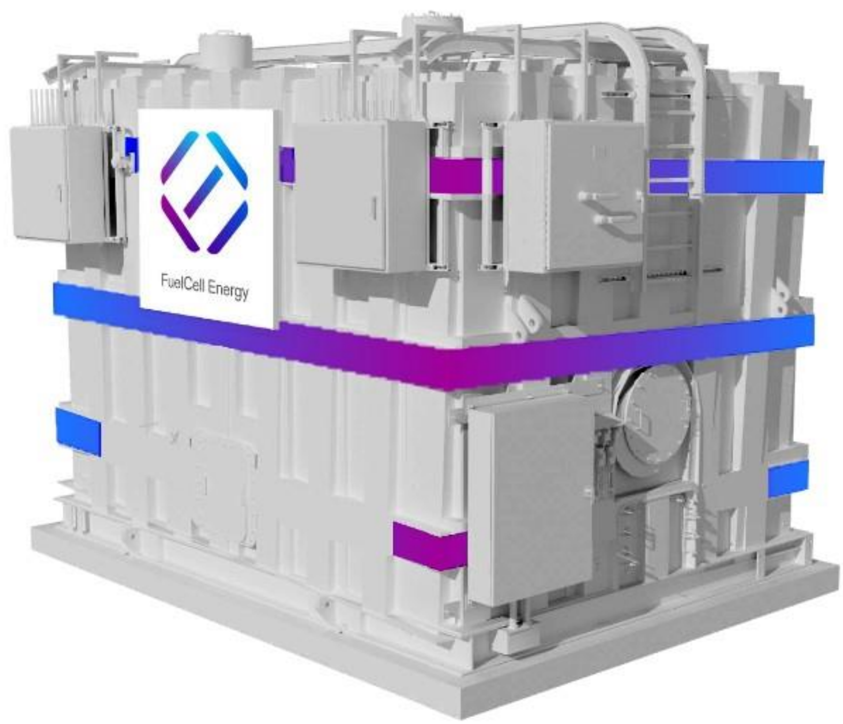
Attachment 2

Facility Sound Assessment



Fuel Cell Plant Infrastructure Update

539 Technology Park Drive

Torrington, Connecticut

July 31, 2024

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Environmental Sound Assessment
Torrington Facility Update

Background

FuelCell Energy, Inc. (FuelCell Energy or FCE) operates a manufacturing and maintenance facility in Torrington, CT. Their fuel cell technology is routinely being updated as new processes are developed to support their ever-expanding worldwide fleet of generation facilities. Some of the infrastructure updates include equipment or processes with the potential to emit environmental sound. The following assessment supports a 2024 update to the Connecticut Siting Council. Several sound surveys and modeling studies have been requested in recent years to assure the facility remained compliant with the standards provided by the Connecticut Department of Energy & Environmental Protection (CDEEP).

Several sound studies were requested as infrastructure plans developed. A facility sound modeling study was requested in 2021 during the planning of a SureSource 1500 generating facility near the module refurbishment area to the north of the existing factory. All SureSource installations are equipped to swap out the modules as needed. However, this facility requires special flexibility due to its diagnostic and testing roles. The 2021 study was never formalized because the ultimate design of equipment remained in flux. Another study was conducted in 2023 to support a new cryogenic N2 separation and storage facility in the northeast corner of the parking lot. The 2023 study identified the need for sound mitigation which was included in the design the N2 facility. The N2 plant is constructed but not yet commissioned. A 2024 Sound Study was commissioned to support equipment needed to recover CO2 from the SureSource tail gasses. Other infrastructure changes are being implemented to the module refurbish facility, backup generator, and special parking for staff EV charging. The purpose of this 2024 Update sound study is to combine all recent infrastructure changes and analyze their potential to affect the community sound levels with respect to the CDEEP standards. Sound level modeling techniques were used to estimate the potential impacts at receiving locations. What follows is a complete analysis of the facility sound using measured ambient data, detailed proposed equipment configuration and using 3-dimensional noise modeling software package CadnaA by Datakustic. Since much of the equipment / processes have been installed and operate, field measurements were made at the facility property to support the modeling study. In this way, the study includes major planned updates as well as other updates to the existing facility.

Overview of Facility Vicinity

The existing FuelCell Energy facility is in an Industrial Park on Technology Park Drive in Torrington, CT. Field measurements were made at sensitive property lines and in the areas that have undergone recent infrastructure updates. Measurements were scheduled to avoid morning and evening high traffic periods. During the field study there were various construction activities underway, mostly related to the subject updates. Measurements were scheduled to avoid significant sound associated with the construction. Measurements were also paused to exclude highway licensed trucking. In these ways, the study represents quiet conditions for this busy mixed-use area. Figure 1 shows the site, major areas of updates along with receptor locations.

