RIVERSIDE SOLAR, LLC

Matter No. 21-00752

900-2.8 Exhibit 7

Noise and Vibration

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Acronym List

AES	The AES Corporation, Inc.
BMP	best management practices
Cmet	meteorological correction
dBA	the broadband overall
Epsilon	Epsilon Associates, Inc.
HDD	Horizontal Directional Drilling
Hz	Hertz
INCE	Institute of Noise Control Engineering
NED	National Elevation Dataset
ORES	Office of Renewable Energy Siting
RCNM	Roadway Construction Noise Model
SAE	Standard Automotive Engineering
USCs	Uniform Standards and Conditions
WHO	World Health Organization

Glossary Terms

Applicant	Riverside Solar, LLC, a subsidiary of The AES Corporation, Inc. (AES), the entity seeking a siting permit for the Facility from the Office of Renewable Energy Siting (ORES) under Section 94-c of the New York State Executive Law.
Facility	The proposed components to be constructed for the collection and distribution of energy for the Riverside Solar Project, which includes solar arrays, inverters, electric collection lines, and the collection substation.
Facility Site	The parcels encompassing Facility components which totals 1,168 acres in the Towns of Lyme and Brownville, Jefferson County, New York (Figure 2-1).
Towns	The Towns of Lyme and Brownville, Jefferson County, New York.

Exhibit 7: Noise and Vibration

This Exhibit will track the requirements of the Noise and Vibration regulations from the Office of Renewable Energy Siting (ORES) §900-2.8 which were issued final March 3, 2021.

7(a) Name of Preparer

This Exhibit includes a detailed analysis of the potential sound impacts associated with the construction and operation of the Facility. Exhibit 7 was prepared by Mr. Ryan Callahan of Epsilon Associates, Inc. (Epsilon). Mr. Callahan has over fifteen years of experience in the areas of community noise impacts, sound level data collection, and analyses. He is a full member of the Institute of Noise Control Engineering (INCE). The modeling performed by Epsilon for the Facility is sufficiently conservative in predicting sound impacts, and includes all proposed inverters plus ancillary equipment, and the substation operating at their maximum capacities.

7(b) Noise Design Goals for the Facility

The design goals for this solar facility are described below.

i) A maximum noise limit of forty-five dBA L_{eq} (8-hour), at the outside of any existing non-participating residence, and fifty-five dBA L_{eq} (8-hour) at the outside of any existing participating residence. The Facility meets these limits as discussed in Section 7(l).

ii) A maximum noise limit of forty dBA L_{eq} (1-hour) at the outside of any existing non-participating residence from the collector substation equipment. The Facility meets these limits as discussed in Section 7(l).

iii) A prohibition on producing any audible prominent tones, as defined by using the constant level differences listed under ANSI S12.9-2005/Part 4 Annex C (sounds with tonal content), at the outside of any existing non-participating residence. Should a prominent tone occur, the broadband overall (dBA) noise level at the evaluated non-participating position shall be increased by 5 dBA for evaluation of compliance with subparagraph (i) and (ii) of this paragraph. The inverter currently under consideration for this Facility has a tone at 5000 Hz. Therefore, the effective limit for non-participating residents is 40 dBA L_{eq} (8-hour) for evaluation of compliance with subparagraph (i) of this paragraph. The Facility meets these limits as discussed in Section 7(e).

iv) A maximum noise limit of fifty-five dBA L_{eq} (8-hour), short-term equivalent continuous average sound level from the facility across any portion of a non-participating property except for portions delineated as NYS-regulated wetlands pursuant to section 900-1.3(e) of this Part and utility ROW to be demonstrated with modeled sound contours drawings and discrete sound levels at worst-case locations. No penalties for prominent tones will be added in this assessment. The Facility meets these limits as discussed in Sections 7(k) and 7(l).

There are no applicable sound level requirements in the Town of Brownville. The Town of Lyme has a law provision regarding noise, however there are no quantitative noise level limits. The Applicant is seeking a waiver of this local law. Refer to Exhibit 24 for more information regarding the Town's requirements and the Applicant's waiver request.

7(c) Radius of Evaluation

All sensitive receptors within at least a one thousand five hundred foot radius from any noise source (e.g., substation transformer(s), medium to low voltage transformers, inverters) proposed for the facility or within the thirty dBA noise contour, whichever is greater, were included in the analysis. Each of these sensitive receptors are visible in Figure 7-1.

A cumulative analysis requires noise modeling to include any solar facility and substation existing and proposed by the time of filing the application, and any existing sensitive receptors within a 3,000-foot radius from any noise source proposed for this facility, or within the 30 dBA noise contour, whichever is greater. The Convergent Energy + Power Project is within 3,000 feet of a Riverside Solar noise source; however, a significant cumulative impact is not anticipated. Details are found in Appendix 7-8.

