during the new construction of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from negligible to medium.

Operation and Maintenance

Overhead Transmission Facilities

Activities for the operation and maintenance stage of overhead transmission facilities would vary based on the type of facility, scale, and site characteristics. Facilities are not expected to have staff on site daily, but maintenance crews are anticipated to be regularly deployed. Transmission facilities require ongoing maintenance for equipment and rights-of-way (ROWs). Overhead transmission facilities could have the following adverse environmental impacts during the operation and maintenance stage:

- Increased Noise at Sensitive Receptors
- Hearing Loss
- Ground-borne Vibration at Off-Site Structures

Increased Noise at Sensitive Receptors

During the operation and maintenance stage of an overhead transmission facility, increased noise at sensitive receptors could result from both permanent and temporary noise sources. Permanent adverse environmental impacts can be associated with both intermittent and continuous sources of operational noise. Intermittent noise sources could include corona discharge,[18] which frequently occurs during foul weather. Operation noise from transmission lines (e.g., corona discharge) is generally low, often in the range of 20 to 40 dBA at the edge of the ROW, and typically below ambient levels in rural areas. The Bonneville Power Administration indicates that during wet weather, noise levels of up to 46 dBA can occur within an 80-foot ROW corridor for a 230-kV line and lower noise levels during dry conditions and for lower-

[18] A discharge of electricity at the surface of a conductor or between two conductors on the same transmission line.

voltage lines (BPA 1977). Noise levels of 46 dBA and lower would be below the 50 dBA EDNA applicable to residential uses within the State of Washington.

Other intermittent noise could occur during routine inspections and maintenance of overhead transmission facilities. General maintenance would include safety inspections of on-site components and possible repair or replacement of equipment. Depending on the accessibility of the site, vehicles or helicopters could be used to transport crews and identify areas requiring maintenance activities. Additionally, vegetation management along the ROW may require the use of chainsaws, tractors, or helicopters.

Continuous operational noise may result from typical transmission facility equipment, including, but not limited to, substations, transformers, and cooling systems. The primary source of noise from transmission facility equipment is anticipated to be transformers. Transformers can create low-frequency humming or buzzing. If cooling systems are required, these too can produce noise from their components. It is expected that cooling systems would be operated periodically and only during warmer weather conditions.

Adverse environmental impacts on sensitive receptors from increased noise levels could occur depending on their distance from the noise source, the equipment's specifications, and the existing natural soundscape. Operational noise is generally not considered significant, except in rare cases involving unusual weather or design conditions.

Impact Determination: Adverse environmental impacts on noise and vibration resulting from increased noise at sensitive receptors during the operation and maintenance of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from negligible to medium.

Hearing Loss

Although hearing loss is not anticipated under the normal operating conditions of overhead transmission facilities, the use of equipment during maintenance or repair activities could result in adverse environmental impacts. However, projects that meet the FTA Noise and Vibration Impact Assessment guidelines and standards, as well as OSHA requirements, are not anticipated to cause hearing loss.

Impact Determination: Adverse environmental impacts on noise and vibration resulting from hearing loss during the operation and maintenance of overhead

transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from negligible to low.

Ground-borne Vibration at Off-site Structures

Ground-borne vibration at off-site structures is not expected under the normal operating conditions of overhead transmission facilities. However, during maintenance or repair activities, ground-borne vibration at nearby structures could occur. The adverse environmental impacts during these activities could be similar to those described for new construction; however, effects would be reduced because fewer pieces of equipment would be required, and the duration of the activities would be shorter.

Impact Determination: Adverse environmental impacts on noise and vibration resulting from ground-borne vibration at off-site structures during the operation and maintenance of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from negligible to low.

Underground Transmission Facilities

Similar to overhead transmission facilities, activities for the operation and maintenance of underground transmission facilities would vary based on the type of facility, scale, and site characteristics. Facilities are not expected to have staff on site daily, but maintenance crews are anticipated to be regularly deployed. Transmission facilities require ongoing maintenance for equipment and ROWs, similar to any other linear industrial facilities. Underground transmission facilities could have the following adverse environmental impacts during the operation and maintenance stage:

- Increased Noise at Sensitive Receptors
- Hearing Loss
- Ground-borne Vibration at Off-Site Structures

Increased Noise at Sensitive Receptors

Adverse environmental impacts from noise are not expected to occur during normal operation of underground transmission facilities. However, if repairs are required, temporary noise impacts could occur due to the use of heavy machinery needed to

access the facilities. Temporary noise impacts would be similar to those expected during construction, though they would be shorter in duration.

Impact Determination: Adverse environmental impacts on noise and vibration resulting from increased noise at sensitive receptors during the operation and maintenance of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from negligible to medium.

Hearing Loss

The potential for hearing loss to occur from the operation and maintenance of underground transmission facilities would be similar to that of overhead transmission facilities.

Impact Determination: Adverse environmental impacts on noise and vibration resulting from hearing loss during the operation and maintenance of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from negligible to low.

Ground-borne Vibration at Off-site Structures

Adverse environmental impacts on off-site structures from ground-borne vibration are not expected to occur during normal operations of underground transmission facilities. However, if repairs are required, temporary ground-borne vibration impacts could occur due to the use of heavy machinery needed to access the facilities. Temporary impacts on off-site structures from ground-borne vibration would be similar to those expected during construction, though they would be shorter in duration and of less severity.

Impact Determination: Adverse environmental impacts on noise and vibration resulting from ground-borne vibration at off-site structures during the operation and maintenance of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from negligible to medium.

Upgrade

Overhead Transmission Facilities

Upgrades to overhead transmission facilities would occur within existing ROWs without expanding the existing facility footprint or causing new ground disturbance.

