

Exhibit Y

Noise

**Carty Generating Station
October 2026**

Prepared for



Portland General Electric Company

Prepared by



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Acronyms and Abbreviations

AC	alternating current
BESS	battery energy storage system
Certificate Holder / PGE	Portland General Electric Company
CGS/ Facility	Carty Generating Station
Council	Oregon Energy Facility Siting Council
dB	decibel
dBA	A-weighted decibel
FHWA	Federal Highway Administration
Hz	hertz
ISO	International Organization for Standardization
kV	kilovolt
L ₁₀	intrusive noise level
L ₅₀	median sound level
L ₉₀	residual sound level
L _{eq}	equivalent sound level
L _{max}	maximum sound level
L _n	statistical sound level
L _w	sound power level
MVA	megavolt ampere
MW	megawatt
NSR	noise sensitive receptor
O&M	operations and maintenance
OAR	Oregon Administrative Rules
ODEQ	Oregon Department of Environmental Quality
RFA	Request for Amendment
UTM	Universal Transverse Mercator

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1.0 Introduction

The Portland General Electric Company (PGE or Certificate Holder) is submitting a Request for Amendment (RFA) 4 to the Site Certificate for the Carty Generating Station (CGS or Facility). The Facility is located approximately 13 miles southwest of Boardman, in Morrow County, Oregon. As currently approved, the Facility is capable of generating up to 450 megawatts (MW) from the natural gas-fueled combined-cycle unit (Unit 1).

In RFA 4, the Certificate Holder is proposing photovoltaic solar energy generation with approximately 200 MW alternating current (AC) of nominal and average generating capacity and BESS with the capability of storing up to 200 MW AC. The overall CGS additions proposed with RFA 4 (including the BESS) are referred to throughout this request as the Carty Solar Farm with proposed RFA 4 changes. The solar generation is proposed in two separate solar areas referred to as the Northern Solar Area, located north of the Carty Reservoir, and the Southern Solar Area, located south of the reservoir [see Figure 2 in RFA 4's Division 27 document (Request for Amendment 4 for the Carty Generating Station)].

This Exhibit Y was prepared to meet the submittal requirements in Oregon Administrative Rules (OAR) 345-021-0010(1)(y). Analysis in this exhibit incorporates and/or relies on reference information, analysis, and findings found in the Application for Site Certificate, previous RFAs, and Oregon Department of Energy Final Orders to demonstrate that the Facility, as modified by RFA 4, continues to comply with applicable Site Certificate Conditions and the Noise Control Regulations in OAR 340-035-0035.

The Carty Solar Farm with proposed RFA 4 changes will comply with the existing Site Certificate Conditions 13.1-13.3 related to prevention and mitigation of noise in the Third Amended Site Certificate (Council 2022). No new noise sensitive receptors (NSRs) are located closer than those previously analyzed for the Facility as described in greater detail below (see Section 1.2).

This exhibit does not address noise analysis previously provided for the natural gas-fueled combined-cycle unit (Unit 1), which is already operating at the Facility and has been addressed previously by the Oregon Energy Facility Siting Council (Council).¹ In addition, the exhibit does not address noise analysis for of CGS infrastructure and facilities previously approved by the Council² with the Second Amended Site Certificate.

1.1 Acoustic Terminology

Airborne sound is described as the rapid fluctuation or oscillation of air pressure above and below atmospheric pressure, creating a sound wave. Sound is characterized by properties of the sound waves, which are frequency, wavelength, period, amplitude, and velocity. Noise is defined as unwanted sound. A sound source is defined by a sound power level (L_w), which is independent of

¹ Final Order on Application for Site Certificate for the Carty Generating Station, p. 173-179 (June 2012).

² Final Order on Request for Amendment 2, p. 73-75 (November 2020).

any external factors. The acoustic sound power is the rate at which acoustical energy is radiated outward and is expressed in units of watts. Sound energy travels in the form of a wave, a rapid fluctuation or oscillation of air pressure above and below atmospheric pressure. A sound pressure level is a measure of this fluctuation and can be directly determined with a microphone or calculated from information about the source sound power level and the surrounding environment through predictive acoustic modeling. While the sound power of a source is strictly a function of the total amount of acoustic energy being radiated by the source, the sound pressure levels produced by a source are a function of the distance from the source and the effective radiating area or physical size of the source. In general, the magnitude of a source's sound power level is always considerably higher than the observed sound pressure level near a source since the acoustic energy is being radiated in various directions.