7(d) Modeling Standards, Input Parameters, and Assumptions

An estimate of the noise level to be produced by the Facility was made using the following assumptions.

1. Future sound levels associated with the Facility were predicted using the Cadna/A noise calculation software developed by DataKustik GmbH. This software implements the ISO 9613-2 international standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation) for full octave

bands from 31.5 Hertz (Hz) to 8000 Hz. As per ISO 9613-2, all calculations assumed favorable conditions for sound propagation, corresponding to a moderate, well-developed ground-based temperature inversion, as might occur on a calm, clear night or equivalently downwind propagation. In addition, the ISO 9613-2 standard assumes all receptors are downwind of every sound source simultaneously. No meteorological correction (Cmet) was added to the results, pursuant to 19 NYCRR § 900-2.8(d).

Elevation contours for the modeling domain were directly imported into Cadna/A which allowed for consideration of terrain shielding where appropriate. The terrain height contour elevations for the modeling domain were generated from elevation information derived from the National Elevation Dataset (NED) developed by the U.S. Geological Survey.

In addition to modeling at discrete points, sound levels were also modeled throughout a large grid of receptor points, each spaced 10 meters apart to allow for the generation of sound level isolines. Tabular results and sound level isolines were calculated and generated for the entire sounds Study area (within 1,500 feet of the Facility).

i) All sound sources were assumed to be operating simultaneously at maximum sound power levels. The collector substation was also modeled by itself operating at maximum sound power level.

The sound power levels for each source used in the modeling are discussed below.

Inverters

The sound level analysis includes 30 inverters as provided to Epsilon by the Applicant. The source location coordinates, ground elevations, and heights above ground are summarized in Appendix 7-1. There is one inverter manufacturer (Sungrow) evaluated for this analysis. All 30 of the proposed inverters will be Sungrow inverters with identical specifications. The inverter manufacturer, power ratings, and dimensions examined for this assessment are presented below in Table 7-1. The low-voltage transformer associated with each inverter has a sound power level 26 dBA quieter than each inverter (92 dBA versus 66 dBA), so its contribution is negligible, and it was not included in the site-wide sound model.

Table 7-1 Power Inverter Analyzed for Sound Level Assessment

Manufacturer	Inverter Model	Maximum Electrical Output [kVA]	Dimensions [WxHxD] [m]
Sungro	SG3600U	3,60	6.

Broadband and one-third octave band sound power levels for the Sungrow inverter operating under typical (daylight) conditions were provided by the Applicant[1]. The octave band sound power levels are presented in Table 7-2.

Table 7-2 Inverter Octave Band Sound Power Levels

Inverter Type	Broadband Sound Power Level [dBA]	Sound Power Levels per Octave-Band Center Frequency [Hz]								
		31.5	63	125	250	500	1k	2k	4k	8k
		dB	dB	dB	dB	dB	dB	dB	dB	dB
SG3600 UD-MV	92	86	85	87	86	90	81	80	88	81

<u>Collector Substation</u>

In addition to the inverters, there will be a collector substation located within the Facility Site. The modeling inputs of the transformers -- coordinates, ground elevation, and height above ground -- are summarized in Appendix 7-1. A step-up transformer rated at up to 125 MVA is proposed for the collector substation. Epsilon estimated octave band sound level emissions using the techniques in the Electric Power Plant Environmental Noise Guide, Table 4.5 Sound Power Levels of Transformers. Table 7-3 summarizes the sound power level data used in the modeling.

Table 7-3 Collector Substation Transformer Sound Power Levels—per unit

1 ATC210014 Test report for SG3600UD-MV, provided April 3, 2021.

Maximum Rating [MVA]	Broadband Sound Power Level [dBA]	Sound Power Levels per Octave-Band Center Frequency [Hz]								
		31.5	63	125	250	500	1k	2k	4k	8k
		dB	dB	dB	dB	dB	dB	dB	dB	dB
125	100	96	102	104	99	99	93	88	83	76

ii) For all modeling scenarios, the ground absorption factor (G) was set to 0.5 for the ground and 0 for water bodies.

iii) A temperature of 10 degrees Celsius and 70% relative humidity was used to calculate atmospheric absorption for the ISO 9613-2 model. These parameters were selected to minimize atmospheric attenuation in the 500 Hz and 1000 Hz octave bands where the human ear is most sensitive, and thus provide conservative results.

iv) The maximum A-weighted dBA Leq (1-hour or 8-hour) sound pressure levels, and the maximum linear/unweighted/Z dB (Leq 1-hour) sound pressure levels from the thirty-one and a half (31.5) Hz up to the eight thousand (8,000) Hz full-octave band, at all sensitive sound receptors within the radius of evaluation are discussed and presented in Section 7(l).

v) The maximum A-weighted dBA Leq sound pressure levels (Leq (8-hour)) at the most critically impacted external property boundary lines of the facility site (e.g., non-participating boundary lines) are shown in Figure 7-4.1.

vi) A summary of the number of receptors exposed to sound levels greater than thirty-five dBA are shown in Table 7-4 grouped in one-dBA bins.