However, these upgrades may result in adverse environmental impacts on noise and vibration, including:

- Increased Noise at Sensitive Receptors
- Hearing Loss
- Ground-borne Vibration at Off-Site Structures

The adverse environmental impacts from upgrading overhead transmission facilities are often comparable to those of maintaining overhead transmission facilities. These adverse environmental impacts are generally anticipated to be lower than those for modifying or constructing a new transmission facility due to several factors. Table 2.3-1 highlights how upgrading existing transmission facilities would generally result in fewer or less impactful adverse environmental impacts.

Underground Transmission Facilities

Upgrades to underground transmission facilities would occur within existing ROWs without expanding the facility footprint or causing new ground disturbance. However, these upgrades may result in adverse environmental impacts on noise and vibration, including:

- Increased Noise at Sensitive Receptors
- Hearing Loss
- Ground-borne Vibration at Off-Site Structure

The adverse environmental impacts from upgrading underground transmission facilities are often comparable to those of maintaining underground transmission facilities. These adverse environmental impacts are generally anticipated to be lower than those for modifying or constructing a new transmission facility due to several factors. Table 2.3-1 highlights how upgrading existing transmission facilities would generally result in fewer or less impactful adverse environmental impacts.

Modification

Overhead Transmission Facilities

Modifying existing overhead transmission facilities typically involves several key steps, each with specific requirements, timelines, and settings, as outlined in Chapter 2, Overview of Transmission Facilities, Development Considerations, and Regulations. The adverse environmental impacts of modifying existing transmission

facilities would vary depending on the scale of the project-specific application. Overhead transmission facilities could have the following adverse environmental impacts on noise and vibration during the modification stage:

- Increased Noise at Sensitive Receptors
- Hearing Loss
- Ground-borne Vibration at Off-Site Structures

Adverse environmental impacts of modifying overhead transmission facilities could be similar to those of new construction, but are anticipated to be lower. Table 2.3-2 highlights how modifying existing transmission facilities would generally result in fewer or less impactful adverse environmental impacts.

Underground Transmission Facilities

Modifying existing underground transmission facilities typically involves several key steps, each with specific requirements, timelines, and settings, as outlined in Chapter 2, Overview of Transmission Facilities, Development Considerations, and Regulations. The adverse environmental impacts of modifying existing transmission facilities would vary depending on the scale of the project-specific application. Underground transmission facilities could have the following adverse environmental impacts on noise and vibration during the modification stage:

- Increased Noise at Sensitive Receptors
- Hearing Loss
- Ground-borne Vibration at Off-Site Structure

Adverse environmental impacts of modifying underground transmission facilities could be similar to new construction, but are generally anticipated to be lower. Table 2.3-2 highlights how modifying existing transmission facilities would generally result in fewer or less impactful adverse environmental impacts.

3.13.3.3 No Action Alternative

Under the No Action Alternative, the Programmatic EIS would not be adopted as a planning or analytical framework. Instead, transmission facility siting and development would continue under existing state and local regulatory processes, with each project evaluated for environmental compliance without the benefit of the environmental review provided in this document. This approach would lack the

advanced notice of potential serious environmental concerns for those planning transmission facilities, as well as Mitigation Strategies developed under the Programmatic EIS. As a result, environmental outcomes could be less predictable and consistent, and adverse environmental impacts could be greater.

3.13.4 Mitigation Measures

Under SEPA, there are six recognized forms of mitigation that agencies can apply to reduce or address adverse environmental impacts:

- **Avoiding the adverse environmental impact** altogether by not taking a certain action or parts of an action.
- **Minimizing adverse environmental impacts** by limiting the degree or magnitude of the action and its implementation.
- **Rectifying the adverse environmental impact** by repairing, rehabilitating, or restoring the affected environment.
- **Reducing or eliminating the adverse environmental impact** over time by preservation and maintenance operations during the life of the action.
- **Compensating for the adverse environmental impact** by replacing or providing substitute resources or environments.
- **Monitoring the adverse environmental impact** and taking appropriate corrective measures.

This section describes the Avoidance Criteria and Mitigation Measures that could apply to adverse environmental impacts from new construction, operation and maintenance, upgrade, and modification of transmission facilities.

All General Measures adopted for this Programmatic EIS, identified in Section 3.1, are relevant to this resource section. Applicants would be responsible for providing information within their application materials documenting their implementation of the General Measures.

Avoidance Criteria[19] that are relevant to this resource section are described below:

AVOID-8 – Important Habitat: Avoid having equipment or infrastructure in areas occupied by important and sensitive wildlife habitat, such as those listed in Appendix 3.1-1.

Rationale: This Avoidance Criterion aims to reduce habitat loss and fragmentation that can be caused by linear features such as transmission facilities.

AVOID-10 – Buffer Setbacks for Wildlife and Wildlife Features: Avoid having equipment or infrastructure within the setbacks identified for wildlife and wildlife features, as outlined in Appendix 3.6-1. Applicants would verify and update the setbacks as new buffers are recommended by Washington State (e.g., Washington Department of Fish and Wildlife [WDFW] and Washington State Department of Ecology). Buffers and setbacks would be reviewed with WDFW prior to the submittal of a project-specific application.

Rationale: This Avoidance Criterion reduces direct and indirect habitat loss and mortality of special status species.[20]

AVOID-21 – Physical Impacts on Historic and Cultural Resources: Avoid having equipment or infrastructure in areas occupied by historic and cultural resources.

Rationale: This criterion aims to avoid physical impacts on historic and cultural resources.