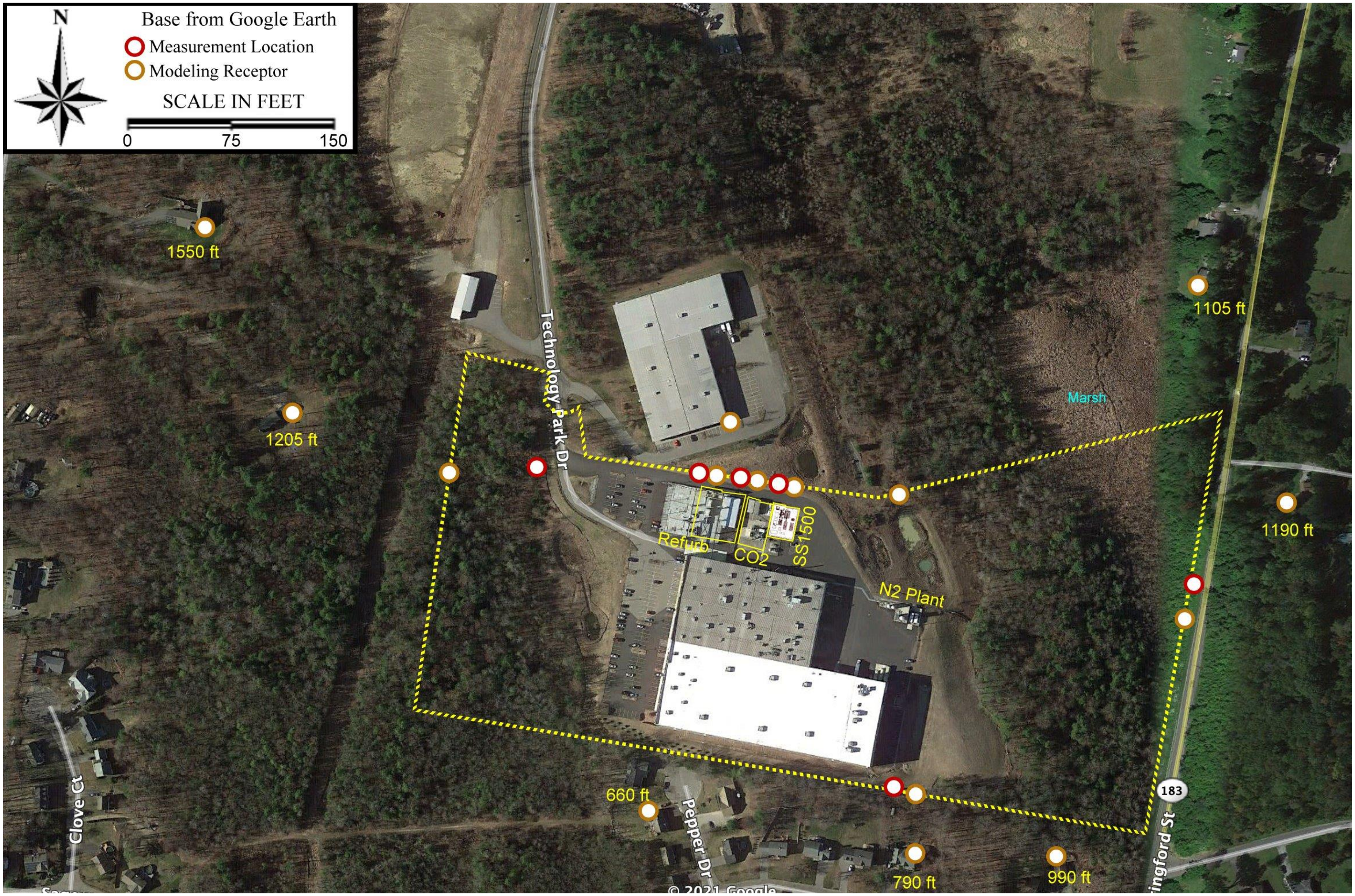

Figure 1: **Aerial Overview of the Area Showing the Key Equipment Areas, Measurement Locations and Receptors**

Discussion of Analysis Methods

There are a number of ways in which sound (noise) levels are measured and quantified. All of them use the logarithmic decibel (dB) scale. Following is a brief introduction to the noise measurement terminology used in this assessment.

Noise Metrics

The Sound Level Meter used to measure noise is a standardized instrument.[1] It contains "weighting networks" to adjust the frequency response of the instrument to approximate that of the human ear under various circumstances. One of these is the *A-weighting* network. A-weighted sound levels emphasize the middle frequency sounds and de-emphasize lower and higher frequency sounds; they are reported in decibels designated as "dBA." Figure 2 illustrates typical sound levels produced by sources that are familiar from everyday experience.

The sounds in our environment usually vary with time so they cannot simply be described with a single number. Two methods are used for describing variable sounds. These are *exceedance levels* and *equivalent levels.* Both are derived from a large number of moment-to-moment A-weighted sound level measurements. Exceedance levels are designated L_n, where "n" can have any value from 0 to 100 percent. For example:

- L_{90} is the sound level in dBA exceeded 90 percent of the time during the measurement period. The L_{90} is close to the lowest sound level observed. It is essentially the same as the *residual* sound level, which is the sound level observed when there are no loud, transient noises.
- L_{50} is the median sound level; the sound level in dBA exceeded 50 percent of the time during the measurement period.
- L_{10} is the sound level in dBA exceeded only 10 percent of the time. It is close to the maximum level observed during the measurement period. The L_{10} is sometimes called the *intrusive* sound level because it is caused by occasional louder noises like those from passing motor vehicles. By using exceedance levels, it is possible to separate prevailing, steady noises (L_{90}) from occasional, louder noises (L_{10}) in the environment.
- The *equivalent level* is the level of a hypothetical steady sound that has the same energy as the actual fluctuating sound observed. The equivalent level is designated L_{eq}, and is also A-weighted. The equivalent level is strongly influenced by loud intrusions.

When a steady sound is observed, all of the L_n and L_{eq} are equal. This analysis is based on the background or L_{90} metric. All broadband levels represented in this study are weighted using the A-weighting scale.

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1 *American National Standard Specification for Sound Level Meters*, ANSI S1.4-1983, published by the Standards Secretariat of the Acoustical Society of America, Melville, NY.

