



August 16, 2021

Ms. Jennifer Cervenka
Cervenka Green & Ducharme LLC
235 Promenade Street, Suite 475
Providence, RI 02908

**RE: *Pre-Installation Noise Assessment
South Road Solar Development
Assessor's Plat 18 Lot 20
East Greenwich, Rhode Island
SAGE Project No. M1058***

Dear Ms. Cervenka:

This correspondence presents the findings of a pre-installation noise assessment for a solar development by South Road Solar, LLC in the Town of East Greenwich, Rhode Island (hereinafter the "Site"). This noise assessment includes the following evaluations:

- Evaluation of the potential change in highway noise (i.e. vehicular noise) from Route 4 to areas abutting the proposed solar installation due to reduced forested area as a result of the proposed solar installation.
- Assessment of sound generated from noise-generating equipment (i.e. inverters and transformers).
- Ambient sound measurement at locations abutting the solar development and in residential areas near the solar development.
- Examination of the octave band sound pressure levels from the noise-generating equipment to determine if a "pure tone" condition exists.

Modeling was performed by David Coate Consulting (DCC) using CADNA, an internationally-accepted environmental noise modeling software application to model the effects of the tree removal and the operation of the solar equipment. The CADNA modeling employs International Standards Organization (ISO) algorithms to analyze the effects of trees and ground topography on the propagation of sound. Vehicular noise from Route 4 was measured 40 feet from the western pavement edge of Route 4 by SAGE and DCC June 29, 2021 through July 2, 2021 and August 2, 2021 through August 5, 2021, **Attachment 1** provides a site plan displaying the location of the data collection (referred to as Location 1). The equipment manufacturers of the inverters and transformers provided data describing the greatest dBA sound generated by each equipment that was utilized in the CADNA modeling. Ambient sound along the Site's northern and southern property lines, as well as two locations where the access driveway will be located, were measured for

comparison to the modeled current sound conditions and sound emanating from the inverters and transformers, the location of these measurements (referred to as Location 2, Location 3, Location 4 and Location 5) are displayed in **Attachment 1**.

Highway Noise Evaluation

Current vehicular noise with the existing forested area was modeled and then compared against modeling of the same noise with the reduced forested area as proposed by the installation. **Attachment 2** provides a map depicting existing forested area that was compiled from the land survey map prepared by DiPrete Engineering and aerial imagery. **Attachment 3** provides the forest reduction that was utilized for the modeling efforts, this includes the reduced forest for the solar equipment, shade reduction and access ways. The green shaded areas in **Attachment 2** and **Attachment 3** represents the area that is forested. The vehicular noise data described above was utilized as the noise source, this data is a good representation of noise from the highway as both collected data sets had an average sound of 72 dBA.

The modeling results predict that the expected increase in noise levels due to the reduction of forested area would be considered imperceptible or barely perceptible. **Attachment 4** provides a map of the difference in sound emitted from Route 4 with the reduced forested area. A three decibel (3 dBA) change is commonly known as the threshold of perception (or barely perceptible) for the human ear to detect a change in noise level. This is represented as green in **Attachment 4**. There are no off-site areas (i.e. areas beyond the property lines) that exceed a 3 dBA difference, and, at all residential occupied areas (i.e. a residential house or structure), it is expected that there would be no perceivable change in sound. It is important to note that this assessment is to evaluate the difference in noise levels between existing conditions and conditions when the forested area is reduced, results are not to be viewed in terms of absolute noise level but rather in terms of the differences in noise level.

Solar Equipment Noise

Solar equipment found on Site that would generate sound are inverters and transformers. **Attachment 5** provides technical details about the solar equipment and **Attachment 1** provides a map showing the location of the solar equipment. The inverters and transformers only generate sound when energy is being generated (i.e. daylight hours), thus sound was evaluated for daylight hours only.

The inverters are located at two central locations along the panels. As depicted in **Attachment 1**, the location to the west has 51 inverters, and the location to the east of the Site has 22 inverters. On the east side of the Site there will also be an equipment pad that will have two (2) medium voltage transformers (1500 kVA and 3750 kVA), as depicted in **Attachment 1**. The combination of sound of all equipment was modeled (i.e. 75 sound emitting objects) to represent operations during daylight hours.