Sound levels are presented on a logarithmic scale to account for the large pressure response range of the human ear and are expressed in units of decibels (dB). A dB is defined as the ratio between a measured value and a reference value usually corresponding to the lower threshold of human hearing defined as 20 micropascals. Conversely, sound power is commonly referenced to 1 picowatt, which is one trillionth of a watt. Broadband sound includes sound energy summed across the frequency spectrum. In addition to broadband sound pressure levels, analysis of the various frequency components of the sound spectrum is often completed to determine tonal characteristics. The unit of frequency is hertz (Hz), which corresponds to the rate in cycles per second that sound pressure waves are generated. Typically, a sound frequency analysis examines 11 octave bands (or 33 1/3 octave) ranging from 20 Hz (low) to 20,000 Hz (high). This range encompasses the entire human audible frequency range. Since the human ear does not perceive every frequency with equal loudness, spectrally varying sounds are often adjusted with a weighting filter. The A-weighted filter is applied to represent the frequency response of the human auditory system. Sound exposure in acoustic assessments is commonly measured and calculated as A-weighted dB (dBA). Unweighted sound levels are referred to as linear. Linear dB are used to determine a sound's tonality and to engineer solutions to reduce or control noise as techniques are different for low and high frequency noise.

Sound levels can be measured, modeled and presented in various formats. The sound metrics that were employed in the following noise assessment have the following definitions:

- L_{eq} : Conventionally expressed in dBA, the L_{eq} is the energy-averaged, A-weighted sound level for the complete time period. It is defined as the steady, continuous sound level over a specified time, which has the same total sound energy as the actual varying sound levels over the specified period.
- L_n : This descriptor identifies the sound level that is exceeded "n" percent of the time over a measurement period (e.g., L_{90} = sound level exceeded 90 percent of the time). The sound level exceeded for a small percent of the time, L_{10} , closely corresponds to short-term, higher-level, intrusive noises (such as vehicle pass-by noise near a roadway). The sound level exceeded for a large percent of the time, L_{90} , closely corresponds to continuous, lower-level background noise (such as continuous noise from a distant industrial facility). L_{50} is

the level exceeded 50 percent of the time and is typically referred to the median sound level over a given period.

- L_{max} : The maximum sound level (L_{max}) can be used to quantify the maximum instantaneous sound pressure level over a given measurement period or maximum sound generated by a source.

1.2 Analysis Area

The analysis area for noise impacts is defined in OAR 345-021-0010 as including those NSRs within 1 mile of the site boundary. Section 2.2 below includes the definition of a NSR. The Carty Solar Farm with proposed RFA 4 changes including the entire analysis area and beyond is surrounded by land either owned by PGE or Threemile Canyon Farms, LLC. NSRs were identified in RFA 1. PGE confirms there are no new NSRs located on land owned by PGE and email correspondence between Threemile Canyon Farms and PGE (Greg Harris, Threemile Canyon Farms, LLC, pers. comm., e-mail message to PGE, August 17, 2023) confirmed no new NSRs on land owned by Threemile Canyon Farms up to 2023. Review of aerial imagery comparing 2023 to August 2026 confirms no new NSRs within the one-mile analysis area. Additionally, the land surrounding the Carty Solar Farm with proposed RFA 4 changes to the east and south, owned by Threemile Canyon Farms, is under a conservation easement managed by The Nature Conservancy which prevents any development on the land. Figure Y-1 shows current site conditions and confirms no NSRs occur within 1 mile from the Amended Site Boundary.

2.0 Regulatory Environment

This section describes the applicable noise-related requirements at the federal, state, county, and local levels. The acoustic assessment described in this exhibit is limited to that of off-site receptors and not potential on-site noise exposure as regulated by the U. S. Occupational Health and Safety Administration.

2.1 Federal Noise Regulations

There are no federal environmental noise requirements specific to the Carty Solar Farm with proposed RFA 4 changes.

2.2 State Noise Regulations

OAR Chapter 340, Division 35 prescribes noise regulations applicable throughout the State of Oregon, with specific requirements in OAR 340-035-0035, "Noise Control Regulations for Industry and Commerce." This standard provides guidance for new noise sources on a previously used site:

OAR 340-035-0035(1)(b)(A) New Sources Located on Previously Used Sites. No person owning or controlling a new industrial or commercial noise source located on a previously used industrial or commercial site shall cause or permit the operation of that noise source if the statistical noise

levels generated by that new source and measured at an appropriate measurement point, specified in subsection (3)(b) of this rule, exceed the levels specified in Table 8, except as otherwise provided in these rules. For noise levels generated by a wind energy facility including wind turbines of any size and any associated equipment or machinery, subparagraph (1)(b)(B)(iii) applies.

Table Y-1 gives statistical noise limits as summarized below. All limits are presented in terms of dBA. The L_{50} is the median sound level (50 percent of the measurement interval is above this level, 50 percent is below). The noise limits apply at “appropriate measurement points” on “noise sensitive property.”³ The appropriate measurement point is defined as whichever of the following is farther from the noise source:

- 25 feet toward the noise source from that point on the noise sensitive building nearest the noise source; or
- The point on the noise sensitive property line nearest the noise source.

“Noise sensitive property” is defined by OAR 340-035-0015(38) as “real property normally used for sleeping, or normally used as schools, churches, hospitals, or public libraries. Property used in industrial or agricultural activities is not Noise Sensitive Property unless it meets the above criteria in more than an incidental manner.”

