Robinson+Cole

KENNETH C. BALDWIN

280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
kbaldwin@rc.com
Direct (860) 275-8345

Also admitted in Massachusetts
and New York

June 30, 2022

Melanie A. Bachman, Esq.
Executive Director/Staff Attorney
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Petition No. 1508 - Enfield Solar One, LLC and VCP, LLC d/b/a Verogy – Petition for a Declaratory Ruling that a Certificate of Environmental Compatibility and Public Need is not Required for the Construction, Operation and Maintenance of a 4.0 MWAC Solar Photovoltaic Project at 110 North Street, Enfield, Connecticut**

Dear Ms. Bachman:

Enclosed is an original and fifteen (15) copies of the Petitioners Supplemental Response to Siting Council Interrogatory No. 23 in the above-referenced matter.

Thank you in advance for your assistance and cooperation.

Sincerely,

Kenneth C. Baldwin

KCB/kmd
Enclosure

STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

IN RE:	:	
	:	
A PETITION FOR A DECLARATORY	:	PETITION NO. 1508
RULING THAT A CERTIFICATE OF	:	
ENVIRONMENTAL COMPATIBILITY AND	:	
PUBLIC NEED IS NOT REQUIRED FOR THE	:	
CONSTRUCTION, OPERATION AND	:	
MAINTENANCE OF A 4.0 MW AC SOLAR	:	
PHOTOVOLTAIC PROJECT AT 110 NORTH	:	
STREET IN ENFIELD, CONNECTICUT	:	JUNE 30, 2022

SUPPLEMENTAL RESPONSE OF ENFIELD SOLAR ONE, LLC AND VCP, LLC D/B/A VEROGY TO CONNECTICUT SITING COUNCIL INTERROGATORY NO. 23

Question No. 23

What is the status of the noise study referenced on page 34 of Petition Exhibit G – Environmental Assessment? Would the proposed project meet applicable Department of Energy and Environmental Protection noise standards at the property boundaries?

Response

A Noise Study for the Project is in-process and will be submitted to the Council shortly.

Supplemental Response

The noise study referenced in the Petition was completed on June 27, 2022 and concludes that the Enfield Solar One project would meet the Department of Energy and Environmental Protection noise standards. *See* attached Noise Study.

Brooks Acoustics Corporation
35 Talcottville Road, Suite 31 Vernon, Connecticut 06066 860-896-1081

Mr. Bradley J. Parsons, PE, PMP
Director of Design and Permitting
Verogy
150 Trumbull Street, 4th Floor
Hartford, CT 06103

27 June 2022
PJ2022-1390-L02

Subject: Solar One Enfield – Solar power acoustics studies

Reference: Solar One East Windsor – Solar power acoustics studies, Brooks Acoustics Corporation Project Letter, BAC PJ2022-1390-L01, dated 20 June 2022.

Dear Mr. Parsons:

As requested, Brooks Acoustics Corporation (BAC) has conducted an acoustical engineering and design study to evaluate the sound emissions from the proposed Solar One facility on North Road in Enfield, Connecticut, and any impact that those sounds may have on the surrounding neighborhood.

As part of this study, sound level estimates were made for the proposed Enfield facility. These sound estimates used test data from a similar existing facility in East Windsor, CT (see Reference report) and acoustical engineering calculations to determine if the Enfield facility is expected to operate in compliance with the Regulations of Connecticut State Agencies (RCSA) Section 22a-69-1 et seq. ("Sound Regulations").

Measurements of the existing facility (East Windsor) were made of the sound levels and tonal spectra attributable to the facility at the nearest residential property line during daytime (sunlight) hours.

Based on this sound study, the Solar One facility in Enfield *is expected to meet the CT State sound level limit regulations.* Therefore, the facility is expected to be compatible with Connecticut Siting Council requirements.

Furthermore, based on the *site design* which was developed for the Enfield facility, the emitted sound levels which may reach residences in the vicinity are expected to be *below ambient background levels*.

The site sound control design features locating the power inverters in the middle of the solar panel array, *away* from the nearby residences.

It is the opinion of BAC that with a reasonable degree of engineering certainty the solar panels will reduce the sound level of the Enfield Solar One facility by 25 dBA more than would be expected by distance calculations alone. This will reduce the Enfield Solar One sound levels to below ambient background levels so that the *facility is expected to be essentially inaudible* at the residences.