Table 7-4 Receptors Modeled at 35 dBA or Greater – Total Sound L_{eq} (8-hour)

Modeled Leq Sound Level [dBA]	# of Receptors			
	Residential		Public	
	Participating	Non-Participating	Participating	Non-Participating
38	1	0	0	0
37	1	0	1	0
36	0	1	0	0
35	1	1	0	0

vii) Sound level contours as specified in 19 NYCRR § 900-2.8(k) are shown in Figure 7-4.1.

2. This subsection is applicable to wind projects and the Facility is a solar facility.
3. The Cadna/A model used a one and a half meter assessment point above the ground. No uncertainty factor was added to the modeled results.

7(e) Prominent Tones

ANSI/ASA S12.9-2013 Part 3, Annex B, section B.1 (informative) presents a procedure for testing for the presence of a prominent discrete tone. According to the standard, a prominent discrete tone is identified as present if the time-average sound pressure level in the one-third octave band of interest exceed the arithmetic average of the time-average sound pressure level for the two adjacent one-third octave bands by any of the following constant level differences:

- 15 dB in low-frequency one-third-octave bands (from 25 up to 125 Hz);
- 8 dB in middle-frequency one-third-octave bands (from 160 up to 400 Hz); or,
- 5 dB in high-frequency one-third-octave bands (from 500 up to 10,000 Hz).

1. Sound pressure level calculations using the Cadna/A modeling software which incorporates the ISO 9613-2:1996 propagation standard is limited to octave band sound levels; therefore, a quantitative evaluation of one-third octave band sound levels using the modeling software was not possible. Instead, one-third octave band sound pressure levels due to the closest inverters were calculated at the nearest five potentially impacted and representative receptor locations (both non-

participants and participants) using equations accounting for hemispherical radiation and atmospheric absorption. The results presented in Table 7-5 shows that received sound pressure levels due to the closest inverters at each of these locations are predicted to result in a prominent discrete tone at the 5000 Hz one-third octave band. Due to this prominent tone, a 5 dBA penalty is being applied on a short term broadband basis to non-participating residential receptors (40 dBA). Despite the observed prominent tone and subsequent broadband penalty, short term broadband sound pressure levels do not exceed 40 dBA at any non-participating residences without any mitigation measures.

2. One-third octave band sound power levels for the collector substation transformer were not supplied by the vendor for the substation equipment; therefore, a quantitative evaluation of one-third octave band sound using the spreadsheet modeling approach was not possible. For this reason, the substation transformer was assumed to be tonal and prominent by default.

Table 7-5 Tonal Analysis & Compliance Evaluation: Modeled Sound Pressure Levels from Inverters

Rec. ID	One-Third Octave Band Center Frequency [Hz]	25	**31.5**	40	50	**63**	80	100	**125**	160	200	**250**	315	400	**500**	630	800	**1000**	1250	1600	**2000**	2500	3150	**4000**	5000	6300	**8000**	10000
	Tonal Limit	-	15	15	15	15	15	15	15	8	8	8	8	8	5	5	5	5	5	5	5	5	5	5	5	5	5	-
4	Received Sound Pressure Level (dB)	23	29	30	29	28	26	27	31	27	24	28	30	34	32	27	24	22	20	20	19	19	16	9	20	7	0	0
	Average Sound Pressure Level of Contiguous Bands	-	27	29	29	28	27	29	27	28	27	27	31	31	30	28	25	22	21	20	19	17	14	18	8	10	4	-
	Difference between Sound Pressure Level and Contiguous Average	-	2	1	0	0	-1	-1	4	-1	-3	0	0	3	2	-1	0	0	-1	0	0	2	2	-9	12	-3	-3	-
	Below Tonal Limit?	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	-
5	Received Sound Pressure Level (dB)	21	26	28	27	26	24	25	29	25	22	26	28	32	30	25	23	20	18	18	18	19	16	11	27	19	13	12
	Average Sound Pressure Level of Contiguous Bands	-	24	27	27	26	25	27	25	26	25	25	29	29	28	26	23	21	19	18	19	17	15	22	15	20	16	-
	Difference between Sound Pressure Level and Contiguous Average	-	2	1	0	0	-1	-1	4	-1	-3	0	0	3	2	-1	0	0	-1	0	0	2	1	-10	12	-1	-3	-
	Below Tonal Limit?	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	-
41	Received Sound Pressure Level (dB)	24	29	30	30	28	27	28	32	27	25	29	31	35	33	28	26	23	21	21	21	21	18	13	28	20	13	12
	Average Sound Pressure Level of Contiguous Bands	-	27	29	29	28	28	30	28	29	28	28	32	32	31	29	26	23	22	21	21	20	17	23	16	20	16	-
	Difference between Sound Pressure Level and Contiguous Average	-	2	1	0	0	-1	-1	4	-1	-3	0	0	3	2	-1	0	0	-1	0	0	2	2	-11	12	-1	-3	-
	Below Tonal Limit?	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	-
50	Received Sound Pressure Level (dB)	25	30	31	30	29	28	29	32	28	26	29	31	35	33	28	26	23	21	21	20	20	17	9	22	7	0	0
	Average Sound Pressure Level of Contiguous Bands	-	28	30	30	29	29	30	28	29	28	29	32	32	32	30	26	23	22	21	21	19	15	19	8	11	4	-