AVOID-23 – Physical Impacts on Tribal Resources and TCPs: Avoid having equipment or infrastructure in areas occupied by Tribal resources, including first foods, and Traditional Cultural Places (TCPs).

Rationale: This Avoidance Criterion aims to avoid adverse physical impacts on Tribal resources and TCPs to the maximum extent practicable.

The Programmatic EIS is intended to support more efficient and effective siting and permitting of transmission facilities, consistent with the legislative direction in RCW 43.21C.408, by streamlining environmental review where projects incorporate the

[19] The complete list of Avoidance Criteria and their rationales can be found in Section 3.1 and Appendix 3.1-1.

[20] For this Programmatic EIS, special status fish and freshwater invertebrate species are defined as either listed under the federal Endangered Species Act or Bald and Golden Eagle Protection Act or listed by Washington State as endangered, threatened, sensitive, or candidate.

recommended planning and Mitigation Strategies. Applicants would be responsible for providing information within their application materials documenting the project's compliance with the above Avoidance Criteria. While total avoidance of all adverse environmental impacts is not required in order to use the Programmatic EIS, applicants are expected to demonstrate how their project aligns with the intent of the Avoidance Criteria to the extent practicable. If specific Avoidance Criteria are not met, the applicant would provide an explanation and supporting information. Additional environmental analyses would be required as part of the documentation for SEPA for the project. Additional mitigation could be required, depending on the nature of the deviation and its potential to result in probable significant adverse environmental impacts.

Mitigation Measures have been identified to minimize adverse environmental impacts from transmission facility projects. These measures are intended to be broad so that they can be applied to most projects that would be covered under this Programmatic EIS. However, project-specific plans would be needed to adapt the measures for project-specific applications. The inclusion of a Mitigation Measure in this Programmatic EIS does not imply that a given adverse environmental impact is presumed to occur. Rather, the measures are provided to support early planning and the avoidance of adverse environmental impacts, streamlining project-specific environmental reviews when impacts are identified. Mitigation Measures are intended to serve as a set of potential strategies that the SEPA Lead Agency and applicants can draw from, depending on the specific environmental context and project footprint. Applicants and the SEPA Lead Agency retain discretion to:

- Propose alternative mitigation strategies that achieve equivalent or better outcomes.
- Demonstrate that certain Mitigation Measures are not applicable due to the absence of relevant impacts.

When impact determinations are identified as medium or high, then the applicant would adopt applicable Mitigation Measures from this Programmatic EIS, or the SEPA Lead Agency may require applicable mitigation to be implemented to reduce project-specific adverse environmental impacts. When impact determinations are low, applicable Mitigation Measures should still be considered by the applicant and the SEPA Lead Agency, as these Mitigation Measures would help to further reduce adverse environmental impacts, including the project's contribution to cumulative impacts. These Mitigation Measures would be implemented in addition to compliance with laws,

regulations, environmental permits, plans, and design considerations required for transmission facilities.

The following Mitigation Measures could be adopted to mitigate adverse environmental impacts:

Noise-1 – Limit Construction Hours: With the exception of trenchless crossings that require continuous day/night operations, limit noise-generating equipment used in new construction, maintenance, upgrades, and modifications that would impact sensitive receptors to weekdays and daytime hours.

Rationale: This Mitigation Measure aims to limit construction noise to daytime hours.

Noise-2 – Use Noise Barriers for Construction: Use noise barriers or other Mitigation Measures for new construction activities, like trenchless crossings, that require continuous day/night operations or during upgrades and maintenance where the potential exists to exceed state and/or local noise standards to mitigate the adverse environmental impact on noise-sensitive receptors.

Rationale: This Mitigation Measure aims to reduce noise impacts on sensitive receptors.

Noise-3 – Use of Operational Noise Mitigation: Provide vendor-supplied noise mitigation or acoustic barriers for substation transformers and equipment located near noise-sensitive areas.

Rationale: This Mitigation Measure aims to reduce noise impacts on sensitive receptors when there is a potential for a project to exceed state and/or local noise standards or otherwise cause a nuisance when sources cannot be moved away from sensitive receptors.

Noise-4 – Prevent Hearing Loss: Identify when construction activities may produce on-site and off-site noise levels that exceed 85 A-weighted decibels (dBA) as an equivalent noise level over 8 hours ($L_{eq[8Hr]}$) and the associated engineering or administrative controls in place to reduce the potential for hearing loss.

Rationale: Prolonged exposure to noise levels above 85 dBA $L_{eq(8Hr)}$ can cause irreversible hearing loss. Identifying high noise levels early allows for timely implementation of protective measures to prevent hearing loss.

Noise-5 – Noise Assessment: Prepare a noise assessment that includes measuring existing baseline noise environments, predicting future noise levels from either new construction and/or operation and maintenance, and evaluating the potential adverse environmental impacts on surrounding sensitive noise receptors.

Rationale: This assessment would help identify sensitive noise receptors, evaluate the potential noise impacts, and determine the effectiveness of potential noise Mitigation Measures.

In addition to the above Mitigation Measures, the following Mitigation Measures[21] developed for other resources may be applicable:

Hab-6 – Worker Education Program: Develop a worker education program for implementation during new project construction and operation. The program would train workers on operating near sensitive wildlife habitat and features, sensitive wildlife periods, working around watercourses and riparian features, management of wildlife attractants, management of special status species, wildlife reporting, and wildlife mortality reporting.

Wild-1 – Wildlife Timing Windows: Schedule vegetation clearing and grubbing and other activities that could destroy or disturb wildlife to occur outside of the sensitive timing windows in appropriate habitat as listed in Appendix 3.6-1. This list and timing periods would be verified with the Washington Department of Fish and Wildlife and updated as needed prior to implementation.