Sound Level Standards

The Regulations of Connecticut State Agencies (RCSA Section 22a – 69) require that noise emitted by an industrial land use to a residential land use shall not exceed 61 dBA (A-weighted decibels) during daytime hours, which are defined as 7:00 a.m. to 10:00 p.m. [see Sec. 22a-69-3.5. Noise zone standards (a)].

If the emitted sound possesses what is defined as an audible prominent discrete tone [see Sec. 22a-69-1.2. Acoustic terminology and definitions (r)], then the sound level which is otherwise not to be exceeded is reduced by 5 decibels [Sec. 22a-69-3.3. Prominent discrete tones].

Therefore, in the case of sound emissions which contain a prominent discrete tone, the noise emitted by an industrial land use to a residential land use shall not exceed 56 dBA during daytime hours.

According to the CT sound regulations, the emitter's zone includes all public rights-of-way [see Sec. 22a-69-1.1 (o)]. Therefore, the sound level which applies to the nearest residential receiver would be measured at the nearest residential property line, which is directly to the north across Middle Road from the facility.

Sound Tests

Sound tests on the East Windsor Solar One north property line were conducted on 14 May 2022. These survey tests were conducted by Bennett Brooks of BAC. The facility was managed by Brad Parsons of Verogy during the tests. Field measurements of sound levels were performed in accordance with the requirements of the Connecticut Sound Regulations (RCSA 22a-69) and with accepted standard methods of environmental noise measurement.

Details of the sound test are documented in the Reference report.

The primary sound generating sources at the Solar One facility are the DC to AC power inverters. These units convert the 12 volt DC power produced by the solar panels to the AC power used by the power transmission grid. The inverters emit a humming sound. They also have cooling fans which run depending on the unit temperature and emit a whooshing sound.

During the sound survey the East Windsor Solar One facility was operating at near full power capacity, as the sky was sunny, although somewhat hazy during that time. Therefore, the power inverters were operating near full load capacity.

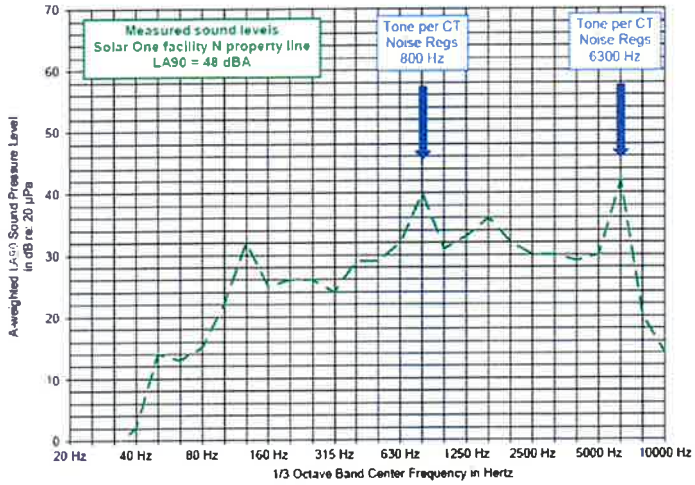
Sound Test Results

The sound level metric used in these comparisons is the LA90 value, which is the A-weighted sound level that is exceeded 90 percent of the time during the test period. The LA90 level is defined as the background level, and incorporates contributions from distant road traffic sound sources, combined with the contributions from steadily running equipment, including the Solar One power inverters.

The sound survey test results are summarized in the Table below:

Test Location	LA90 sound level	Distance to inverters
Pos 1 – East Windsor Facility N property line	48 dBA	87 feet

A Spectral chart was made for the sound record taken at Position 1, shown below.



Test Position 1 -- Measured LA90 spectrum

The spectral charts show the 1/3 octave band (OB) sound levels at each test position. These are the frequency bands which are analyzed for comparison to the CT Sound Regulations definitions for a Prominent Discrete Tone.

Tones are sounds such as hums, whines or whistles and are represented as peaks on the spectral curve. Several tones are apparent on each of these spectral charts. Prominent discrete tones are represented by 1/3 OB levels that stand out above the levels of their adjacent bands to the extent that is defined by the CT Sound Regulations. Of the several tones seen in these spectral charts, two of them qualify as Prominent Discrete Tones according to the CT Sound Regulations, at 800 Hz and at 6300 Hz.