Table 7-5 Tonal Analysis & Compliance Evaluation: Modeled Sound Pressure Levels from Inverters

Rec. ID	One-Third Octave Band Center Frequency [Hz]	25	**31.5**	40	50	**63**	80	100	**125**	160	200	**250**	315	400	**500**	630	800	**1000**	1250	1600	**2000**	2500	3150	**4000**	5000	6300	**8000**	10000
	Tonal Limit	-	15	15	15	15	15	15	15	8	8	8	8	8	5	5	5	5	5	5	5	5	5	5	5	5	5	-
	Difference between Sound Pressure Level and Contiguous Average	-	2	1	0	0	-1	-1	4	-1	-3	0	0	3	2	-1	0	0	-1	0	0	2	2	-10	13	-3	-4	-
	Below Tonal Limit?	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	-
62	Received Sound Pressure Level (dB)	23	29	30	29	28	26	27	31	27	25	28	31	34	33	28	25	23	21	22	22	23	22	18	35	27	21	20
	Average Sound Pressure Level of Contiguous Bands	-	27	29	29	28	28	29	27	28	27	28	31	32	31	29	25	23	22	22	22	22	21	28	22	28	24	-
	Difference between Sound Pressure Level and Contiguous Average	-	2	1	0	0	-1	-1	4	-1	-3	0	0	3	2	-1	0	0	-1	0	0	1	1	-11	12	-1	-3	-
	Below Tonal Limit?	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	-

7(f) Low Frequency Noise for Wind Facilities

This subsection is not applicable to this Facility.

7(g) Infrasound for Wind Facilities

This subsection is not applicable to this Facility.

7(h) Sound Study Area

Figure 7-1 is a map of the sound Study Area showing the location of sensitive sound receptors in relation to the facility (including the collector substation and the point of interconnect).

1. In total, 122 discrete receptors were analyzed for the Facility. These include 116 residential receptors and six public receptors. Of the 122 receptors, seven were participating, and 115 were non-participating, as defined in Section 7(h)(3) below. Of the six public receptors, one was participating and five were non-participating. A detailed listing of all receptors including receptor ID, latitude/longitude, elevation, participation status, and receptor category is included as Appendix 7-2.
2. All residences were included as sensitive sound receptors regardless of participation in the facility (e.g., participating, potentially participating, and non-participating residences) or occupancy (e.g., year-round, seasonal use)
3. Only properties that have a signed contract with the applicant prior to the date of filing the application were identified as "participating." Other properties were designated as "non-participating."

7(i) Evaluation of Ambient Pre-Construction Baseline Noise Conditions

An evaluation of ambient pre-construction baseline noise conditions was conducted for eight days by using the L_{90} statistical and the L_{eq} energy based noise descriptors, and by following the recommendations included in ANSI/ASA S3/SC 1.100 -2014-ANSI/ASA S12.100-2014 American National Standard entitled Methods to Define and Measure the Residual Sound in Protected Natural and Quiet Residential Areas. The full details of the ambient pre-construction sound level measurement program are found in Appendix 7-3.