Table Y-1. New Industrial and Commercial Noise Standards

Statistical Descriptor	Maximum Permissible Statistical Noise Levels (dBA)	
	Daytime (7:00 a.m. – 10 p.m.)	Nighttime (10 p.m. – 7 a.m.)
L_{50}	55	50
L_{10}	60	55
L_1	75	60
Source: OAR 340-035-0035, Table 8		

The standard also provides guidance for new noise sources on a previously unused site, which is defined in OAR 340-035-0015(47) as property which has not been used by any industrial or commercial noise source during the 20 years immediately preceding commencement of construction of a new industrial or commercial source on that property. The standard reads as follows:

OAR 340-035-0035(1)(b)(B)(i) No person owning or controlling a new industrial or commercial noise source located on a previously unused industrial or commercial site shall cause or permit the operation of that noise source if the noise levels generated or indirectly caused by that noise source increase the ambient statistical noise levels, L_{10} or L_{50} , by more than 10 dBA in any one hour, or exceed the levels specified in Table 8, as measured at an appropriate measurement point, as specified in subsection (3)(b) of this rule, except as specified in subparagraph (1)(b)(B)(iii).

³ OAR 340-035-0035(3)(b)

OAR 340-035-0035(1)(b)(B)(ii) The ambient statistical noise level of a new industrial or commercial noise source on a previously unused industrial or commercial site shall include all noises generated or indirectly caused by or attributable to that source including all of its related activities. Sources exempted from the requirements of section (1) of this rule, which are identified in subsections (5)(b)–(f), (j), and (k) of this rule, shall not be excluded from this ambient measurement.

In accordance with the regulatory definitions in OAR Chapter 340 Division 35, the analysis presented in this assessment assumes that the Carty Solar Farm with proposed RFA 4 changes will constitute an industrial or commercial use located on both previously used and unused sites. Although there are no NSRs present within 1 mile, compliance will be evaluated at the closest residence (approximately 2.5 miles away) relative to the most stringent 50 dBA L₅₀ nighttime limit described in Table Y-1. Since the closest residence is over 2 miles from any proposed noise source, a baseline sound survey was not conducted for evaluation of compliance with the 10 dBA ambient degradation standard.

2.2.1 Exemptions to State Noise Regulations

OAR 340-035-0035(5) specifically exempts construction activity from the state noise standards and regulations, as indicated below. This section also provides an exemption for maintenance of capital equipment, the operation of aircraft (such as helicopters used in project construction), and sounds created by activities related to timber harvest.

OAR 340-035-0035(5) Exemptions:

Except as otherwise provided in subparagraph (1)(b)(B)(ii) of this rule, the rules in section (1) of this rule shall not apply to:

[section abridged for brevity]

(b) Warning devices not operating continuously for more than 5 minutes;

(g) Sounds that originate on construction sites.

(h) Sounds created in construction or maintenance of capital equipment;

(j) Sounds generated by the operation of aircraft and subject to pre-emptive federal regulation. This exception does not apply to aircraft engine testing, activity conducted at the airport that is not directly related to flight operations, and any other activity not pre-emptively regulated by the federal government or controlled under OAR 340-035-0045;

(k) Sounds created by the operation of road vehicle auxiliary equipment complying with the noise rules for such equipment as specified in OAR 340-035-0030(1)(e);

(m) Sounds created by activities related to the growing or harvesting of forest tree species on forest land as defined in subsection (1) of ORS 526.324.

OAR 340-035-0035(6) allows for some exceptions to the state noise regulations:

OAR 340-035-0035 (6) Exceptions:

Upon written request from the owner or controller of an industrial or commercial noise source, the Department may authorize exceptions to section (1) of this rule, pursuant to rule 340-035-0010, for:

- (a) Unusual and/or infrequent events;*
- (b) Industrial or commercial facilities previously established in areas of new development of noise sensitive property;*
- (c) Those industrial or commercial noise sources whose statistical noise levels at the appropriate measurement point are exceeded by any noise source external to the industrial or commercial noise source in question;*
- (d) Noise sensitive property owned or controlled by the person who controls or owns the noise source;*
- (e) Noise sensitive property located on land zoned exclusively for industrial or commercial use.*

2.3 County and Municipal Noise Regulations

There are no quantitative noise limits in Morrow County. Morrow County stipulates that noise shall not be “plainly audible within a dwelling unit one hundred feet (100') or more away from the source of the noise,” between 11:00 PM and 7:00 AM, and allows an exception for construction between 6:00 AM and 10:00 PM.

3.0 Existing Conditions

A wide range of noise settings occur within the acoustic analysis area. The background sound level will vary spatially and is related to various physical characteristics such as topography, land use, proximity to transportation corridors and terrain coverage including extent and height of exposed vegetation. The acoustic environment will also vary due in part to surrounding land use and population density. Areas in proximity to major transportation corridors such as interstate highways and areas with higher population densities and are expected to generally have higher existing ambient sound levels as compared to open and rural lands. Table Y-2 shows the relative A-weighted noise levels of common sounds measured in the environment and industry.

Typically, ambient sound measurements would be collected to characterize the pre-construction ambient acoustic environment for a proposed solar energy facility in Oregon; however, considering there are no NSRs within 1 mile of the Facility, it was determined that measurements were not necessary. Due to the separation distance potential noise impacts associated with operation of the Carty Solar Farm with proposed RFA 4 changes are expected to be very low level.

