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MEMORANDUM

To:	Tierra del Sol Solar Farm LLC; Rugged Solar LLC
From:	Mike Greene, Environmental Specialist/Acoustician
Subject:	Response to Comments: Boulevard Planning Group Comment (8), Infrasound and Low Frequency Sound
Date:	January 15, 2015
cc:	Josh Saunders, Dudek; Asha Bleier, Dudek
Attachment(s):	Figure 1, Table 1

On January 9, 2015, Boulevard Planning Group (BPG) submitted comments to the San Diego County Planning Commission on the Soitec Solar Development Final Programmatic Environmental Impact Report (FPEIR). BPG comment (8) relates to the Technical Memorandum found at FPEIR Appendix 9.0-3, prepared by Mike Greene, Environmental Specialist/Acoustician, and entitled Infrasound and Low-Frequency Noise, Tracker Motor and Fenceline Noise Measurements at Newberry Springs Solar Facility (ILFN Memo). BPG's comment states that the ILFN Memo "appears to address both infra and low frequency sound, but the test data stops at 80 Hz -- just below the frequencies where the tones and harmonics of the inverters, and other sources of tones and hum, would show up in the measurement data." BPG does not provide documentation or references to support the statement that the "tone and harmonics" of inverters or other sources of "tones and hum" would be shown in measurements taken just above 80 Hz.

The ILFN Memo provides that low-frequency sound is generally sound at frequencies between 20 and 200 Hz and infrasound commonly refers to sound at frequencies below 20 Hz. The audible spectrum for humans is approximately 1000 to 4000 Hz; however, infrasound and low-frequency noise (ILFN) may be audible if ILFN exceeds 85 decibels on the G-weighted sound scale (dBG). Noise measurements taken by Mr. Greene at Soitec's Newberry Springs concentrated photovoltaic project (Newberry Springs Project) used equipment capable of measuring sound frequencies from 1 Hz to 80 Hz. Noise measurements for equipment at the Newberry Springs Project, at a distance of 25 to 50 feet, were 55.1 dBG to 62 dBG, below the 85 dBG threshold where ILFN could be audible.

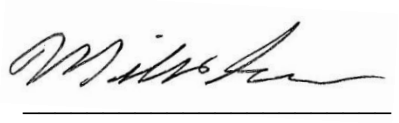
BPG's comment appears to take issue with the frequency range of the noise measurements of 1 Hz to 80 Hz, and the fact that measurements were not taken above 80 Hz. The unweighted noise

measurements at the Newberry Springs Project, providing the 1/3rd-octave band measurements, show that noise at 1 Hz ranges from 58.4 to 62.6 and has a generally downward trend as frequency increases, such that measurements at 80 Hz are 39.1 to 46.5. Octave band measurements were not conducted above 80 Hz because the range of the special sound level meter capable of measuring infrasound stopped at 80 Hz. Measurements above 80 Hz would have continued this downward trend (as shown below) and would not have contributed to higher measurements on the dBG scale. As the IFLN Memo provides, San Diego County does not have a significance threshold for ILFN; Australia and Denmark use as a guideline when assessing ILFN from wind turbines the accepted threshold for audibility of ILFN, 85 dBG. The measurements at the Newberry Springs Project show that ILFN from Project equipment (1) would not be audible, and (2) is below the threshold for ILFN used in two other jurisdictions.

As shown in Figure 1, the A-weighting curve de-emphasizes sounds in the low-frequency range (for example, -20 dB at 100 Hz), whereas the C-weighting curve is essentially unweighted at frequencies from 100 Hz to 2500 Hz. Thus, for example several sources recommend that one way to detect the presence of substantial low-frequency noise energy in the absence of frequency analysis is to compare A-weighted and C-weighted broadband measurements; if the C-weighted level is 20-30 decibels or more than the A-weighted level, than a low-frequency issue may exist.

Broadband (i.e., non-frequency specific) A-weighted and C-weighted noise measurements were taken at the Newberry Springs Project concurrently with the ILFN measurements. The results of those measurements are summarized below (Table 1). As shown, the differences between the A- and the C-weighted levels ranged from 4 to 12 decibels, with the average difference being 9 decibels. Therefore, the degree of low-frequency energy is well below thresholds (20-30 decibels or more) which would indicate a low-frequency noise issue.

Sincerely,



Mike Greene
Environmental Specialist/Acoustician

[1] DIN 45680 : 1997 (Messung und Bewertung tieffrequenter Geräuschimmissionen in der Nachbarschaft) suggests a 20 dB difference; Report of the Noise Review Working Party 1990 published by the Department of the Environment (the Batho report) suggests a 30 dB difference. (Reference: Low Frequency Noise, Technical Research Support for DEFRA Noise Programme. 2001. Casella Stanger for DEFRA (Department of the Environment), Northern Ireland, Scottish Executive, National Assembly for Wales).

Table 1: A-Weighted and C-Weighted Noise Measurements

Measure-ment Number	Start Time	End Time	Leq	L90	L50	L10	Location
1	12:05	12:10	49.5 dBA	48.8 dBA	49.3 dBA	49.8 dBA	Schneider Xantrex GT250 480 Inverter at 50 ‘
2	12:12	12:17	59.4 dBC	57.7 dBC	58.5 dBC	60.9 dBC	Schneider Xantrex GT250 480 Inverter at 50‘
3	12:30	12:35	46 dBA	44.2 dBA	45.8 dBA	47 dBA	Transformer & Cooling fans cabinet at 25’
4	12:35	12:40	55.7 dBC	54.7 dBC	55.5 dBC	56.6 dBC	Transformer & Cooling fans cabinet at 25'
5	12:45	12:50	57.4 dBA	56.8 dBA	57.2 dBA	57.9 dBA	Schneider Xantrex GT500 Inverter at 50’
6	12:52	12:57	61.9 dBC	61.1 dBC	61.7 dBC	62.8 dBC	Schneider Xantrex GT500 Inverter at 50'
7	13:05	13:10	40.7 dBA	37.2 dBA	39.2 dBA	43.5 dBA	Fenceline, south side, 250’ from GT 500 inverter
8	13:11	13:16	51.6 dBC	48.9 dBC	50.8 dBC	53.7 dBC	Fenceline, south side, 250' from GT 500 inverter

Figure 1: Acoustical Weighting Curves (A, B, C and D)