7(j) Evaluation of Future Noise Levels during Construction

1. Future construction noise modeling was performed for the main phases of construction and from activities at the proposed batch plant/laydown area using the ISO 9613-2:1996 sound propagation standard as implemented in the Cadna/A software package. Reference sound source information was obtained from either Epsilon's consulting files or the FHWA's Roadway Construction Noise Model (RCNM).
2. The majority of the construction activity will occur around each of the inverter locations, at the location of the collector substation, at each of the solar arrays, and at the locations where Horizontal Directional Drilling (HDD) will occur. By its very nature, construction activity moves around the Facility Site. Full construction activity will generally occur at one location at a time, although there will be some overlap at adjacent construction locations for maximum efficiency. For modeling conservatism, it was assumed that full activity was occurring at the closest locations to their surrounding receptors. There are generally five phases of construction for a solar energy project – site preparation and grading, trenching and road construction, HDD, equipment installation, and commissioning. Table 7-6 presents the equipment sound levels for the louder pieces of construction equipment expected to be used at this site along with their phase of construction.

Table 7-6 Sound Levels for Noise Sources Included in Construction Modeling

Phase	Equipment	Sound Level at 50 feet [dBA]
Site Preparation & Grading	Grader (174 hp)	85
Site Preparation & Grading	Rubber Tired Loader (164 hp)	85
Site Preparation & Grading	Scraper (313 hp)	89
Site Preparation & Grading	Water Truck (189 hp)	80
Site Preparation & Grading	Generator Set	81

Table 7-6 Sound Levels for Noise Sources Included in Construction Modeling

Phase	Equipment	Sound Level at 50 feet [dBA]
Trenching & Road Construction	(2) Excavator (168 hp)	85
Trenching & Road Construction	Bar Trencher (600 hp)	89
Trenching & Road Construction	Grader (174 hp)	85
Trenching & Road Construction	Water Truck (189 hp)	80
Trenching & Road Construction	Trencher (63 hp)	83
Trenching & Road Construction	Rubber Tired Loader (164 hp)	85
Trenching & Road Construction	Generator Set	81
Equipment Installation	Crane (399 hp)	83
Equipment Installation	Crane (165 hp)	83
Equipment Installation	(2) Forklift (145 hp)	85
Equipment Installation	(2) Vermeer PD10 Pile Driver	84
Equipment Installation	(6) Pickup Truck/ATV	55
Equipment Installation	(2) Water Truck (189 hp)	80
Equipment Installation	(2) Generator Set	81
HDD Entry	Excavator (168 hp)	85
HDD Entry	Auger Drill Rig	85
HDD Entry	Pickup Truck/ATV	55
Commissioning	(2) Pickup Truck/ATV	55

(1) The operational modeling requirements included Sections 7(d)(1)(i) through 7(d)(1)(iii), and 7(d)(3) of this Exhibit were also used for modeling of construction noise.
(2) Worst-case sound levels from construction activity are shown using sound level contours in Figure 7-j.1 and sound levels at the most critically impacted receptors are shown in Tables 7-7 to 7-8.

Two areas within the Facility Site were chosen to calculate worst case construction sound levels. The areas and assumed locations of simultaneous construction are:

- Area 1 – This area includes the closest receptors to a solar array panel. Modeling assumed simultaneous construction activity at this solar array panel. Site preparation and grading work, trenching and road construction work, equipment installation work, and commissioning work was modeled at this location.
- Area 2 – This area includes all receptors in the vicinity of the closest HDD entry point to a receptor. Modeling assumed simultaneous construction activity at this HDD entry point. HDD work and commissioning work was modeled at this HDD entry point.

For each of the areas, construction sound levels at the ten closest receptors have been calculated. These receptors included both non-participants and participants. The results are shown as maximum 1-second L_{eq} sound levels with all pieces of equipment for each phase operating at the locations. These results overstate expected real-world results, because under actual construction conditions, not all pieces of equipment will be operating at the same exact time, and the highest sound levels from every piece of equipment will not tend to occur at the same time as was assumed in the modeling. At other areas of construction (i.e. substation, laydown yards, inverter pads), sound levels due to construction would be lower, as those locations are further from receptors than the two areas that were analyzed.

Area 1 Modeling Results

The cumulative impacts from site preparation and grading work, trenching and road construction work, equipment installation work, and commissioning work was calculated with the Cadna/A model for the ten closest receptors to construction activity within Area 1. The loudest phase of construction within this area will be trenching and road construction work. A sound contour figure of trenching and road construction work occurring at the solar array is presented in Figure 7-j.1.

The highest sound level at a non-participating receptor within this area is 65 dBA during site preparation and grading (Receptor #110), 66 dBA during trenching and road construction (Receptor #110), 66 dBA during equipment installation (Receptor #110), and 31 dBA during commissioning (Receptor #110). Modeling results of construction sound levels within this area are summarized in Table 7-7.