Wild-14 – Wildlife-Specific Noise Mitigation: Implement noise control measures (e.g., temporary noise barriers, mufflers) or practices (e.g., restrictions to low-level helicopter flights) where project activities are expected near sensitive wildlife habitat.

Minimize the use of blasting, impact or vibratory driving, or other construction methods near water or implement noise reduction strategies to reduce underwater noise.

Hist/Cultural-1 – WISAARD Database: While planning transmission facilities, gather information on previously surveyed historic and cultural resources.

[21] The rationales for the identified Mitigation Measures are provided in their respective resource sections.

Hist/Cultural-3 – Early Engagement: Conduct early engagement with interested parties, including Tribes.

Hist/Cultural-4 – Survey Methodology Approval: Obtain concurrence from the Washington State Department of Archaeology and Historic Preservation (DAHP) and Tribes on historic and cultural resource survey methodologies prior to conducting the surveys.

3.13.5 Probable Significant Adverse Environmental Impacts

Determining the significance of an adverse environmental impact involves consideration of context and intensity, which, in turn, depend on the magnitude and duration of the impact. "Significant" in SEPA means a reasonable likelihood of more than a moderate adverse environmental impact on environmental quality. An adverse environmental impact may also be significant if its chance of occurrence is not great, but the resulting impact would be severe if it occurred (WAC 197-11-794).

Identification of adverse environmental impacts and assignment of discipline-specific ratings are based on a structured evaluation consistent with the criteria outlined in WAC 197-11-330. Significance determinations consider the context and intensity of potential adverse environmental impacts, using both quantitative and qualitative information where appropriate. Professional expertise does not substitute for regulatory compliance. Regulatory requirements establish the baseline for environmental analysis and mitigation. Professional experience is used to supplement this baseline, providing additional insight to identify whether Mitigation Measures beyond those required by regulation may be warranted. In cases where data are incomplete or unavailable, a conservative approach has been applied to ensure that potential adverse environmental impacts are not underestimated.

This Programmatic EIS weighs the potential adverse environmental impacts on noise and vibration that would result from transmission facilities after considering the application of laws and regulations; siting and design considerations, including agency guidance and BMPs, and Mitigation Strategies, and makes a resulting determination of significance for each impact. **Table 3.13-6** summarizes the adverse environmental impacts anticipated for the new construction, operation and maintenance, upgrade, and modification of transmission facilities.

Table 3.13-6: Summary of Adverse Environmental Impacts, Mitigation Strategies, and Significance Rating for Noise and Vibration

Adverse Environmental Impact	Project Stage	Description of Impact	Impact Determination Before Applying Mitigation	Mitigation Strategy Applied[a]	Significance After Applying Mitigation Strategy	Rationale for Significance Rating
Noise – Increased Noise at Sensitive Receptors	New Construction	The new construction of both overhead and underground transmission facilities could impact sensitive receptors from increased noise levels as a result of using heavy equipment, helicopters, and additional construction vehicles. The new construction of underground transmission facilities could result in more severe adverse environmental impacts on sensitive receptors due to activities such as blasting, tunneling, and rock breaking. Additionally, these activities could require continuous nighttime work.	**Overhead:** negligible to high Underground: low to high	▪ **AVOID-8:** Important Habitat ▪ **AVOID-10:** Buffer Setbacks for Wildlife and Wildlife Features ▪ **Noise-1:** Limit Construction Hours ▪ **Noise-2:** Use Noise Barriers for Construction ▪ **Noise-3:** Use Operational Noise Mitigation ▪ **Noise-4:** Prevent Hearing Loss ▪ **Noise-5:** Noise Assessment ▪ **Hab-6:** Worker Education Program ▪ **Wild-1:** Wildlife Timing Windows ▪ **Wild-14:** Wildlife-Specific Noise Mitigation	Less than Significant	Adverse environmental impacts on sensitive receptors from increased noise would be reduced to a less than significant level through the implementation of and compliance with Mitigation Strategies.
	Operation and Maintenance	Increased intermittent noise at sensitive receptors could occur from the maintenance of both overhead and underground transmission facilities. These adverse environmental impacts could result from vegetation management activities, heavy equipment used for repairs, or vehicles or helicopters used to transport crews. Overhead transmission lines could also produce intermittent noise from corona discharge, which frequently occurs during foul weather. Overhead transmission facilities could also result in continuous operational noise from equipment, such as substations, transformers, and cooling systems.	**Overhead:** negligible to medium **Underground:** negligible to medium			
	Upgrade	Increased noise at sensitive receptors from the upgrade of existing overhead or underground transmission facilities could be similar to the maintenance of these facilities. These adverse environmental impacts would be lower than those from modifying or constructing new transmission facilities due to the utilization of existing infrastructure and ROW, shorter construction durations, and minimized disturbance at overhead transmission facilities.	**Overhead:** negligible to medium **Underground:** negligible to medium			
	Modification	Increased noise at sensitive receptors from the modification of existing overhead or underground transmission facilities could be similar to that expected for new construction. However, these impacts could be less due to the utilization of existing infrastructure and minimized disturbance.	**Overhead:** negligible to high **Underground:** low to high			
Noise – Hearing Loss	New Construction	Both on-site and off-site hearing loss could be caused by high noise levels from various construction activities and equipment used for the new construction of overhead and underground transmission facilities. It is expected that compliance with regulatory requirements and implementation of BMPs will be effective.	**Overhead:** negligible to low **Underground:** negligible to low	▪ **Noise-1:** Limit Construction Hours ▪ **Noise-2:** Use Noise Barriers for Construction ▪ **Noise-3:** Use Operational Noise Mitigation	Less than Significant	The risk of hearing loss can be effectively managed through compliance with OSHA requirements and standard BMPs. The implementation of Mitigation Measures would further reduce the