To ***summarize*** the findings of these test results, the sound level of the East Windsor Solar One operation, which is attributable to the power inverters, was **48 dBA** at the North property line. The sound signature of the inverters displayed the **presence of a prominent discrete tone.**

Estimates of sound levels at nearest residence

Acoustical engineering calculations were made to estimate the sound levels at the nearest residence due to the operation of the power inverters at the proposed Enfield Solar One site.

The source sound levels used for this analysis are based on measurements made by BAC at an existing Solar One power facility in East Windsor, CT, as described above. The source sound was characterized by the sound pressure level data for the existing power inverters that were tested and then adjusting those data using sound propagation effects.

The sound propagation calculation procedure accounts for the effects of the sources, barriers, and also distance and atmospheric conditions, in accordance with International Standards on the attenuation of sound during propagation outdoors, ISO 9613-1 and ISO 9613-2.

As shown in ISO 9613-2, the sound level of a source at a distance may be calculated using the following formula:

$$L(dist) = L(source) - Attenuation\ effects$$

In this case, the source sound level is taken from the test data, where the inverters emitted a sound level (LA90) of 48 dBA, at a distance of 87 feet. The measured sound spectrum is also shown above.

The attenuation effects are reductions in the estimated sound level due to various sound propagation factors, and may be given in decibels (dB) by the equation in ISO 9613-2 as follows:

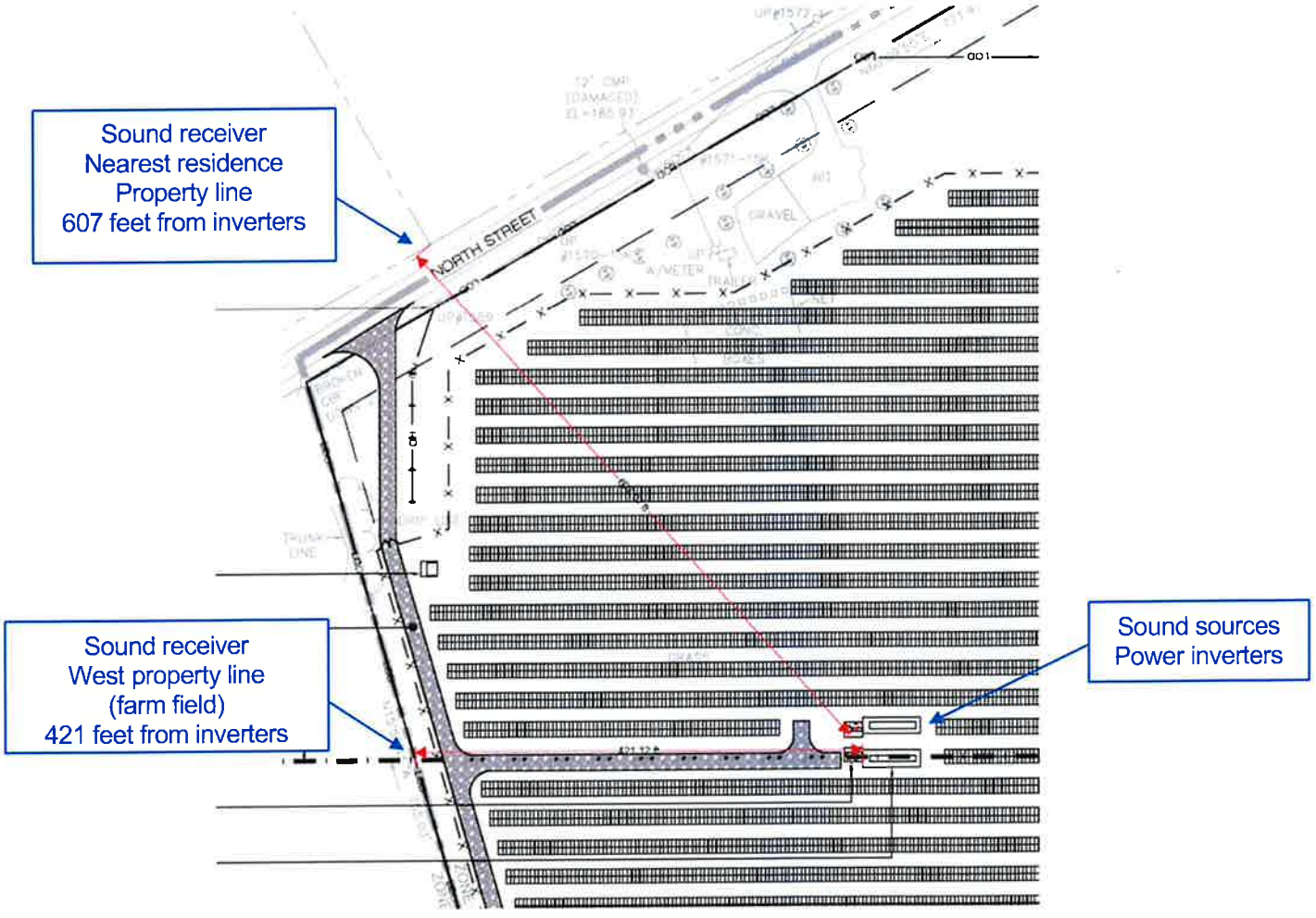
$$\text{Attenuation effects } A = A_{div} + A_{atm} + A_{gr} + A_{bar} + A_{misc}$$