Table 7-7 Construction Noise Modeling Results – Area 1 Construction [dBA]

Receptor ID	Distance [m]	Participation Status	Site Preparation & Grading	Trenching & Road Construction	Equipment Installation	Commissioning
4	26	Participating	81	81	80	46
110	137	Non-Participating	65	66	66	31
28	254	Non-Participating	60	62	61	26
119	309	Non-Participating	59	60	60	25
14	315	Non-Participating	58	59	59	24
24	379	Non-Participating	57	58	58	23
71	422	Non-Participating	56	57	57	22
87	429	Non-Participating	55	57	56	21
53	430	Non-Participating	55	57	56	21
48	430	Non-Participating	55	57	56	21

Area 2 Modeling Results

The cumulative impacts from HDD work and commissioning work were calculated with the Cadna model for the ten closest receptors to construction activity within Area 2. The loudest phase of construction within this area will be HDD work. A sound contour figure of HDD work occurring at the HDD entry point is presented in Figure 7-j.1.

The highest sound level at a non-participating receptor within this area is 55 dBA during HDD (Receptor #8) and 25 dBA during commissioning (Receptor #8). Modeling results of construction sound levels within this area are summarized in Table 7-8, and a sound contour figure of results is shown in Figure 7-j.1.

Table 7-8 Construction Noise Modeling Results – Area 2 Construction [dBA]

Receptor ID	Distance [m]	Participation Status	HDD	Commissioning
91	226	Participating	57	28
8	315	Non-Participating	55	25
65	432	Non-Participating	52	22
17	506	Non-Participating	51	20
114	677	Participating	48	18
82	721	Non-Participating	47	17
69	973	Non-Participating	44	14

96	1088	Non-Participating	43	13
34	1197	Non-Participating	42	12
41	1316	Non-Participating	41	11

Construction Noise Conclusions

Noise due to construction is an unavoidable outcome of construction. The five major construction phases are: site preparation and grading, trenching and road construction, HDD, equipment installation, and commissioning. Most of the construction will occur at significant distances to sensitive receptors, and therefore noise from most phases of construction is not expected to result in impacts to sensitive receptors. There are a few instances where construction will be fairly close to residences (#4, #110, #91, #28 & #119) and coordination with these neighbors may be warranted. Construction noise will be minimized through the use of best management practices (BMP).

7(k) Sound Levels in Graphical Format

1. Figure 7-4.1 presents future L_{eq} (8-hour) sound contour lines showing expected sound levels during worst-case operation of the Facility's inverters plus the collector substation using the methodology described above. Figure 7-5.1 presents future L_{eq} (1-hour) sound contour drawings showing expected sound levels during worst-case operation of the Facility's collector substation-only using the methodology described above.
2. The sound contour maps include all sensitive sound receptors, boundary lines (differentiating participating and non-participating), and all Facility noise sources.
3. Sound contours are rendered until the thirty dBA noise contour is reached, in one-dBA steps, with sound contour multiples of five dBA differentiated.
4. Full-size hard copy maps (22" x 34") of these figures in 1:12,000 scale will be submitted to the Office.

7(l) Sound Levels in Tabular Format

A tabular comparison between the maximum sound impacts and any design goals, noise limits, and local requirements for the facility, and the degree of compliance at all sensitive sound receptors and at the most impacted non-participating boundary lines within the Study Area is presented below.

All sources running--inverters plus the collector substation

Future L_{eq} (8-hour) sound levels during worst-case operation of the Facility's inverters plus the collector substation have been calculated using the methodology described above. Appendix 7-4 provides the predicted A-weighted (dBA) and full octave band frequency (31.5 Hz to 8,000 Hz) sound pressure levels at all sensitive receptors. The results are sorted by receptor ID and sorted by A-weighted sound level high to low, and then are broken down by receptor type (Residential and Public) and participation (Non-Participating and Participating). In total, there are seven tables from Table 7-4.1a to Table 7-4.1g found in Appendix 7-4.

The highest sound levels at residential receptors, under this scenario are:

- Non-participating receptor = 36 dBA
- Participating receptor = 38 dBA

These sound levels are below the design goals of 45 dBA for a non-participating residence and 55 dBA for a participating residence, and also meet the adjusted design goal at the non-participating residences due to the observed prominent tone and subsequent 5 dBA penalty. Thus, the Facility complies with these design goals.

Sound level contours generated from the modeling grid are presented in an overview figure, (Figure 7-4.1), accompanied by a series of inset maps that provide a higher level of detail at all modeled receptors. As these figures show, sound levels will be below the design goal of 55 dBA at all non-participating property lines. The highest sound level due to the Facility at a non-participating property line occurs on Parcel ID: 62.11-1-3.2, near Inverter 25. This property line boundary is predicted to be 54 dBA.