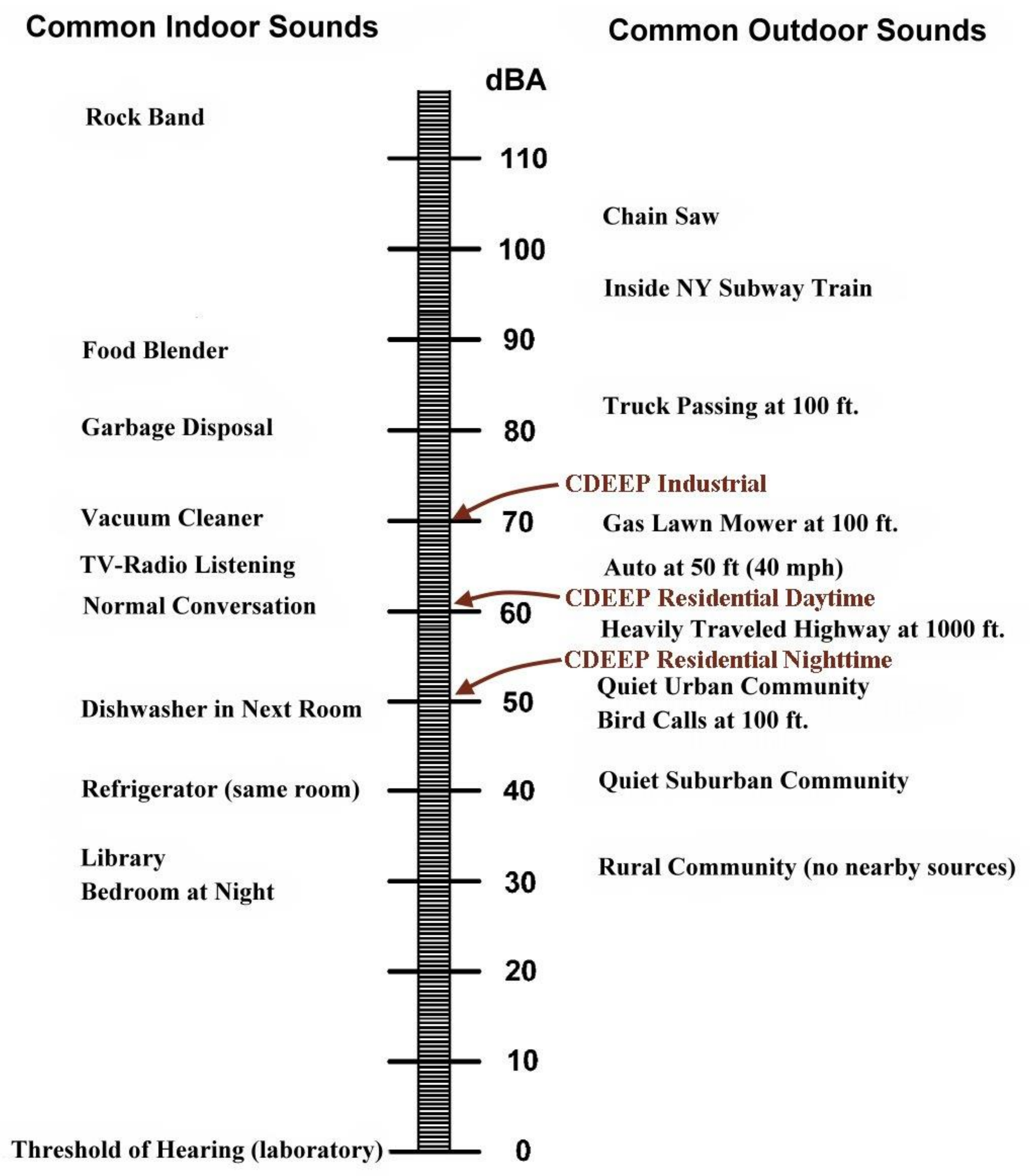


Figure 2: **Typical Sound Levels from Everyday Experience Showing Applicable CDEEP Standards**

When a steady sound is observed, all of the L_n and L_{eq} are equal. This analysis is based on the background or L_{90} metric. All broadband levels represented in this study are weighted using the A-weighting scale.

In the design of noise control treatments, it is essential to know something about the frequency spectrum of the sound of interest. Noise control treatments do not function like the human ear, so simple A-weighted levels are not useful for noise-control design or the identification of tones. The frequency spectra of sounds are usually stated in terms of *octave band sound pressure levels*, in dB, with the octave frequency bands being those established by standard.[2] The sounds in the community were measured in 1/3 octave band levels. The sounds expected as a result of this project have been evaluated with respect to the octave band sound pressure levels as well as the A-weighted equivalent sound level. For simplicity both are summarized in this report as A-weighted levels.

Noise Regulations and Criteria

Sound compliance is evaluated on two bases: the extent to which Federal and State regulations or guidelines are met, and the extent to which it is estimated that the community is protected from excessive sound levels. The governmental regulations that may be applicable to sound produced by activities at the Site are summarized below.

- ***Federal***

  Occupational noise exposure standards: 29 CFR 1910.95. This regulation restricts the noise exposure of employees at the workplace as referred to in Occupational Safety and Health Administration requirements. The facility will emit only occasional sounds of modest levels, as demonstrated by this study.

- ***State***

  The state of Connecticut (Connecticut Department of Energy & Environmental Protection or CDEEP) regulates noise at Regulation Title 22a, Sections 69-1 through 69-7.4, Control of Noise. The project is a Class C (Industrial) emitter. Some properties in the area are zoned commercial or residential and were evaluated as Class B and A Noise Receptors, respectively. The details of the CDEEP performance criteria are shown in Table 1 based on the character of both the source and receiving land uses.

Table 1: CDEEP Noise Standards, by Zoning District

	Receptor's Zone			
Emitter's Zone	Industrial	Commercial	Residential/Day	Residential/Night
Residential	62 dBA	55 dBA	55 dBA	45 dBA
Commercial	62 dBA	62 dBA	55 dBA	45 dBA
Industrial	70 dBA	66 dBA	61 dBA	51 dBA

2 *American National Standard Specification for Octave, Half-octave and Third-octave Band Filter Sets*, ANSI S1.11-1966 (R1975).