Table Y-2. Sound Pressure Levels (L_p) and Relative Loudness

Noise Source or Activity	Sound Level (dBA)	Subjective Impression	Relative Loudness (Perception of Different Sound Levels)
Jet aircraft takeoff from carrier (50 ft.)	140	Threshold of pain	64 times as loud
50-hp siren (100 ft.)	130		32 times as loud
Loud rock concert near stage Jet takeoff (200 ft.)	120	Uncomfortably loud	16 times as loud
Float plane takeoff (100 ft.)	110		8 times as loud
Jet takeoff (2,000 ft.)	100	Very loud	4 times as loud
Heavy truck or motorcycle (25 ft.)	90		2 times as loud
Garbage disposal Food blender (2 ft.) Pneumatic drill (50 ft.)	80	Loud	Reference loudness
Vacuum cleaner (10 ft.)	70	Moderate	1/2 as loud
Passenger car at 65 mph (25 ft.)	65		
Large store air-conditioning unit (20 ft.)	60		1/4 as loud
Light auto traffic (100 ft.)	50	Quiet	1/8 as loud
Quiet rural residential area with no activity	45		
Bedroom or quiet living room Bird calls	40	Faint	1/16 as loud
Typical wilderness area	35		
Quiet library, soft whisper (15 ft.)	30	Very quiet	1/32 as loud
Wilderness with no wind or animal activity	25	Extremely quiet	
High-quality recording studio	20		1/64 as loud
Acoustic test chamber	10	Just audible	
	0	Threshold of hearing	

Adapted from: Beranek 1988 and EPA 1971a.

4.0 Predicted Noise Levels – OAR 345-021-0010(1)(y)(A)

OAR 345-021-0010(1)(y) Information about noise generated by construction and operation of the proposed facility, providing evidence to support a finding by the Council that the proposed facility complies with the Oregon Department of Environmental Quality's noise control standards in OAR 340-035-0035. The applicant must include:

OAR 345-021-0010(1)(y)(A) Predicted noise levels resulting from construction and operation of the proposed facility.

4.1 Construction Noise Assessment

Potential noise impacts associated with construction of the Carty Solar Farm with proposed RFA 4 changes were reviewed; however, according to OAR 340-035-0035(5)(g), sound originating from construction sites is exempt from state noise regulations.

Construction of the Carty Solar Farm with proposed RFA 4 changes will require the use of construction equipment that may have the potential for localized sound on a temporary basis, as construction activities progress. The list of construction equipment that may be used for the Carty Solar Farm with proposed RFA 4 changes and estimates of construction sound levels are presented in Table Y-4 using a semi-qualitative approach based on equipment sound levels provided in the *Federal Highway Administration Roadway Construction Noise Model* (FHWA 2006). This equipment is also used for solar projects, so the Federal Highway Administration's sound levels are applicable to incorporate into the Carty Solar Farm with proposed RFA 4 changes. Construction activities at the Carty Solar Farm with proposed RFA 4 changes can be generally divided into five phases:

- Preparation of the site and staging areas, including grading and on-site access roads;
- Installation of array foundations, conductors, the operations and maintenance (O&M) building, and the control enclosure;
- Assembly of solar panels and electrical connection components;
- Construction of the inverter pad and battery pads, substation, cabling, terminations, and transmission lines; and
- Commissioning of the array and interconnection, revegetation, and waste removal and recycling facilities.

These activities will occur sequentially for discrete groupings of solar arrays, with the potential for overlap. In addition to the solar panels, construction activities will also occur for supporting infrastructure. The inverters and distribution transformers are likely to be completed while respective solar arrays are being constructed; completion of other components, such as the O&M building, will occur independently.

Overhead transmission and collector line construction is typically completed in the following stages, but various construction activities may overlap, with multiple construction crews operating simultaneously:

- Preparing the site and site access;
- Installing structure foundations, if required;
- Erecting of support structures and poles; and
- Stringing of conductors, shield wire and fiber optic ground wire.

The sound levels resulting from construction activities vary significantly depending on several factors such as the type and age of equipment, the specific equipment manufacturer and model, the operations being performed, and the overall condition of the equipment and exhaust system mufflers. Table Y-3 lists the typical sound levels associated with common construction equipment at various distances. Periodically, sound levels may be higher or lower; however, the overall sound levels should generally be lower due to excess attenuation.