Where:

A_{div} = Attenuation due to geometric divergence (spreading out over a distance)
A_{atm} = Attenuation due to sound absorption by the atmosphere
A_{gr} = Attenuation due to sound absorption by the ground
A_{bar} = Attenuation due to blockage by a barrier or wall
A_{misc} = Miscellaneous attenuation factors

For this study only the sound attenuation factors due to geometrical divergence (A_{div}) and barriers (A_{bar}) were considered and calculated.

The site plan of the proposed Enfield Solar One facility is shown in the All-Points Technology Corporation drawing OP-2, dated 11 April 2022. A portion of the site plan is shown below.



The sound attenuation for **geometrical divergence** (spreading out over a distance) is given by the formula:

$$A_{div} = 20 \log (d_{receiver} / d_{source})$$

The sound attenuation due to **barrier effects** for a single solar power panel were estimated by acoustical engineering analysis, see the calculation sheets attached. The calculations were based on the inverter to solar panel configuration on the site plan, and seen in the photo below.

The practical limit for the attenuation of a single barrier is 20 dB. This site plan shows that multiple sound barriers (solar panels) are located between the inverters and the nearest residence. For multiple barriers, the single attenuations are combined with a practical attenuation limit of 25 dB (per ISO 9613-2). Therefore, at this site the total barrier attenuation effectively is:

$$A_{bar} = 25$$

For the receiver location at the *nearest residence property line*, both divergence (distance) and barrier attenuation effects were calculated.

For the receiver location at the *site west property line* there are no solar panels acting as sound barriers between the inverters and the property line, as there is an access road between these locations. So, only distance effects were calculated for this receiver. A Table showing the calculation results is below.

Receiver location	Distance	Distance Attenuation	Barrier Attenuation	Sound level outside
Inverter Source Sound	87 feet	--	--	48 dBA (normal whisper)
Site West Property Line	421 feet	14 dB	--	34 dBA (very quiet whisper) Likely at or below ambient background sound
Nearest residential Property line	607 feet	17 dB	25 dB	6 dBA (near hearing threshold) Well below ambient background sound

Sound impact evaluation

The estimated sound level for the Enfield Solar One facility at the nearest residential property boundary to the North was **6 dBA** with the presence of a prominent discrete tone.

The Regulations of Connecticut State Agencies (RCSA Section 22a-69) place a limit on noise emissions of 61 dBA at residential property lines during daytime hours. There is a penalty of 5 dB for sounds which include the presence of a prominent discrete tone. The resulting **sound level limit** for the Solar One operation is **56 dBA** at the nearest residential property line.

The measured sound level attributable to the facility (6 dBA) is substantially below that limit. Therefore, the facility is expected to be ***in compliance*** with the sound level limit requirement of the RCSA.

This level will be well below the lowest ambient background level in that area of Enfield, due to distant traffic and natural sound sources. Therefore, it is very likely that the Solar One facility will be ***inaudible*** at the nearest residential property line.

Further, as exterior walls and windows typically provide at least 25 dBA sound reduction from the outside to the inside, it is *highly unlikely* that any sound from the power inverters will be audible indoors. It is expected that the operation of the Solar One facility with sound controlwill not disturb the comfort and repose of any person in the vicinity.

Please contact me if you have any questions concerning these findings.