Adjustments for high background noise levels or impulse sounds

1. In those individual cases where the background noise levels caused by sources not subject to these regulations exceed the standards contained in this chapter, a source shall be considered to cause excessive noise if the noise emitted by such source exceeds the background noise levels by five dBA, provided that no source subject to the provisions of this chapter shall emit noise in excess of eighty (80) dBA at any time, and provided that this section does not decrease the permissible levels of other sections of this chapter.

2. No person shall cause or allow the emission of impulse noise in excess of eighty (80) dB peak sound pressure level during the nighttime to any residential noise zone.

3. No person shall cause or allow the emission of impulse noise in excess of one hundred (100) dB peak sound pressure level at any time to any zone.

- ***Local Torrington Requirements***

Electrical generation projects are generally regulated at the State level. The key element of the subject infrastructure changes is the production of a nominal 1500 kW of electricity. In this study, Modeling Specialties has evaluated the site based on the CDEEP criteria at sensitive locations. A review of the Torrington Code of Ordinances identified a 'Town of Torrington Noise Ordinance' which was recently updated. The document states that it was effective on April 28, 2021. While the document is new, it carries the same sound level targets as the CDEEP standards, based on land use. In this way, addressing the CDEEP standards also addresses the Torrington noise standards.

Since the noise standards are based on the land use of both the emitter and the receiver, the current land use in the area is important to the study. An excerpt of the Torrington Zoning Map is provided in Figure 3 for the project area. The site and properties nearest the site are industrial in use. The zoned land use as well as the observed land use was considered in the selection of relevant noise receptor locations.

Existing Community Sound Levels

A baseline site survey and noise measurement study were conducted for the facility on March 18, 2021. The 2021 survey is used to represent the "baseline sound level" in the analysis of the recent infrastructure updates. The survey also established an "Existing Condition" of plant sound levels under normal operating conditions.

While the ambient sound levels tend to fluctuate through the day and night, the sound from the facility is relatively steady. Some of the subject infrastructure updates are expected to operate 24/7 so the sound field is expected to increase at some locations but remain steady. It is noted that several interim sound surveys (since 2020) have been conducted associated with new equipment. In each case, surveys included as much of the new plant equipment as practical. Some of the intermittent sources were quantified using a series of sound level measurements on a separate meter configured as a continuous monitor. However, the N2 Gas Plant is installed but not yet commissioned and the Carbon Recovery equipment is still being installed. Their operation sound has not been confirmed by field measurements.