Adverse Environmental Impact	Project Stage	Description of Impact	Impact Determination Before Applying Mitigation	Mitigation Strategy Applied[a]	Significance After Applying Mitigation Strategy	Rationale for Significance Rating
	Operation and Maintenance	The potential for hearing loss is not anticipated under the normal operating conditions of transmission facilities. However, the use of equipment during maintenance or repair activities could result in adverse environmental impacts. It is expected that compliance with regulatory requirements and implementation of BMPs will be effective.	**Overhead:** negligible to low **Underground:** negligible to low	▪ **Noise-4:** Prevent hearing loss ▪ **Noise-5:** Noise Assessment		potential for adverse environmental impacts.
	Upgrade	The potential for hearing loss during upgrade activities would be similar to that of the maintenance of both overhead and underground transmission facilities. It is expected that compliance with regulatory requirements and implementation of BMPs would be effective.	**Overhead:** negligible to low **Underground:** negligible to low			
	Modification	The potential for hearing loss during modification would be similar to new construction; however, adverse environmental impacts are generally anticipated to be lower than those for constructing new transmission facilities due to minimized disturbance footprints and using existing infrastructure.	**Overhead:** negligible to low **Underground:** negligible to low			
Vibration – Ground-borne Vibration at Off-Site Structures	New Construction	Ground-borne vibration could be generated by construction equipment operations for both overhead and underground transmission facilities. Impacts from ground-borne vibration could lead to structural damage, disruption of sensitive equipment, and decreased comfort for nearby occupants. The new construction of underground transmission facilities is expected to have more severe impacts due to the likelihood of blasting, tunneling, and extensive earthwork activities.	**Overhead:** negligible to medium **Underground:** negligible to medium	▪ **AVOID-21:** Physical Impacts on Historic and Cultural Resources ▪ **AVOID-23:** Physical Impacts on Tribal Resources and TCPs ▪ **Noise-1:** Limit Construction Hours ▪ **Hab-6:** Worker Education Program ▪ **Wild-14:** Wildlife-Specific Noise Mitigation ▪ **Hist/Cultural-1:** WISAARD Database ▪ **Hist/Cultural-3:** Early Engagement ▪ **Hist/Cultural-4:** Survey Methodology Approval	Less than Significant	Adverse environmental impacts from ground-borne vibration on off-site structures can be effectively managed through the application of standard BMPs and Mitigation Strategies. With the application of these measures, it is expected that impacts from ground-borne vibration at off-site structures would be less than significant.
	Operation and Maintenance	Ground-borne vibration at off-site structures is not expected under the normal operating conditions of overhead transmission facilities. During maintenance or repair activities, ground-borne vibration at nearby structures could occur. The adverse environmental impacts during these activities could be similar to those described for new construction; however, effects would be less severe because fewer pieces of equipment would be required, and the duration of the activities would be shorter.	**Overhead:** negligible to low **Underground:** negligible to medium			
	Upgrade	Ground-borne vibration impacts associated with the upgrade of both overhead and underground transmission facilities would be similar to the maintenance of these facilities and lower than those from modifying or constructing new facilities due to the utilization of existing infrastructure and ROW, shorter construction duration, and minimized disturbance.	**Overhead:** negligible to low **Underground:** low to medium			

Adverse Environmental Impact	Project Stage	Description of Impact	Impact Determination Before Applying Mitigation	Mitigation Strategy Applied[a]	Significance After Applying Mitigation Strategy	Rationale for Significance Rating
	Modification	Ground-borne vibration impacts during the modification of transmission facilities could be similar to those expected for new construction. However, these adverse environmental impacts are anticipated to be less than those for constructing new transmission facilities due to minimized footprint disturbances and utilizing existing infrastructure.	**Overhead:** negligible to medium **Underground:** negligible to medium			

Notes:

[a] Appendix 3.1-1 provides a detailed listing of each Mitigation Strategy. This appendix serves as a reference section that can be consulted independently of the main text. This is particularly useful for detailed guidance and technical specifications that may be referred to multiple times. Additionally, including this information in an appendix allows for easier updates and revisions. If Mitigation Strategies or guidance changes, the appendix can be updated without altering the main content.

BMP = best management practice; **OSHA** = Occupational Safety and Health Administration; **ROW** = right-of-way; **WISAARD** = Washington Information System for Architectural and Archaeological Records Data

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3.13.6 Environmental Sensitivity Map

Project-specific applications require a comprehensive analysis to identify the site-specific adverse environmental impacts on resources and determine the suitability of this Programmatic EIS. Environmental reviews may be phased by incorporating relevant information from this Programmatic EIS by reference while evaluating site-specific adverse environmental impacts of individual project applications. For more information on phased reviews, please refer to Chapter 1, Introduction.

Each project-specific application would include details about the proposal's location and site-specific conditions. This Programmatic EIS provides environmental sensitivity maps that, when used alongside project-specific data, could support more informative and efficient environmental planning. An online mapping tool has been developed to provide public access to the most current data used in creating these environmental sensitivity maps.