Table Y-3. Estimated L_{max} Sound Pressure Levels from Construction Equipment

Construction Equipment	Expected Sound Level by Distance (dBA)			
	50 feet	1,000 feet	2,500 feet	5,000 feet
Bulldozer (250 to 700 horsepower [hp])	88	62	54	43
Front-end loader (6 to 15 cubic yards)	88	62	54	43
Truck (200 to 400 hp)	86	60	52	41
Grader (13- to 16-foot blade)	85	59	51	40
Shovel (2 to 5 cubic yards)	84	58	50	39
Portable generators (50 to 200 kilowatts)	84	58	50	39
Mobile crane (11 to 20 tons)	83	57	49	38
Concrete pumps (30 to 150 cubic yards)	81	55	47	36
Tractor (0.75 to 2 cubic yards)	80	54	46	35
Source: Beranek 1988, FHWA 2006. dBA = A-weighted decibel				

All reasonable efforts will be made to minimize the impact of noise resulting from construction activities. Candidate construction noise mitigation measures include scheduling louder construction activities during daytime hours and equipping internal combustion engines with appropriately sized muffler systems to minimize noise excessive emissions.

4.2 Operational Noise Assessment

The Certificate Holder modeled noise sources from the Carty Solar Farm with proposed RFA 4 changes to demonstrate that operations will not exceed the noise levels outlined in the Oregon Department of Environmental Quality (ODEQ) Noise Rules.

4.2.1 Acoustic Modeling Software and Calculation Methods

DataKustik GmbH's computer-aided noise abatement program (CadnaA; DataKustik 2023) was used for the Carty Solar Farm with proposed RFA 4 changes acoustic analysis. Further details pertaining to this program are given in the following subsection.

4.2.1.1 CadnaA

The acoustic modeling analysis was conducted using the most recent version of CadnaA, a comprehensive three-dimensional acoustic software model that conforms to the International Organization for Standardization (ISO) standard ISO 9613-2 "Attenuation of Sound during Propagation Outdoors" (ISO 1996). The engineering methods specified in this standard consist of full (1/1) octave band algorithms that incorporate geometric spreading due to wave divergence, reflection from surfaces, atmospheric absorption, screening by topography and obstacles, ground effects, source directivity, heights of both sources and receptors, seasonal foliage effects, and meteorological conditions.

Topographical information was imported into the acoustic model using the official U.S. Geological Survey digital elevation dataset to accurately represent terrain in three dimensions (USGS 2023). Terrain conditions, vegetation type, ground cover, and the density and height of foliage can also influence the absorption that takes place when sound waves travel over land. The ISO 9613-2 standard accounts for ground absorption rates by assigning a numerical coefficient of $G=0$ for acoustically hard, reflective surfaces and $G=1$ for absorptive surfaces and soft ground. If the ground is hard-packed dirt, typically found in industrial complexes, pavement, bare rock or for sound traveling over water, the absorption coefficient is defined as $G=0$ to account for reduced sound attenuation and higher reflectivity. In contrast, ground covered in vegetation, including suburban lawns, livestock and agricultural fields (both fallow with bare soil and planted with crops), will be acoustically absorptive and aid in sound attenuation (i.e., $G=1$). A mixed (semi-reflective) ground factor of $G=0.5$ was used in the Facility acoustic modeling analysis and is considered standard engineering practice. In addition to geometrical divergence, attenuation factors include topographical features, terrain coverage, and/or other natural or anthropogenic obstacles that can affect sound attenuation and result in acoustical screening. To be conservative, sound attenuation through foliage and diffraction around and over existing anthropogenic structures such as buildings was not included in this modeling analysis.

Sound attenuation by the atmosphere is not strongly dependent on temperature and humidity; however, the temperature of 10 degrees Celsius (50 degrees Fahrenheit) and 70 percent relative humidity parameters were selected for this analysis and is considered standard engineering practice. Over short distances, the effects of atmospheric absorption are minimal. The ISO 9613-2 standard calculates attenuation for meteorological conditions favorable to propagation, i.e., downwind sound propagation or what might occur typically during a moderate atmospheric ground level inversion. Though a physical impracticality, the ISO 9613-2 standard simulates omnidirectional downwind propagation. For receivers located between discrete Carty Solar Farm

with proposed RFA 4 changes sound sources, the acoustic model may result in over-prediction. In addition, the acoustic modeling algorithms essentially assume laminar atmospheric conditions, in which neighboring layers of air do not mix. This conservative assumption does not take into consideration turbulent eddies and micrometeorological inhomogeneities that may form when winds change speed or direction, which can interfere with the sound propagation path and increase effects of attenuation.

4.3 Input to the Noise Prediction Model

4.3.1 Solar and Battery Energy Storage Facilities

The principal sources of noise associated with the solar facilities are the BESS cooling units, the electrical components of the inverters, the step-up transformer associated with each inverter skid, and the main power transformer planned for installation as part of the Carty Solar Farm with proposed RFA 4 changes. The inverter skids and battery storage units are mounted on pads at grade level.

It is expected that all equipment will potentially operate consistently during both daytime and nighttime hours. The projected operational noise levels are based on Certificate Holder-supplied manufacturer sound power level data with representative octave band sound power level information. Table Y-4 summarizes the equipment sound power level data used as inputs to the initial modeling analysis. It is assumed that the Carty Solar Farm with proposed RFA 4 changes equipment will have similar sound power profiles as those used in the acoustic modeling analysis; however, it is possible that the final manufacturer warranty values may vary slightly.