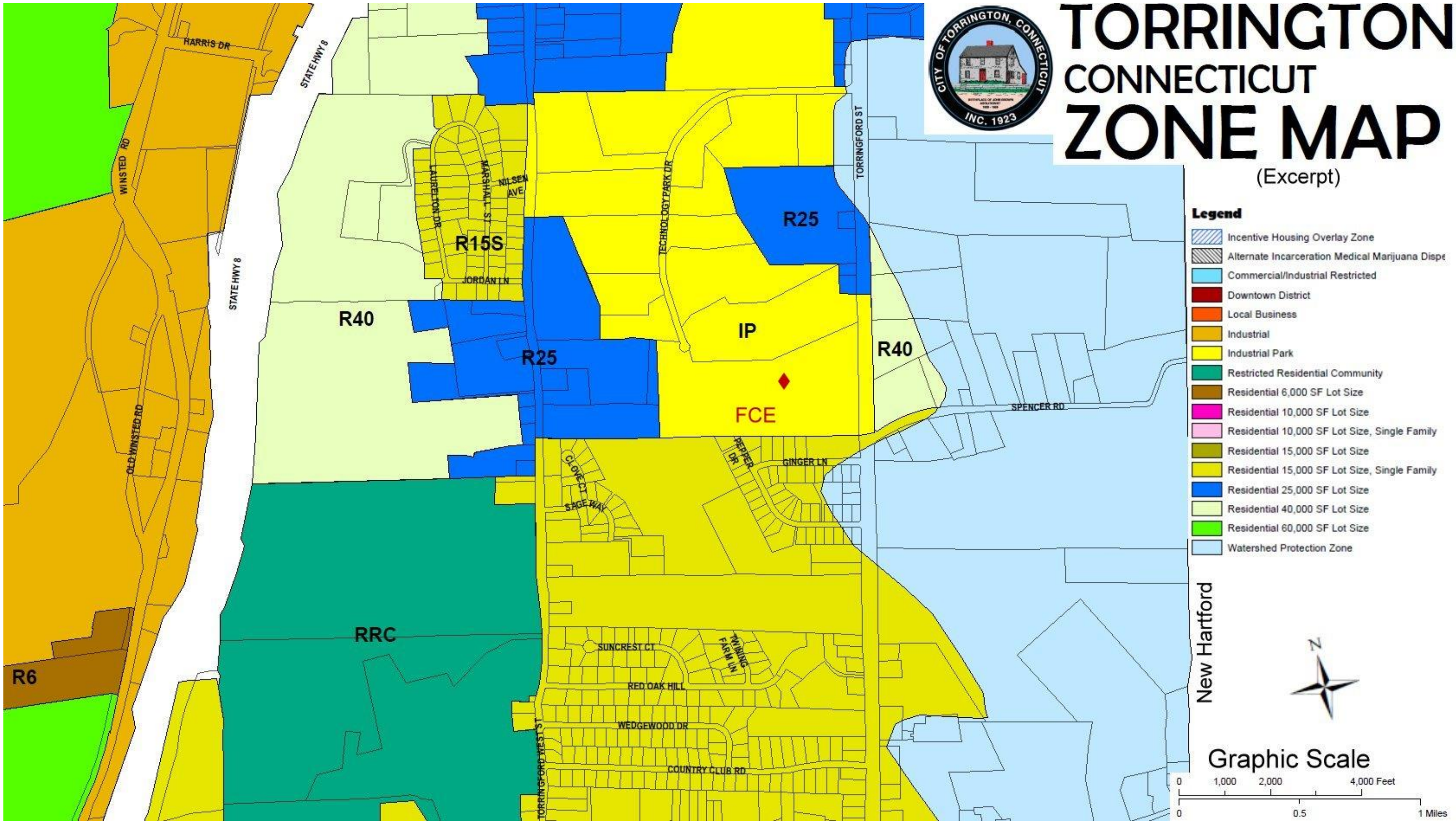


Figure 3: **Excerpt from the Torrington Zoning Map of the Project Area**

The host site is part of a larger industrial area that introduces some sound energy for the area. Because of the increased distance to sources and trucks associated with neighboring industries, the FCE plant is the primary source of sound at most of the observed property line locations. Attended sound level measurements were made using a Rion NA-28 sound level meter(s). The meter was mounted on a tripod approximately 5 feet above the ground. The microphone was fitted with factory recommended foam windscreen. The meter was programmed to take measurements for the test period and then store processed statistical levels. The meter meets the requirements of ANSI S1.4 Type 1 – Precision specification for sound level meters. For each survey, the sound level meter(s) were calibrated in the field before and after the sessions. The field calibrations indicated that the meter(s) did not drift during the study. Many of the measurements included spectrum analysis that complies with the requirements of the ANSI S1-11 for octave band filters. Background levels in a fluctuating field (like the along CT-183) used L_{90} to characterize the background sound level, much like the "residual" which is the level in the absence of any nearby intrusive sources. The sound from short term or infrequent sources (like traffic) is statistically excluded from the L90 samples.

Results of the Ambient Survey

The results of the ambient sound level measurements are summarized in Table 2. The community sensitivity is usually based on the lower background levels. Comparing the Leq levels (including all sounds) to the L90 levels (quietest 10% of samples) illustrates the sound character of the area. Baseline levels are affected by community conditions, meteorology, seasons, insects and traffic patterns. Because the measured levels are dominated by traffic sounds, they can be expected to fluctuate. However, the background levels show that the existing community meets the target levels of the CDEEP standards.

Table 2: Ambient Sound Levels Measured on March 18, 2021

Location	Time	Period	L_{eq}	L_{90}
P/L NW, Near Entrance	3:20 AM	Night	57 dBA	49 dBA
P/L N, Near Center of Site	3:48 AM	Night	62 dBA	58 dBA
P/L E, Near Roadway	4:54 AM	Night	66 dBA	48 dBA
P/L S, Near Stone Wall	4:16 AM	Night	46 dBA	44 dBA
P/L NW, Near Entrance	8:44 AM	Day	49 dBA	48 dBA
P/L N, Near Refurbish Area	9:09 AM	Day	61 dBA	60 dBA
P/L N, Near Carbon Area	9:15 AM	Day	59 dBA	59 dBA
P/L N, Near 1500 Area	9:22 AM	Day	64 dBA	63 dBA
P/L E, Near Roadway	10: 33 AM	Day	71 dBA	55 dBA
P/L S, Near Stone Wall	9:48 AM	Day	49 dBA	44 dBA

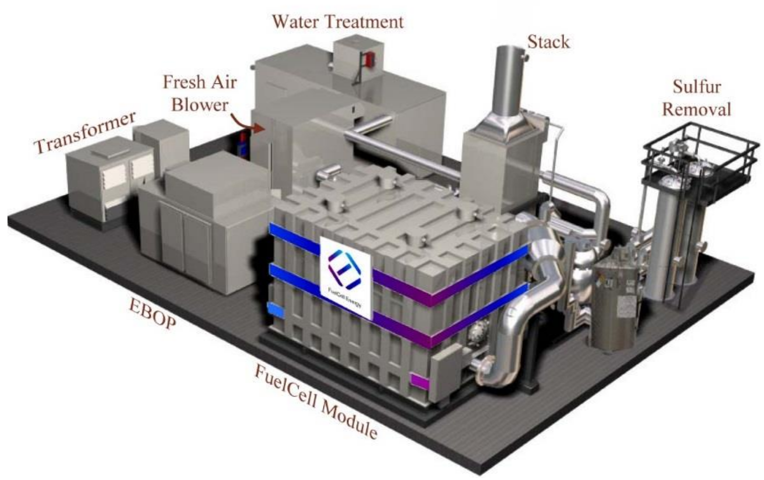
Consistent with most communities, the daytime is affected by elevated traffic volumes on local and distant roadways. Nighttime levels tend to be lower because of lower traffic volumes and the reduced industrial, commercial and neighborhood activities.

Expected Sounds from the Updated Facility Operation

As noted in the overview, the original Factory was designed with significant attention to protecting the community sound environment at every step of its design. The existing rooftop air handlers are not noticeable at any measurement location. Manufacturing activities are located inside the insulated building with no openings in any direction that is exposed to nearby community receivers. Since the facility was designed, most of the equipment and activities with the potential to emit environmental sound were located to the north of the existing. In this way, the existing facility also serves as an effective barrier to shield the nearest community to the south from facility sound. This report addresses three separate groups of infrastructure improvements, although they were essentially developed and installed with a similar timeline. In the evaluation of facility sound, a fourth source represent existing equipment or upgrades that did not fit into the three specific equipment areas.