The Town of East Greenwich does not provide noise standards within Zoning Chapter 260 Article XX: Solar Energy Systems and Facilities. However, Chapter 152 Noise, of the Code of the Town of East

Greenwich, Rhode Island, does require that the potential noise be less than 55 dBA 10:00 p.m. to 7:00 a.m. and less than 60 dBA 7:00 a.m. to 10:00 p.m. at the property line. The Site abuts the Town of North Kingstown, as such the noise standards for the Town of North Kingstown were also evaluated. The Town of North Kingstown also does not provide noise standards within their solar ordinance (Chapter 21, Article XII, Sec. 21-323). Chapter 21, Article VI Noise, of the Town of North Kingstown Zoning Ordinance, does require that the potential noise received by a residential property must be less than 50 dBA 10:00 p.m. to 7:00 a.m. and less than 60 dBA 8:00 a.m. to 10:00 p.m. at the property line. To provide a conservative evaluation, the lowest permitted sound level was used for this noise assessment, which is 50 dBA the Town of North Kingstown threshold 10:00 p.m. to 7:00 a.m. Note that solar equipment would only emit noise when the sun is radiating energy; 5:10 a.m. is the sunrise time and 8:24 p.m. is the sunset time for the 2021 summer solstice, the longest daylight for the year. As such, this sound level is a conservative evaluation as it utilizes the sound threshold typical for nighttime operations.

This assessment notes that sound emitted from the proposed project does not exceed 50 dBA at any location along the property lines. **Attachment 6** provides the calculated sound emitted from the inverters and transformers. The largest potential sound calculated at a residential occupied area is 33 dBA (at residential properties to the south of the development) and the largest potential sound calculated at the property line is 39 dBA (along the eastern property line near the highway), both dBA levels are lower than ambient sound. The purple dotted line displayed in **Attachment 6** figure represents the 50 dBA contour. This means that any area past the purple contour line would experience sounds lower than the indicated dBA level (i.e. 50 dBA). Note that 50 dBA is a conservative evaluation, 50 dBA is the Town of North Kingstown's threshold 10:00 p.m. to 7:00 a.m as described above.

The total sound that potentially could be observed at the Site is displayed in **Attachment 7**, this includes representative highway noise along with the noise generated from the inverters and transformers. As displayed in **Attachment 7**, the sound emanating from the solar equipment are minor in comparison to vehicular noise that is already present at the Site.

The total sound potentially observed from the highway and noise generated from the inverters and transformers was compared to the current sound. **Attachment 8** provides a map of the difference in total sound that potentially could be observed and the current sound. As described above, a three decibel (3 dBA) change is commonly known as the threshold of perception (or barely perceptible) for the human ear to detect a change in noise level. This is represented as green in **Attachment 8**. There are no off-site areas that exceed a 3 dBA difference. As such, noise from the solar development is not likely to be noticeable beyond the immediate Site area and is not expected to be perceived at residential occupied areas.

Ambient Sound

Ambient sound was collected from two locations on the property lines during June 29, 2021 through July 2, 2021, depicted as Location 2 (south side of Site) and Location 3 (north side of Site) in **Attachment 1**; and two locations along the property lines where the access driveway will be located during August 2, 2021 through August 5, 2021, depicted as Location 4 and Location 5 in **Attachment**

1. **Table 1** provides the measured ambient sounds at these locations compared to the estimated sound from the solar equipment at the same location. As depicted in **Table 1**, at all four (4) locations the average measured sound was greater than the potential sound emitted from the solar project, meaning the solar development is not expected to be perceptible.

Table 1
Ambient Sound Compared to Estimated Solar Equipment Sound

	Measured Ambient Sound (dBA)	Estimated Sound from Solar Equipment (dBA)
Location 2	46	22
Location 3	48	33
Location 4	59	29
Location 5	63	14

The measured ambient sound was compared to the modeled current sound, (i.e. the sound emitted from Rt-4 with no change to the forested area). The overall average difference between measured ambient sound and modeled current sound is -0.2 dBA. This means reduced forested area modeling is a good representation of what is expected when treed areas are removed.

In addition, seven (7) locations that are nearby the Site (i.e. no more than a quarter of a mile from the solar development area) were measured for an instantaneous sound level using a 3M Quest 2200R-10 Type 2 Integrating Sound Level Meter on June 29, 2021 at approximately 1pm. **Attachment 9** provides a map depicting the locations of where the sound screening occurred and the measured instantaneous sound at each location. Note that these observed sounds are instantaneous, there is variability to sound due to wind blowing through the trees, residential sounds and cars passing. These instantaneous sounds are provided to get a relative understanding of sounds in locations that are nearby the site. Sound ranged from 38.7 dBA to 60.3 dBA in the residential areas near the Site. The sound observed in these areas are greater than the potential sound emitted from the solar project as described above, meaning the solar development is not expected to be perceptible.