Table Y-4. Modeled Octave Band Sound Power Level of Solar/BESS Equipment

Equipment	Octave Band Sound Power Level (dB) by Frequency (Hz)									Broadband (dBA)
	31.5	63	125	250	500	1000	2000	4000	8000	
PV Inverter	55	61	76	77	79	82	83	93	79	94
BESS Unit	113	99	107	101	93	85	80	73	67	96
BESS Inverter	94	87	92	86	82	82	82	92	80	94
BESS Transformer	93	101	100	96	95	91	87	82	75	97

4.3.2 Substation

The primary ongoing noise sources at substations are the transformers, which generate sound generally described as a low humming. There are three main sound sources associated with a transformer: core noise, load noise, and noise generated by the operation of the cooling equipment. The core vibrational noise is the principal noise source and does not vary significantly with electrical load.

Transformer noise varies with transformer dimensions, voltage rating, and design, and attenuates with distance. The noise produced by substation transformers is primarily caused by the load current in the transformer's conducting coils (or windings) and consequently the main frequency of this sound is twice the supply frequency (60 Hz). The characteristic humming sound consists of tonal components generated at harmonics of 120 Hz. Most of the acoustical energy resides in the fundamental tone (120 Hz) and the first three or four harmonics (240, 360, 480, and 600 Hz).

Circuit-breaker operations may also cause audible noise, particularly the operation of air-blast breakers, which is characterized as an impulsive sound event of very short duration and expected to occur no more than a few times throughout the year. Because of its short duration and infrequent occurrence, circuit breaker noise was not considered in this analysis. The Carty Solar Farm with proposed RFA 4 changes includes a collector substation located inside the solar array fence line. The substation will include one step-up transformer. The transformer rating of 230 megavolt amperes (MVA) corresponds to a National Electrical Manufacturers Association rating of 83 dBA. The L_W for the substation transformer was calculated using the methodology recommended by the Electric Power Plant Environmental Noise Guide (Volume 1, 2nd edition) (Edison Electric Institute 1983). Table Y-5 presents the transformer sound source data by octave band center frequency input to the acoustic modeling analysis. Table Y-5 presents the transformer sound source data by octave band center frequency input to the acoustic modeling analysis.

Table Y-5. Transformer Sound Power Level

Equipment	Octave Band Sound Power Level (dBA) by Frequency (Hz)									Broadband (dBA)
	31.5	63	125	250	500	1000	2000	4000	8000	
230 MVA Transformer	105	111	113	108	108	102	97	92	85	108

5.0 Assessment of Compliance with Applicable Noise Regulations – OAR 345-021-0010(1)(y)(B)

OAR 345-021-0010(1)(y)(B) An analysis of the proposed facility's compliance with the applicable noise regulations in OAR 340-035-0035, including a discussion and justification of the methods and assumptions used in the analysis;

Construction activities are categorically exempted under OAR 340-35-0035(5)(g). Construction noise is short term and not expected to result in any significant long-term impacts.

The acoustic modeling analysis evaluated simultaneous operation of all Carty Solar Farm with proposed RFA 4 changes components including the proposed solar facilities, BESS facilities, and substation. Resultant received sound levels were evaluated at the closest residence (approximately 2.5 miles away) relative to the applicable ODEQ noise regulations.

A sound contour plot displaying modeled operational sound levels in color-coded isopleths is provided in Figure Y-1. The resultant noise contour plots are independent of the existing acoustic environment (i.e., are project-generated sound levels only). Table Y-6 presents the results of the acoustic modeling analysis for the Carty Solar Farm with proposed RFA 4 changes and includes the feature ID, Universal Transverse Mercator (UTM) coordinates, and the received sound levels at each NSR resulting from operations. Received sound levels are rounded to the nearest whole decimal for consistency with the ODEQ noise regulations.

Modeling results indicate the Carty Solar Farm with proposed RFA 4 changes successfully demonstrates compliance with the applicable ODEQ statistical noise limits (50 dBA L_{50} , 55 dBA L_{10} , 60 dBA L_{10}) at the closest NSRs and all sound levels are well below those limits.

Table Y-6. Acoustic Modeling Results

NSR ID	UTM Coordinates (m)		Project Sound Level (dBA)	Compliance with OAR 340-035-0035
	Easting	Northing		
1	282860	5056927	22	Yes
2	281015	5056932	22	Yes
3	273004	5065969	23	Yes

6.0 Measures to Reduce Noise Levels or Impacts to Address Public Complaints – OAR 345-021-0010(1)(y)(C)

OAR 345-021-0010(1)(y)(C) Any measures the applicant proposes to reduce noise levels or noise impacts or to address public complaints about noise from the facility;

The Certificate Holder has successfully demonstrated compliance with the OAR 340-035-0035 noise regulations; therefore, it is not expected that any further noise mitigation measures will be required during operation of the Carty Solar Farm with proposed RFA 4 changes. During construction, the following mitigation measures will be considered and incorporated into the contract specifications, as necessary and appropriate, to minimize noise levels to the extent practicable:

- Confine the noisiest operation of heavy construction equipment to the daylight hours per Site Certificate Condition 13.1.
- Construction site and access road speed limits will be established and enforced during the construction period.
- Electrically powered equipment will be used instead of pneumatic or internal combustion powered equipment, where feasible.
- Material stockpiles and mobile equipment staging, parking, and maintenance areas will be located as far as practicable from NSRs.