1. Installation of SureSource 1500 Electrical Generation Equipment

The fuel cell equipment is manufactured in Connecticut by FuelCell Energy, Inc. Like other SureSource 1500 installations, the generation block is based on a single fuel cell module fed by a main air blower with the module's process gases vented through a stack. Other typical skids support the process such as water treatment, sulfur removal, chillers, transformers and electrical equipment that is described as the electrical balance of plant (EBOP) which has signal purifiers and inverters among other processes. The typical facility components are shown as a 3D block sketch to the right, introducing basic elements. The Torrington layout is more complex as shown in Figure 4.



Component sound levels are itemized in Table 3.

Table 3: Expected Sound Levels for SureSource 1500 Components

SureSource 1500 Sources	Location (Area)	Sound Level (dBA, Dist)	Sound Power (dBA)	Time Active
FuelCell Module	SS 1500	65 @ fence+10	87	Continuous
Chiller	SS 1500	65 @ fence+10	68/cell	Frequent
Water Treatment	SS 1500	65 @ fence+10	68	Infrequent
Sulfur Treatment	SS 1500	65 @ fence+10	57	Continuous
Piping	SS 1500	65 @ fence+10	85	Continuous
Fuel Heater	SS 1500	65 @ fence+10	80	Continuous
Fresh Air Blower	SS 1500	65 @ fence+10	95	Continuous
Air Discharge Pipe	SS 1500	65 @ fence+10	91	Continuous
EBOP (x3)	SS 1500	65 @ fence+10	73/unit	Continuous
DC Load Leveler (x2)	SS 1500	84@ 3 ft	96/unit	Transient
AC Load Leveler	SS 1500	84@ 3 ft	96	Transient
Load Bank	SS 1500	84@ 3 ft	96	Transient
Inverter Unit	SS 1500	- -	66	Infrequent
Transformer	SS 1500	- -	58	Continuous
Backup Gas Generator	SS 1500	80@23 ft	112	Transient

[redacted]

Consistent with a typical SureSource 1500 installation, the Torrington installation will generator electricity, most of which is to be used by the FCE facility. But this installation is designed around several other roles that require additional components. It will be a test bed for new designs of support equipment that might support future installations. For example, it is fitted with three separate EBOP systems. It has several redundant inverter systems. In these test roles, this installation will require more operational flexibility than is usually needed. If any one of the test components offers a variation, it could trip the FuelCell package. Such a trip could require a Load Bank to take the fluctuating output at a moment's notice. In another scenario, a DC Load Leveler could stabilize the module output or an AC Load Leveler could stabilize the post-inverter output. These Load Centers are not part of the facility operation but will safely and temporarily take the module load while the facility adjusts to a new base load operation. They operate in a similar way to a backup generator. They do not operate routinely, but provide a recovery that is safe for the staff and also for the equipment. Some of the supplementary components are shown below.

Fuel Cell Module   Load Bank   Load Leveler   Inverter

FCE provided an opportunity to measure the SureSource 1500 normal operation in its actual configuration. These units were not active and will be rarely used only in a system upset. This supplemental equipment produces sound that can be heard at the property line. The expected sound levels from this equipment is listed in Table 3 (but is not in the model).

2. *Installation of Cryogenic N2 Separation and Storage Facility*

Nitrogen gas is used in both the manufacturing and operation processes for FCE Fuel Cells. The existing facility included the storage and processing of N2 that was shipped to the site. The gas plant is designed and operated by Air Gas, Inc. to locally produce and store Nitrogen. It is hosted at the Torrington Facility in an expanded area of the northeastern (shipping) parking lot. The plant includes evaporators and storage tanks to support the higher volumes of gas. Like the existing evaporators and tanks, this equipment produces a modest amount of environmental sound. Occasional venting for purging lines or safety depressurization produces significant but short-lived sound that is not included in the plant sound model. In the updated configuration all venting will be made through a common vent stack that is designed around a muffler to manage its sound.

The primary source of future sound from this area is expected to be the Sullair Compressors. Four compressors are will operate in the gas plant area. The layout of the gas plant is shown in Figure 5 along with a field image of one compressor. The air-cooled compressors will be installed within an enclosure with a sound rating of 90 dBA at 1 meter from the enclosure. The compressed air will continue the processing in the Warm Skid, which emits a sound that is an order of magnitude lower than a compressor. For that reason, the vendor did not have sound data available. A reduced level (-10 dB) is used in the modeling. Preliminary sound modeling indicated that full operation of the compressors would result in sound levels that were above the CDEEP standard to the east even though it remained below the ambient level. To assure compliance, an architectural wall was installed along plant's south and east perimeter to serve as a sound barrier.

Table 4: Expected Sound Levels for Gas Plant Equipment

Nitrogent Plant Sources	Location	Sound Level (dBA, Dist)	Sound Power (dBA)	
Sullair Compressor	N2 Plant	90@ 3 ft (4 ea)	105/unit-	As Needed
Warm Skid	N2 Plant	80@ 3 ft (2 ea)	95/unit	As Needed
Vent Muffler	N2 Plant	88@ 10 ft-	105	Momentary

[redacted]

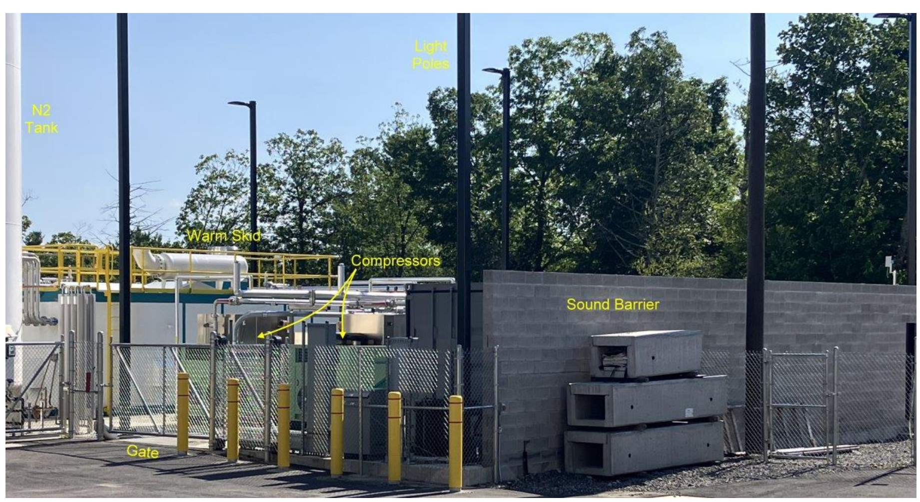


Figure 6:

Field Image of the N2 Plant Showing the South Barrier Wall

3. *Installation of Carbon Recovery from the SureSource Tail Gas*

The fuel cell is a complex process but involves a relatively simple chemical reaction. Methane (purified Natural Gas) combines with Oxygen to form Carbon Dioxide and water (plus electricity). Because of the purity of the input stream, the tail gas stream is also very clean. Another group of equipment was designed to recover the carbon from the tail gas. The output gas is compressed, separated from the water and further purified then finally compressed as a product. This equipment is being installed in the area between the existing refurbishing area and the new SureSource 1500 area as shown in Figure 7.

[redacted]

The various components of the carbon recovery area are shown in Table 5. The whole equipment package is modeled to be operating continuously. However, the entire package is dependent on the operation of the SureSource 1500 operation. When the SureSource unit goes down, the carbon recovery process also stops.

Table 5: Expected Sound Levels for Carbon Recovery Equipment

Carbon Recovery Sources	Location	Sound Level (dBA, Dist)	Sound Power (dBA)	
AERS Skid	CO2 Area	88@ 3 ft-	100-	Continuous
VPSA Skid	CO2 Area	85@ 3 ft	70	Continuous
Tail Gas Compressor	CO2 Area	88@ 3 ft-	100	Continuous
Water Treatment	CO2 Area	Minor	- -	Continuous
Dry Cooler	CO2 Area	68@ 3 ft (6 ea)	82/cell	Continuous
CO2 Compressor	CO2 Area	88@ 3ft	104	Continuous
Refrigeration (Comp)	CO2 Area	84@ 3 ft	97	Continuous
Refrigeration (Regen)	CO2 Area	84@ 3 ft	66	Continuous
Chiller	CO2 Area	58@ 3 ft (3 ea)	75/cell	Frequent
Ammonia Condenser	CO2 Area	68@ 3 ft (5 ea)	89/cell	Continuous

4. Existing Facility Sources

There is a wide collection of sound sources that are part of the existing FCE Torrington plant. These sources were quantified and added to the plant sound level model for the purpose of evaluating compliance of the entire facility with the CDEEP sound standards.

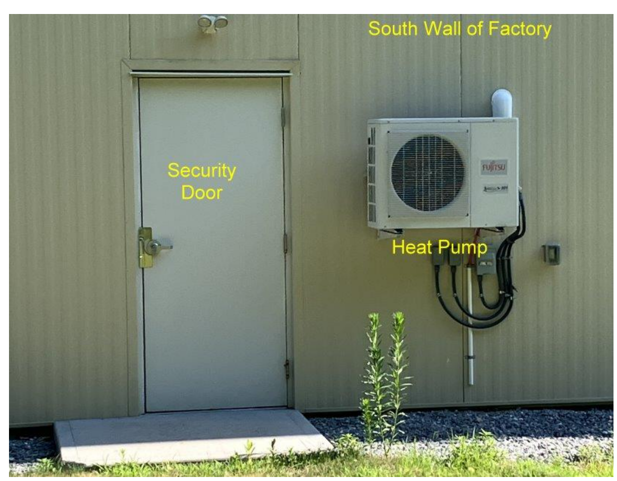
Rooftop Building Mechanical

Emission Control Systems (Existing)

Module Refurbishing Area (Existing)

Facility Backup Generator (Existing Source)

In addition to large infrastructure elements of the facility, there are smaller components with the potential to be sound contributors. They are included here for completeness. The northeast corner of the main factory is the dust control systems. This area is shielded from all residential exposure but contributes noticeable sound in the area. The 2024 survey noted that a break in the duct allowed the filtered air to vent directly to



the atmosphere (noted on graphic). This produces sound that dominates the local area. However, the break is related to the fine tuning of a new filtering process and is expected to be closed again soon. The plant is designed with all sound sources on the north side, shielding the community in the acoustic shadow of the factory itself. The latest survey also noted two heat pumps that were located on the south side of the building. They operate only under very high or low ambient conditions and are residential-style heat pumps. Their operational sound was not observed but are expected to be consistent with the community-friendly sound field to the south of the facility.

Table 6: Sound Levels from Existing Outdoor Equipment

Outdoor Sources	Location	Sound Level (dBA, Dist)	Sound Power (dBA)	
Module Refurbish	Refurb Area	88@ 3 ft-	100-	Continuous
Thermal Oxidizer	Plant N Wall	85@ 3 ft	70	Continuous
Building Wall Vent	Plant N Wall	88@ 3 ft-	100	Daytime
Dust Collector	NE Corner	Minor	- -	Daytime
Gas Generator test No Load Test Backup Power	SS 1500 Area	 80@ 23 ft 86@ 23 ft	 110 115	Transient
Heat Pump (2 ea)	Plant S Wall	40@5ft	44/cell	Infrequent

Modeling of Project Sound

A computer model was developed for the facility's sound levels based on conservative sound propagation principles prescribed in the acoustics literature. Most of the equipment sources produce broadband sound of a continuous nature for as long as the equipment is active. Each of the potential sources during routine operation of the facility was identified. Identifying specific receiving locations is a key element of the noise modeling since sound levels decrease exponentially with increasing distance. Figure 1 shows the distance from the receptor to the nearest sound source. The model is based on the actual distance between the modeled source(s) and the sensitive receptor. The sound from each facility-related source is estimated at the source and at the property line receptor(s). The sum of the contributing sources is used to represent the predicted sound level at the modeled location. This study was expanded to include the nearest neighboring residential receptor. More sources/receptors were identified in the area than are typically studied because there are so many local variations in industrial, commercial, roadway and residential sources and varied receiving zoning districts.

