

PRIVILEGED AND CONFIDENTIAL

MEMORANDUM

To: Lee Curtis, BSC Group
From: Marc Wallace and Matthew Riegert
Date: February 11, 2019
Subject: Beverly 12 Substation Revised Preliminary Sound Modeling Analysis Ref. 4361

Tech Environmental, Inc. (Tech) revised our preliminary screening level operational noise modeling exercise for the new electrical transformer planned at the existing “Beverly 12” substation at 44 River Street in Beverly. It is our understanding that the facility plans to install a new electrical transformer, adjacent to the existing electrical transformer located on-site. Furthermore, National Grid has historically purchased transformers that have a NEMA sound level rating of 65 dB, or less. This revised analysis assesses the sound impacts of a new transformer with a NEMA sound level rating of 65 dB, the sound impacts of the same transformer with on-site sound barrier walls, and the sound impacts of a new transformer with a NEMA sound level rating of 58 dB.

Long-term baseline sound level monitoring was conducted near to the project site’s property line over a seven (7) day period during the week of 1/5/2019. The measured nighttime baseline sound levels at the site’s property line were as low as 32 dBA. Subsequent short-term nighttime baseline sound level monitoring was conducted at five (5) additional residential locations surrounding the project. Those measured short-term baseline sound levels were no lower than 32 dBA, with the exception of a nighttime measured baseline sound level of 30 dBA at 1 Hooper Avenue in Beverly.

Revised preliminary screening level operational noise modeling of the new transformer was conducted, per the guidance of National Grid, assuming that the new electrical transformer will:

- 1) Have a NEMA sound level rating no higher than 65 dB;
- 2) The dimensions of the new transformer will be approximately 76”W x 157”L x 157”H; and
- 3) The NEMA sound level includes the sound impacts of all associated cooling fans.

The NEMA sound level rating differs from the estimated sound power level that is used in the modeling. IEEE Standard C57.12.90 and the U.S. Department of Defense (DOD) Unified Facilities Criteria, Noise and Vibration document were utilized to estimate that the transformer described above would emit a sound power level of be 84 dBA with sound energy emitted in each octave band from 31 Hz to 8,000 Hz. This sound power level represents the sound emitted from a transformer with a NEMA sound level rating of 65 dB, with the dimensions stated above, and does not account for the possibility that the transformer could, over time, become noisy above the NEMA rating.

The MassDEP Noise Policy limits impacts of new projects to ten (10) dBA above baseline levels, and prohibits the creation of a “pure tone” condition. Although, a ten (10) decibel increase would be

audible, and in fact, “twice” as loud as the existing baseline level. A five (5) decibel increase would be “noticeable”. And, a three (3) decibel increase would be “perceptible”.

Acoustic modeling of the proposed electrical transformer described above results in sound level impacts as high as 37 dBA at the nearest residential use (i.e. 4 Marshal Court, Beverly). The sound level impacts at all other modeled residential uses are less. A sound level impact of 37 dBA would equate to total sound level of 38 dBA at the site’s property line, a +6 dBA over the baseline, and compliant with the MassDEP Noise Policy. These modeling results do not include any “pure tone” conditions. However, a +6 dBA increase over the baseline would be “noticeable” by the nearest neighbors. Figure 1 illustrates the impacts of the proposed electrical transformer, with the blue contour representing an impact of 30 dBA, the green contour representing an impact of 40 dBA, and the red contour 50 dBA.

Figure 1 – Sound Level Impacts of NEMA 65 Transformer:



An electrical transformer “not perceptible” at the nearest residence would need to emit at least seven (7) decibels less than that outlined above. Such a transformer could have a NEMA sound level rating of 58

dB, with similar dimensions, and emit an estimated sound power of 77 dBA. Modeling of such an electrical transformer would result in sound level impacts as high as 30 dBA at the nearest residential use (i.e. 4 Marshal Court, Beverly). This impact would result in a total sound level of 34 dBA, +2 dBA greater than the lowest existing baseline sound levels at the site's property line, would be compliant with the MassDEP Noise Policy, and would not be "perceptible". The sound level impacts of such an electrical transformer would be 8 dBA at 1 Hooper Avenue, where measured nighttime baseline sound levels were 30 dBA, would also be compliant with the MassDEP Noise Policy, and would also not be "perceptible". Figure 2 illustrates the impacts of such a transformer.

Figure 2 – Sound Level Impacts of NEMA 58 Transformer:



A transformer with a NEMA sound level rating of 65 dB, and similar dimensions presented herein, could also be "not perceptible" at the nearest residences via the installation of noise barrier walls. Such walls would be required to block the transmission of sound to both the south and the east of the transformer, and would need to be at least as tall as the proposed transformer (i.e. at least 13 feet based on these assumptions). The actual dimensions of the wall would be dependent on the location of the

wall (i.e. how near it is to the transformer) and the dimensions of the selected transformer. Modeling of a NEMA rated 65 dB transformer with a two-sided (i.e. “L-shaped”) noise barrier, in close proximity to the unit , could result in sound level impacts at all nearest residences compliant with the MassDEP Noise Policy, and would not be “perceptible” (i.e. no more than +2 dBA over baseline). The cost for this type of barrier, as configured, would be over \$100K and significantly higher than that if it needs to be redesigned to be further away from the unit.

Figure 3 illustrates the impacts of NEMA rated 65 dB transformer with sound barrier walls to the south and east (brown L-shaped lines).

Figure 3 – Sound Level Impacts of NEMA 65 Transformer with Sound Barrier Walls:



If you would like to discuss further, please call me at 781-890-2220 x30.