“Pure Tone” Condition Evaluation

Evaluation if a “pure tone” condition exists was done following the Massachusetts Department of Environmental Protection (MassDEP) requirement. Note that Rhode Island, the Town of East Greenwich, and the Town of North Kingstown do not have regulatory requirements relative to what is referred to as a “pure tone” condition. “Pure tone” is defined as any octave band level that exceeds the levels in the two adjacent octave bands by 3 dB or more, if such a condition occurs then there is “pure tone”. DCC evaluated the octave band sound pressure levels of the ambient sound measurements and the modeled sound from the solar equipment. **Table 2** summarizes the “pure tone” evaluation. As displayed in **Table 2**, the only “pure tone” that exists are in the ambient sound measured at Location 4 and Location 5; which is due to the highway noise. There are no “pure tone” conditions estimated from the solar equipment. As such, the operation of the solar development will not likely generate measurable “pure tone” conditions.

Table 2
Ambient and Solar Equipment Octave Band Sound Pressure Levels

		Octave Band Sound Pressure Level (dB)									dBA
		31.5Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
Location 2	Ambient	55	55	47	41	41	40	37	37	34	46
Location 2	Solar Equipment	37	34	25	18	22	16	3	-1	-22	22
Location 2	Total	55	55	47	41	41	40	37	37	34	46
Location 3	Ambient	58	57	48	45	45	44	38	38	32	48
Location 3	Solar Equipment	44	44	38	24	29	31	18	13	-8	33
Location 3	Total	58	57	49	45	45	44	38	38	32	48
Location 4	Ambient	60	63	57	48	54	56	47	40	35	59
Location 4	Solar Equipment	39	38	33	21	22	27	16	9	-11	29
Location 4	Total	60	63	57	48	54	56	47	40	35	59
Location 5	Ambient	63	67	62	51	56	60	54	46	38	63
Location 5	Solar Equipment	31	30	22	14	14	8	-10	-24	-72	14
Location 5	Total	63	67	62	51	56	60	54	46	38	63

Ambient = measured ambient sound at indicated location

Solar Equipment = estimated sound from solar equipment at indicated location

Total = combined sound from measured ambient sound and estimated sound from solar equipment at indicated location

Blue highlighted cells = "pure tone" condition exists

Conclusion

SAGE concludes that the solar development as a whole, which includes the reduction of forested area and the utilization of the solar equipment, would not be impactful to the sound quality of the neighboring areas. The noise assessment determined the following:

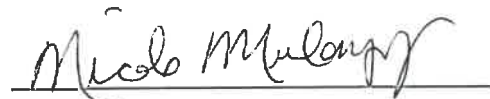
- When the forested area is reduced, a change in vehicular noise from Route 4 is expected to be imperceptible at residential occupied areas.

- Model calculated sound from the inverters and transformers are below 50 dBA at all locations along the property lines, and therefore, below the Town of East Greenwich and the Town of North Kingstown's maximum permitted sound levels.
- Total sound potentially observed from the highway and noise generated from the inverters and transformers is expected to be imperceptible at residential occupied area when compared to current sound.
- Potential noise from the solar equipment at the property lines is less than measured ambient sound.
- Potential noise from the solar equipment at residential occupied areas is less than the measured sound during the instantaneous sound screening.
- Modeling results indicate operation of the solar development will not generate measurable "pure tone" conditions.

These points collectively taken together demonstrate that the potential increase of noise from the proposed reduced forested area and the solar equipment is such that it is expected that there is no perceptible (or a barely perceptible) increase in noise above current observed noise levels and any such impact would be below the Town of East Greenwich and the Town of North Kingstown's noise standards.

Should you have any questions or concerns, please do not hesitate to contact me.

Sincerely,
SAGE Environmental, Inc.



Nicole Mulanaphy, P.E.
Senior Project Manager

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Attachments:

- Attachment 1: Solar Equipment Location and Ambient Sound Measurement Locations
- Attachment 2: Current Location of Forested Area
- Attachment 3: Reduced Forested Area from Solar Development
- Attachment 4: Difference in Sound Emitted from Route 4 with Reduced Forested Area
- Attachment 5: Solar Equipment Technical Specifications
- Attachment 6: Total Sound Emitted from Inverters and Transformers
- Attachment 7: Potential Sound at Site with Representative Route 4 Highway Noise
- Attachment 8: Potential Sound Difference at Site with Representative Route 4 Highway Noise
- Attachment 9: Observed Sound Nearby Solar Development