Very truly yours,
BROOKS ACOUSTICS CORPORATION

Bennett M. Brooks, PE, FASA, INCE
President

Attachments

SHELTER BARRIER ATTENUATION CALCULATION

Solar One - Enfield

Source: Inverters -- Receiver: Residence Property Line

* Indicates values to be input in feet – sound from source up and over solar power panel
Panels 10 feet high - Inverters in middle of site
Baseline elev. 190 ft

$h_b := 10$ *Height of barrier

$h_s := 5$ *Height of source

$h_r := 5$ *Height of Receiver

$d_{sb} := 10$ *Distance from source to barrier

$d_{br} := 597$ *Distance from barrier to receiver

$c := 344$ Speed of sound (m/s)

$n := 0..8$

$f_n := 31.25 \cdot 2^n$ Frequency of peak (Hz)

$\lambda_n := \frac{c}{f_n}$ Wavelength of peak (meters)

$D_{br} := d_{br} \cdot .3048$ $D_{br} = 181.966$

$D_{sb} := d_{sb} \cdot .3048$ $D_{sb} = 3.048$

$H_{sb} := (h_b - h_s) \cdot .3048$ $H_{sb} = 1.524$

$H_{br} := (h_b - h_r) \cdot .3048$ $H_{br} = 1.524$

The path distances specific to the geometry of the installation – in meters

$R_{sb} := \sqrt{(D_{sb})^2 + (H_{sb})^2}$ $R_{sb} = 3.408$

$R_{br} := \sqrt{D_{br}^2 + H_{br}^2}$ $R_{br} = 181.972$

Fresnel Number

$N_n := \frac{2 \cdot [(R_{sb} + R_{br}) - (D_{sb} + D_{br})]}{\lambda_n}$

$C := 10$

C=10 for receiver over reflecting plane (close to ground)

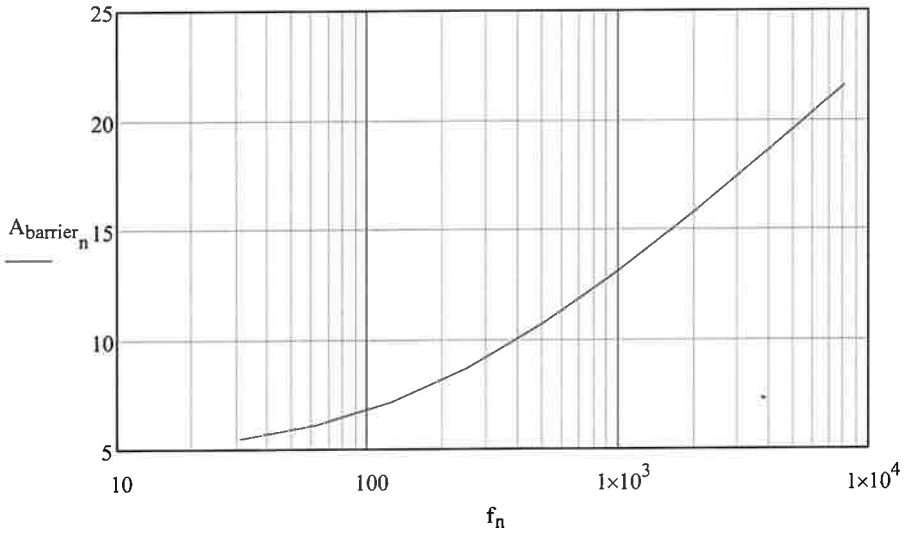
$$A_{barrier_n} := 10 \cdot \log\left[3 + C \cdot N_n \cdot \exp\left[-\frac{1}{2000} \cdot \sqrt{\frac{R_{sb} \cdot R_{br} \cdot (D_{sb} + D_{br})}{2 \cdot [(R_{sb} + R_{br}) - (D_{sb} + D_{br})]}}\right]\right]$$

Barrier Attenuation

$$A_{barrier} = \begin{pmatrix} 5.5 \\ 6.1 \\ 7.1 \\ 8.7 \\ 10.7 \\ 13.1 \\ 15.8 \\ 18.6 \\ 21.5 \end{pmatrix}$$

31.5
63
125
250
500
1000
2000
4000
8000

Note: Practical limit for barrier attenuation is 20 dB


25
20
15
10
5
$A_{barrier_n}$
10
100
1×10^3
1×10^4
f_n