Figure 3.13-3 presents the environmental sensitivity map for noise and vibration, identifying areas of varying sensitivity based on siting criteria described in the following sections

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LEGEND

Sensitivity Score

Low Sensitivity

Very High Sensitivity

Nanaimo
Richmond
Surrey
White Rock
Abbotsford
SKAGIT RANGE
2582 m
Greenwood
Grand Forks
Trail
Cowichan Lake
Duncan
5020 ft
10762 ft
Bellingham
Victoria
Skagit River
Mount Vernon
Salish Sea
Oak Harbor
Sandpoint
OLYMPIC MOUNTAINS
6027 ft
7967 ft
Everett
Lake Chelan
Franklin D. Roosevelt Lake
Post Falls
Spokane
Seattle
CASCADE RANGE
Wenatchee
WENATCHEE MOUNTAINS
Kent
Tacoma
Hangman Creek
Moses Lake
Olympia
Aberdeen
14411 ft
Yakima River
Moscow
Yakima
Lewiston
Astoria
COASTAL RANGES
8336 ft
Longview
Kennewick
Walla Walla
4680 ft
Columbia River
The Dalles
Hillsboro
Portland
11215 ft
Newberg

Washington State Energy Facility Site Evaluation Council

PROJECT

PROGRAMMATIC EIS
HIGH-VOLTAGE TRANSMISSION

TITLE

SENSITIVITY MAP
NOISE AND VIBRATION

YYYY-MM-DD 2025-09-02

CONSULTANT wsp

FIGURE 3.13-3

N

0 30 60

1:1,700,000 MILES

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

DESIGNED MK PREPARED MK REVIEWED SHUP APPROVED AHSGIZA

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3.13.6.1 Environmental Sensitivity Map Criteria Cards

The environmental sensitivity map evaluates various siting criteria and assigns sensitivity levels to geographic areas based on their potential for adverse environmental impacts, as analyzed in this Programmatic EIS. Each criterion was assigned a sensitivity level (1, 2, or 3), with Level 3 representing the highest sensitivity. Criteria cards illustrate the spatial extent of the siting criteria chosen. A summary of the criteria cards is provided below. Appendix 3.1-2 details the data preparation process for the criteria cards.

Highly Sensitive Noise Environments – Sensitivity Level 3

Figure 3.13-4 illustrates the spatial extent of sensitive receptors, including National Parks, State Parks, schools, hospitals, long-term-care nursing homes, and land use zones classified as residential, parks, hospitals, hotel, recreation, and education (DOR 2018; WSDOSH 2020; DOH 2024; NPS Land Resources Division 2025; OSPI 2025; WaTech 2025; WSPRC 2025). Areas within 800 feet of US highways, interstates, and state routes were excluded from this criterion as these areas are already subject to elevated noise levels (WSDOT 2025).

The areas in this criterion are more susceptible to noise impacts when new sources of noise are introduced. Construction and operational noise impacts in these areas are more likely to create nuisance complaints to local authorities or exceed noise limits. The analysis assumes daytime construction only.

Moderately Sensitive Noise Environments – Sensitivity Level 2

Figure 3.13-5 illustrates areas 0 to 500 feet from a sensitive noise receptor. These sensitive receptors are defined in the "Highly Sensitive Noise Environments – Sensitivity Level 3" criterion and include National Parks, State Parks, schools, hospitals, long-term-care nursing homes and land use zones classified as residential, parks, hospitals, hotel, recreation, and education (DOR 2018; WSDOSH 2020; DOH 2024; NPS Land Resources Division 2025; OSPI 2025; WaTech 2025; WSPRC 2025). The footprints of the sensitive receptors themselves were excluded from this Level 2 criterion. Areas within 800 feet of US highways, interstates, and state routes were also excluded as these areas are already subject to elevated noise levels (WSDOT 2025).

The areas in this criterion are considered moderately susceptible to noise impacts. Construction, operation and maintenance, upgrade, and modification of transmission

facilities in these areas could generate nuisance complaints or exceed noise limits. The analysis assumes daytime construction only.