Collector substation only

Future L_{eq} (1-hour) sound levels during worst-case operation of the Facility's collector substation only have been calculated using the methodology described above. Appendix 7-5 provides the predicted A-weighted (dBA) and full octave band frequency (31.5 Hz to 8,000 Hz) sound pressure levels at all residences. The results are sorted by receptor ID and sorted by A-weighted sound level from high to low for all Non-Participating residences. In total, there are two tables from Table 7-5.1a to 7-5.1.b found in Appendix 7-5. Sound level contours from the collector substation generated from the modeling grid are presented in Figure 7-5.1.

The highest sound level under this scenario is 32 dBA at a non-participating residence. This sound level meets the design goal of 35 dBA, assuming the 5 dBA tonal penalty, which is likely for a substation transformer.

Local Requirements

There are no applicable sound level requirements in the Town of Brownville. The Town of Lyme has a law provision regarding noise, however there are no quantitative noise level limits. The Applicant is seeking a waiver of this local law. Refer to Exhibit 24 for more information regarding the Town's requirements and the Applicant's waiver request.

7(m) Community Noise Impacts

1. Hearing Loss for the Public

   The Facility's potential to result in hearing loss to the public was evaluated against the 1999 "Guidelines for Community Noise" published by the World Health Organization (WHO). According to the WHO Guidelines, the threshold for hearing impairment is 70 dBA L_{eq} (24-hour), 110 dBA (Lmax, fast) or 120/140 dBA (peak at the ear) for children/adults. Operational noise will always be less than 55 dBA L_{eq} (8-hour) at any residence. This is well below the 70 dBA limit. The only construction noise source for this Facility capable of exceeding the WHO hearing impairment threshold is blasting, but no blasting is anticipated for this Facility. All other construction activities will produce noise below the WHO hearing impairment threshold. Therefore, no Facility activities have the potential to cause hearing loss to the public.

2. Potential for Structural Damage

   At this time, blasting is not planned as part of construction for the Facility. If blasting becomes necessary, a detailed discussion of the potential to produce structural damage on any existing proximal buildings is found in Exhibit 10 Geology, Seismology and Soils.

7(n) Noise Abatement Measures for Construction Activities

1. Noise Abatement Measures

Noise due to construction is an unavoidable outcome of construction. The Applicant will communicate with the public to notify them of the beginning of construction of the Facility. Most of the construction will occur at significant distances to sensitive receptors, and therefore noise from most phases of construction is not expected to result in impacts to sensitive receptors. Nonetheless construction noise will be minimized through the use of BMP such as those listed below.

- Blasting is not anticipated at this site. However, if necessary, blasting will be limited to daytime hours and conducted in accordance with an approved Blasting Plan.
- Post installation and HDD will be limited to daytime hours.
- Pursuant to 19 NYCRR § 6.2(k)(1), utilizing construction equipment fitted with exhaust systems and mufflers that have the lowest associated noise whenever those features are available and maintaining functioning mufflers on all transportation and construction machinery.
- Maintaining equipment and surface irregularities on construction sites to prevent unnecessary noise.
- Configuring, to the extent feasible, the construction in a manner that keeps loud equipment and activities as far as possible from noise-sensitive locations.
- Using back-up alarms with a minimum increment above the background noise level to satisfy the performance requirements of the current revisions of Standard Automotive Engineering (SAE) J994 and OSHA requirements.
- Developing a staging plan that establishes equipment and material staging areas away from sensitive receptors when feasible.
- Contractors shall use approved haul routes to minimize noise at residential and other sensitive noise receptors.

2. Complaint Management Plan

Complaints due to construction or operation of the Facility have the potential to occur. If complaints do arise, the Complaint Management Plan provides information on how and when the public may file a complaint, as well as an identification of any procedures or protocols that may be unique to each phase of the Facility or complaint type. In accordance with 19 NYCRR § 6.2(a), (c) and (d), the Applicant will provide notice of commencement of construction and completion of construction. The notice will include the procedure and contact information for registering a complaint. To minimize noise impacts during construction, the Applicant will comply with 19 NYCRR § 6.2(k)(2), which includes responding to noise and vibration complaints according to the complaint resolution protocol approved by the Office.

3. Compliance with Local Laws

There are no applicable sound level requirements in the Town of Brownville. The Town of Lyme has a law provision regarding noise, however there are no quantitative noise level limits. The Applicant is seeking a waiver of this local law. Refer to Exhibit 24 for more information regarding the Town's requirements and the Applicant's waiver request.

7(o) Noise Abatement Measures for Facility Design and Operation

1. Wind Facilities

This subsection is not applicable to the Facility.

2. Solar Facilities

Adverse noise impacts will be avoided or minimized through careful siting of Facility components. The noise emitted by a solar project is limited to daytime periods only for the majority of the components. No mitigation is required at any of the central inverters across the Facility or the substation under the current design. If any mitigation measures become necessary, they shall be implemented no later than the start date of operations.