- The use of noise-producing signals, including horns, whistles, alarms, and bells, will be for safety warning purposes only.
- All noise-producing construction equipment and vehicles using internal combustion engines will be equipped with mufflers, air-inlet silencers where appropriate, and any other shrouds, shields, or other noise-reducing features in good operating condition that meet or exceed original factory specification per Site Certificate Condition 13.1. Mobile or fixed “package” equipment (e.g., arc-welders, air compressors) will be equipped with shrouds and noise control features that are readily available for that type of equipment.
- Establish a complaint response system at the construction manager’s office to address noise complaints per Site Certificate Condition 13.1. Records of noise complaints during construction must be made available to authorized representatives of the Department of Energy upon request.
- All construction noise complaints will be logged within 48 hours of issuance. The construction supervisor will have the responsibility and authority to receive and resolve noise complaints. A clear appeal process to the Certificate Holder will be established prior to the start of construction that will allow for resolution of noise problems that cannot be resolved by the site supervisor in a reasonable period of time.
- During operation, the Certificate Holder will maintain a complaint response system to address noise complaints per Site Certificate Condition 13.2. The Certificate Holder will notify the Department within 15 days of receiving a complaint about noise from the facility. The notification should include the date the complaint was received, the nature of the complaint, the complainant’s contact information, the location of the affected property, and any actions taken, or planned to be taken, by the certificate holder to address the complaint.
- Final equipment specifications and noise warranty data will be reviewed by an acoustician to ensure compliance with OAR 340-035-0035.

7.0 Monitoring – OAR 345-021-0010(1)(y)(D)

OAR 345-021-0010(1)(y)(D) Any measures the applicant proposes to monitor noise generated by operation of the facility; and

Noise monitoring is not proposed for the Carty Solar Farm with proposed RFA 4 changes during operation. However, the legislative authority granted to the Council in OAR 345-026-0010(1) states that under Oregon Revised Statute 469.430, “the Council has continuing authority over the site for which a site certificate is issued and may inspect, direct the Department of Energy to inspect, or ask another state agency or local government to inspect, the site at any time to ensure that the certificate holder is operating the facility in compliance with the terms and conditions of the site certificate.”

In addition, Site Certificate Condition 13.3 states that upon written notification from the Department of Energy, the Certificate Holder will monitor and record the actual statistical noise levels during operations to verify that the Certificate Holder is operating the facility in compliance with the noise control regulations. The monitoring plan must be reviewed and approved by the Department of Energy prior to implementation. The cost of such monitoring, if required, will be borne by the Certificate Holder.

8.0 Owners of Noise Sensitive Property- OAR 345-021-0010(1)(y)(E)

OAR 345-021-0010(1)(y)(E) A list of the names and addresses of all owners of noise sensitive property, as defined in OAR 340-035-0015, within one mile of the proposed site boundary.

No noise sensitive properties were identified within 1 mile from the Amended Site Boundary.

9.0 References

- Beranek, L. 1988. Noise and Vibration Control, Chapter 7 - Sound Propagation Outdoors. Institute of Noise Control Engineering, Washington, DC.
- Council (Oregon Energy Facility Siting Council). 2022. Third Amended Site Certificate for the Carty Generating Station. Energy Facility Siting Council, Salem, Oregon. July 2022. Available at: <https://www.oregon.gov/energy/facilities-safety/facilities/Facilities%20library/2022-08-07-CGS-AMD3-Site-Certificate.pdf>
- DataKustik (DataKustik GmbH). 2023. Computer-Aided Noise Abatement Model CadnaA, Munich, Germany.
- Edison Electric Institute. 1983. Electric Power Plant Environmental Noise Guide (Volume 1, 2nd edition, Report 3637. 1983 Update). Prepared by Bolt Beranek and Newman Inc.
- EPA. 1971a. Community Noise. NTID300.3 (N-96-01 IIA-231). Prepared by Wylie Laboratories.
- FHWA. 2006. Federal Highway Administration Roadway Construction Noise Model User's Guide, FHWA-HEP-05-054, January 2006.
- ISO (International Organization for Standardization). 1996. Standard ISO 9613-2 Acoustics – Attenuation of Sound during Propagation Outdoors. Part 2 General Method of Calculation. Geneva, Switzerland.
- USGS (U.S. Geological Survey). 2023. National Geospatial Program, USGS National Elevation Dataset 1/3 arc-second. (Publish date unknown.)