There are many sources of modest sound at the facility and a few sources of major sound. In general, the plant is operated within primarily daytime workday periods. The new sources, like the SureSource 1500, carbon recovery and the emission control systems, operate continuously so are designed for day and night operation. Several sources will cycle on and off as required by the facility operation. The plant surveys identified the sound levels of many operations that seldom operate but were included in the sound model.

Conservatism in the Modeling

Conservatism in modeling is planned. If a variable has a range of possibilities, it is appropriate to take the assumption that leads to a higher result – in this case higher property line sound level. For instance, the module refurb area is equipped for three modules at a time. Measured levels were scaled to reflect full operation. In the SureSource 1500 area a cooling unit on the Water Processing Skid and supplementary process chiller provides cooling only when needed. It will cycle on and off in response to the process demand but is modeled as continuous. Sound estimates from the Carbon Recovery skid-mounted equipment was specified as a distance from the skid enclosure. Most skids have an environmental enclosure which will block some sound, but are not designed to mitigate sound so were modeled as though they had no enclosure at all. On the other hand, the enclosed skids are placed in the work areas in a way that can block significant sound from other inner skids. Since the enclosures are not assumed to have an acoustic character, no shielding is provided (in the model) from one block of equipment shielding the property line. In these ways, the conservative study is designed to estimate project sound somewhat higher that might be measured. A demonstration of the conservative nature of the model is that the 2024 operation of the SureSource 1500 was measured under base load (without any load levelers or load banks). The result at the adjacent north property line was 64 dBA. The model indicates that the highest level expected is 69 dBA. The actual operation is expected to be in between these levels.

The modeling accounts for the equipment under full base load conditions consistent with the regulatory criteria. Results of the modeling are shown in Table 7 and are provided in graphic form in Figure 8. The model does not account for the potential shielding provided by offsite buildings.

Table 7: Summary of Modeled Sound Levels at Receptors (distance from equipment)

Receptor	Distance (ft)	Project Sound (dBA)	Criterion (dBA)	Comply?
Property Line W	200	51	61/51	Yes
Property Line N1	30	65	70	Yes
Property Line N2	30	66	70	Yes
Property Line N3	30	69	70	Yes
Property Line N4	30	62	70	Yes
Property Line E	200	50	66	Yes
Property Line S	150	43	70	Yes
Residential, W	240	49	61/51	Yes
Residential, NW	420	45	61/51	Yes
Industrial, N	65	61	70	Yes
Residential, NE	320	49	61/51	Yes
Residential, E	220	48	61/51	Yes
Residential, S1	200	46	61/51	Yes
Residential, S2	200	45	61/51	Yes
Residential, S3	225	45	61/51	Yes

Mitigation Measures

As noted, the factory was designed with thick, well insulated walls to contain its sound. Rooftop air handlers are designed in a way that they make little contribution to the sound field observed in the area. All major openings are located to allow the facility itself to shield the activity sound from the community to the south. The community to the east and west enjoy much more sound reduction due to distance. Recent upgrades to the infrastructure take advantage of the facility design. Most major equipment is located to the north of the facility, adjoined by industrially zoned uses. The N2 gas plant has a solid block wall was placed along the south and east faces of the compressor area to provide additional shielding of the area from the residential areas. Individual items of equipment have been fitted with enclosures and silencers where available. The standby generator is not included in this study, but was designed within an enclosure with silencing at all openings (see bottom of page 13). In this way, the larger capacity gas generator is essentially an equal sound source as the smaller existing gas generator that it replaced.

Conclusions

The FuelCell Energy facility at Torrington manufactures hardware that is used around the world to generate clean, efficient, steady power. The facility is consistently seeking processes that improve the value of its equipment offerings. Existing equipment and recent upgrades include sound sources of modest level such as blowers, pumps, condenser and fans. The size of the equipment and character of the sound is more typical of commercial building mechanical equipment than of typical electrical generating sources. Fuel cell equipment inherently lacks the heavy mechanical equipment that is commonly associated with electrical generation. Sound mitigation measures are engineered into the testing equipment and configurations. Cryogenic air reduction is an inherently noisy operation due to compressor sound. Sound reduction is provided by compressor enclosures, vent muffler and lagging on piping as needed. A 12-foot architectural wall was also added at the N2 plant east and south perimeter to further manage the expected sound emissions. Carbon recovery from the FuelCell tail gas is a recent innovation and uses skid mounted equipment of a similar nature to the SureSource generation layout.

The ambient baseline was established by measurements that exclude short term ambient sounds (fleeting sources like nearby cars & trucks) so it represents quiet conditions for the area. The potential sources of sound at the facility were identified and quantified. Sound level modeling techniques were employed to estimate the sound levels at the nearest receptor locations of varied land uses. The field measurements at the existing facility demonstrate that it currently meets the CDEEP standards at locations dominated by the FCE facility. Many of the outdoor infrastructure sources are continuous sources. However, since the facility meets the nighttime standard in this conservative study, it will also meet the higher daytime standard. The results of the modeling indicate that the facility levels resulting from recent and upcoming infrastructure changes will continue to meet the CDEEP noise criteria at all property line and community receptors.

Figure 8: **Graphical Summary of the Predicted Facility Sound Levels at Receptor Locations**