7(p) Software Input Parameters, Assumptions, and Associated Data for Computer Noise Modeling

1. GIS files used for the computer noise modeling, including noise source and receptor locations and heights, topography, final grading, boundary lines, and participating status have been submitted to the Office by digital means.
2. The Cadna/A computer noise modeling files have been submitted to the Office by digital/electronic means.

3. Site plan and elevation details of substations, as related to the location of all relevant noise sources are presented in Appendix 7-6.
4. This subsection is not applicable to the Facility.
5. Noise source locations and manufacturers information are included as follows:
   i) The locations of all noise sources identified with GIS coordinates are presented in Appendix 7-1. The digital GIS files with that information have been submitted to the Office.
   ii) Sound information from the manufacturers for all noise sources included in this analysis are presented in Appendix 7-7.

7(q) Miscellaneous

1. A glossary of terminology, definitions, and abbreviations used throughout this Exhibit is included as Appendix 7-9. The references mentioned in the application are found in Appendix 7-10.
2. All information has been reported in tabular, spreadsheet compatible or graphical format as follows:
   i) All data reported in tabular format has been clearly identified to include headers and summary footer rows. Headers include identification of the information contained in each column, such as noise descriptors; weighting; duration of evaluation; time of the day; whether the value is a maximum or average value and the corresponding time frame of evaluation.
   ii) Table titles identify whether the tabular or graphical information correspond to the "unmitigated" or "mitigated" results, if any mitigation measures are evaluated, and “cumulative” or “non-cumulative” for cumulative noise assessments.
   iii) Columns or rows with results related to a specific design goal, noise limit or local requirement, identify the requirement to which the information relates.
   iv) Tables include rows at the bottom summarizing the results to report maximum and minimum values of the information contained in the columns. Sound receptors are separated in different tables according to their use (e.g.,

participating residences, non-participating residences, schools, parks, cemeteries, historic places, etc.).

v) This Exhibit reports estimates of the absolute number of sensitive sound receptors that will be exposed to noise levels that exceed any design goal or noise limit (in total as well as grouped in one-dBA bins).

Conclusions

A study was conducted to confirm that any noise and vibrational impacts resulting from the construction and operation of the Facility will not exceed the design goals listed within the regulations of Section 94-c of the New York State Executive Law. Adverse noise impacts were avoided or minimized through careful siting of Facility components. The noise emitted by a solar project is limited to daytime periods only for the majority of the components. No mitigation is required at any of the central inverters across the Facility or the substation under the current design. See Exhibit 7 for further discussion of noise impacts from the Facility. The Facility has been designed to comply with 19 NYCRR § 900-2.8 and the Uniform Standards and Conditions (USCs) and impacts related to noise and vibration have been avoided and minimized to the maximum extent practicable.

References

American National Standard ANSI/ASA S1.4-1983 (R2006). 1983. *Specification for Sound Level Meters.*

American National Standard ANSI/ASA S1.11-2004 (R2009). 2004. *Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters.*

American National Standard ANSI/ASA S1.40-2006 (R2020). 2006. *Specifications and Verification Procedures for Sound Calibrators.*

American National Standard ANSI/ASA S1.43-1997 (R2007). 1997. *Specification for Integrating-Averaging Sound Level Meters.*

American National Standard ANSI S12.9-1992/Part 2 (R2018). 1992. *Quantities and Procedures for Description and Measurement of Environmental Sound. Part 2: Measurement of long-term, wide-area sound.*

American National Standard ANSI S12.9-2013/Part 3 (R2018). 2013. *Quantities and Procedures for Description and Measurement of Environmental Sound. Part 3: Short-term Measurement with an Observer Present.*

American National Standard ANSI S12.9-2005/Part 4 (R2020). 2005. *Quantities and Procedures for Description and Measurement of Environmental Sound. Part 4: Noise Assessment and Prediction of Long-term Community Response.*

American National Standard ANSI S12.18-1994 (R2019). 1994. *Procedures for Outdoor Measurement of Sound Pressure Level.*

American National Standard ANSI/ASA S3/SC1.100-2014 & ANSI/ASA S12.100-2014. 2014. *Methods to Define and Measure the Residual Sound in Protected Natural and Quiet Residential Areas.*

Edison Electric Institute. 1984. *Electric Power Plant Environmental Noise Guide, 2nd Edition.*

International Standard ISO 9613-2. 1996. *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.*

U.S. DOT, Federal Highway Administration (FHWA). 2006. *FHWA Roadway Construction Noise Model User's Guide.*

World Health Organization (WHO). 1999. *Guidelines for Community Noise.*