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Figures

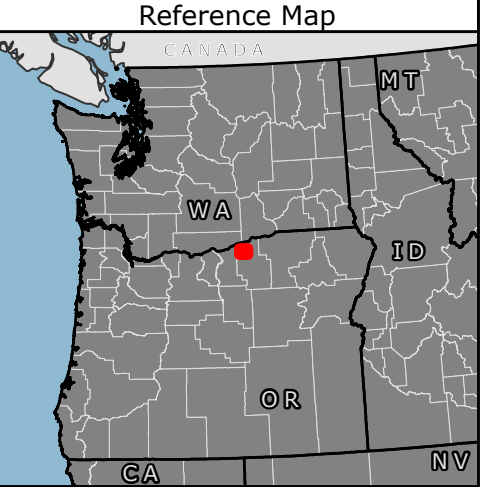
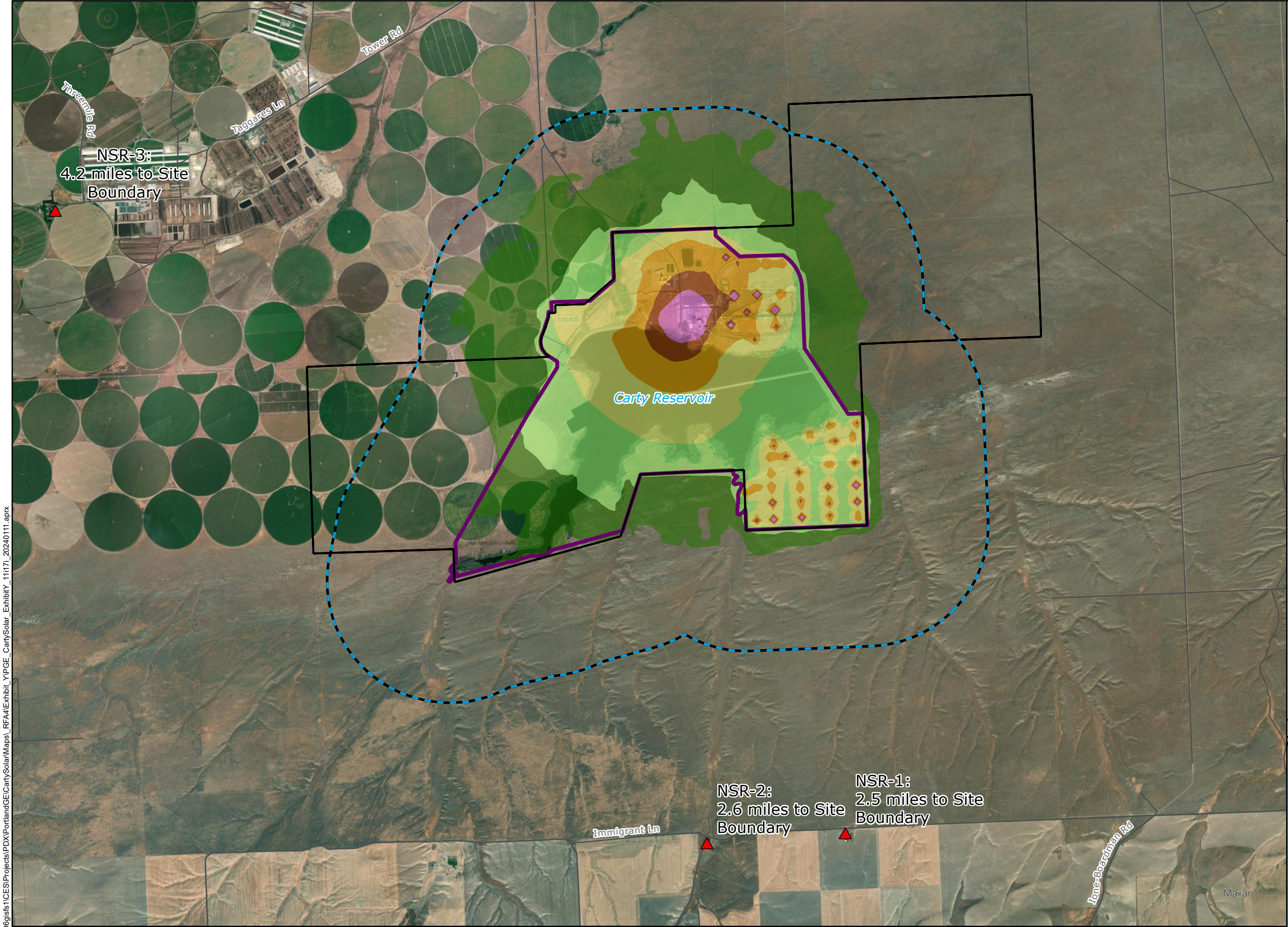
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**Carty
Generating Station
Request for
Amendment 4**

**Figure Y-1
Operational Received
Sound Levels**

MORROW COUNTY, OR

- Amended Site Boundary
- Analysis Area (1-mile Buffer)
- Property Line
- Local Roads
- Noise Sensitive Receptor
- Sound Contours (dBA)
 - 36-41
 - 41-46
 - 46-51
 - 51-56
 - 56-61
 - > 61

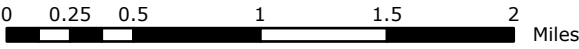


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1:48,000

WGS 1984 UTM Zone 10N



NOT FOR CONSTRUCTION