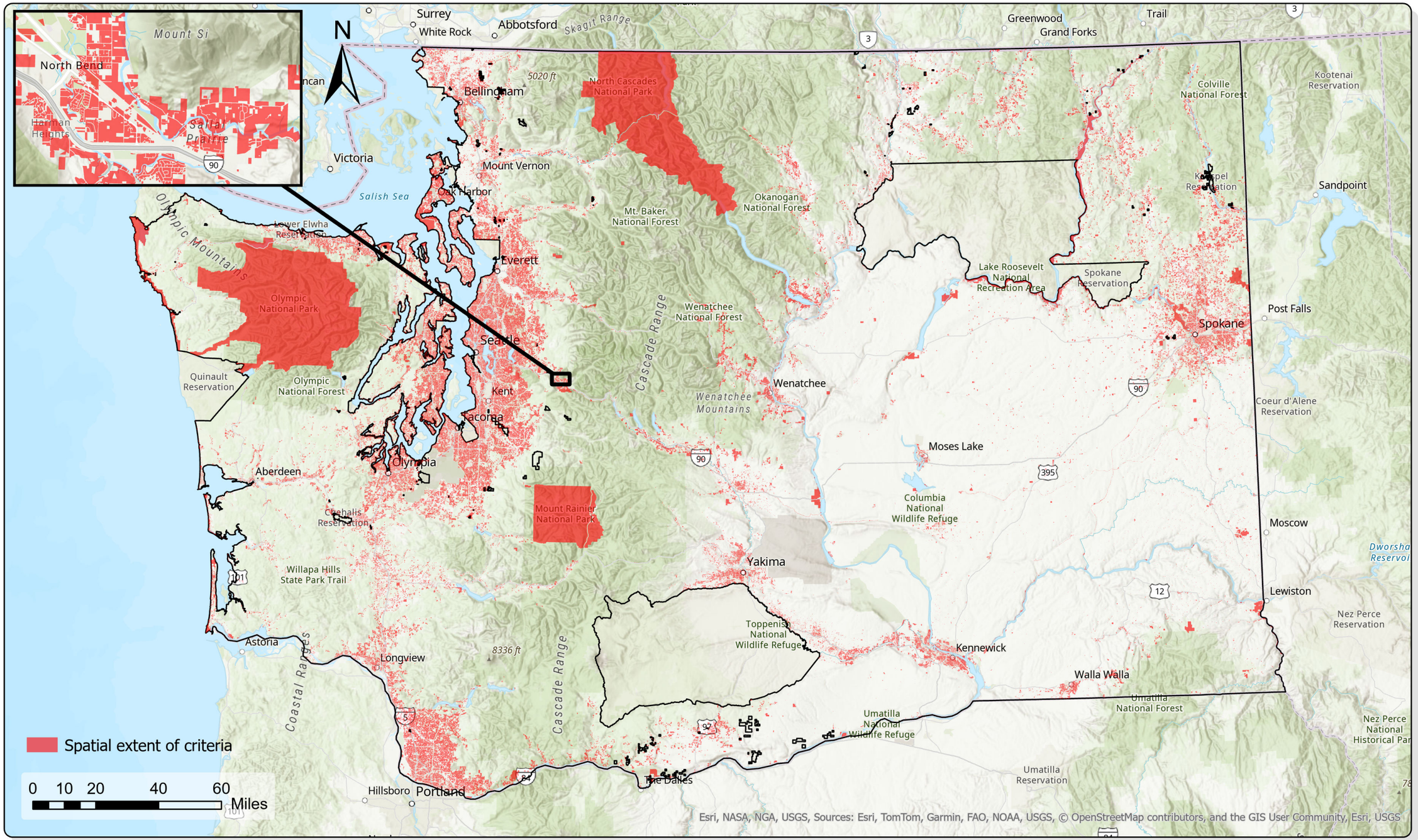
Less Sensitive Noise Environments – Sensitivity Level 1

Figure 3.13-6 illustrates areas 0 to 500 feet from a sensitive noise receptor. These sensitive receptors are defined in the "Highly Sensitive Noise Environments – Sensitivity Level 3" criterion and include National Parks, State Parks, schools, hospitals, long-term-care nursing homes, and land use zones classified as residential, parks, hospitals, hotel, recreation, and education (DOR 2018; WSDOSH 2020; DOH 2024; NPS Land Resources Division 2025; OSPI 2025; WaTech 2025; WSPRC 2025). The sensitive receptor footprints and the 500-foot buffer around them were excluded from this Level 1 criterion. Areas within 800 feet of US highways, interstates, and state routes were also excluded, as these areas are already subject to elevated noise levels (WSDOT 2025).

Due to the increased distance from sensitive receptors, these areas are likely to be less susceptible to noise impacts from new or increased noise sources. Construction, operation and maintenance, upgrade, and modification of transmission facilities in these areas are less likely to generate nuisance complaints to local authorities or exceed noise limits. The analysis assumes daytime construction only.

Highly Sensitive Noise Environments – Sensitivity Level 3

Washington State Energy Facility Site Evaluation Council



NOISE AND VIBRATION

Figure 3.13-4

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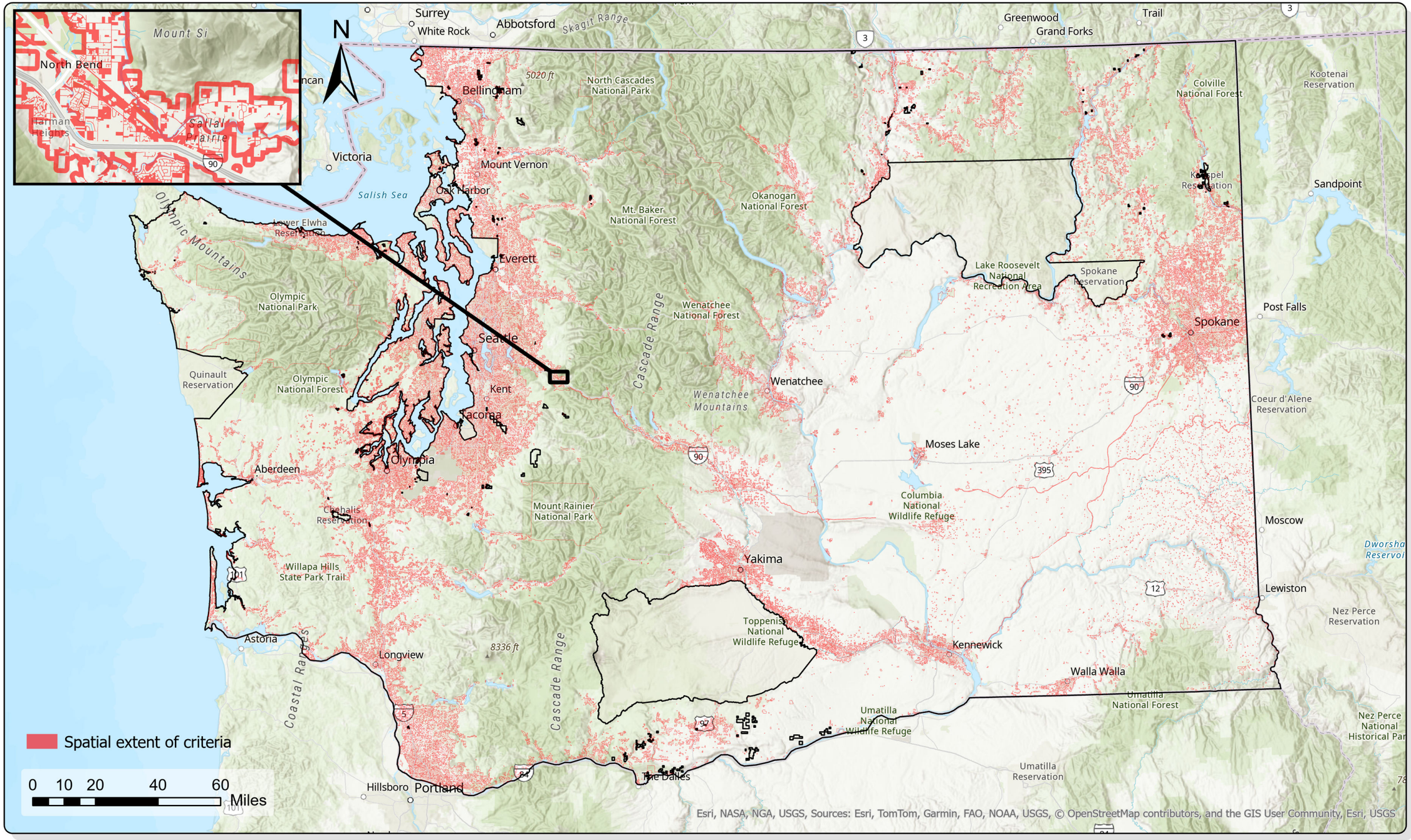
Moderately Sensitive Noise Environments – Sensitivity Level 2

Washington State Energy Facility Site Evaluation Council



NOISE AND VIBRATION

wsp

Figure 3.13-5

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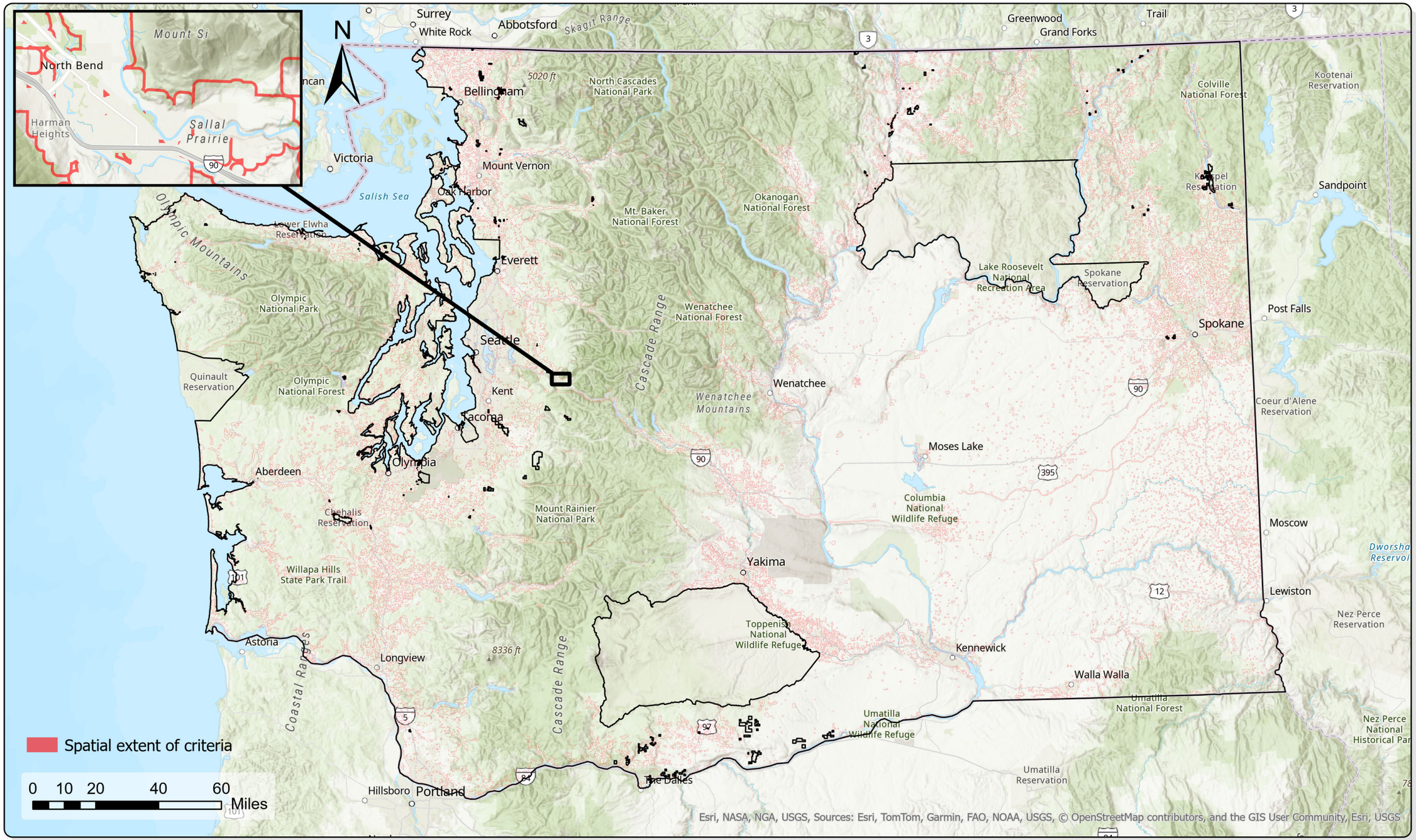
Less Sensitive Noise Environments – Sensitivity Level 1

Washington State Energy Facility Site Evaluation Council



NOISE AND VIBRATION

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Figure 3.13-6

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