Exhibit 4

Noise Report

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Sandstone Environmental Associates, Inc.

Noise Review
Proposed Liquid Petroleum Gas Storage Facility
Finger Lakes LPG Storage, LLC

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1.0 Background

1.1 Introduction

Sandstone Environmental Associates Inc. (SEA) was retained by Earthjustice in December 2014 to assess noise associated with the proposed construction and operation of an underground liquid petroleum gas (LPG) storage facility (Project) in the Town of Reading, New York, and to determine whether the Project may have significant unmitigated noise impacts.[1] To answer that question, I reviewed the Draft Supplemental Environmental Impact Statement (DSEIS) prepared in support of the application of Finger Lakes LPG Storage, LLC (the Applicant) for an underground storage permit for the Project as well as a Sound Study prepared by Hunt Engineers, Architects & Land Surveyors (Hunt), and I evaluated those documents in light of the New York State Department of Environmental Conservation (NYSDEC or the Department) Program Policy and guidance entitled *Assessing and Mitigating Noise Impacts* (NYSDEC, 2001). I also performed a review of the scientific literature on long-distance sound transmission over water bodies; conducted noise monitoring in the Town of Reading and the Town of Hector (east side of Seneca Lake); and calculated future noise levels at receptors in Hector.

As detailed in the Community Character Analysis by Harvey K. Flad, Ph.D., the study area is a significant recreational destination with wineries, historic sites and districts, scenic roads, numerous bed-and-breakfasts, and the Watkins Glen State Park. As the Department has recognized:

> The sound generated by proposed or existing facilities may become noise due to land use surrounding the facility. When lands adjoining an existing or proposed facility contain residential, commercial, institutional or recreational uses that are proximal to the facility, noise is likely to be a matter of concern to residents or users of adjacent lands.

(NYSDEC, 2001: 2) Residents seeking to preserve the character of the Seneca Lake community have expressed concern about the Project's potentially significant noise impacts.

I believe that those concerns are well founded. In my opinion as an environmental engineer with more than 40 years' experience in conducting noise studies, environmental impact statements, and environmental assessments in over 30 states (see Appendix 7.3.1), residents of the Seneca

[1] Two SEA experts collaborated on this report. A. Brook Crossan, a principal environmental engineer, conducted SEA's noise monitoring and drafted this report. Nancy C. Neuman, a principal environmental analysis, reviewed the report for purposes of quality assurance and approved its contents. Curriculum vitae for both Crossan and Neuman are attached to this report as Appendices 7.3.1 and 7.3.2.

Lake community and tourists visiting the area are likely to suffer significant and unmitigated noise impacts from the Project, notwithstanding the mitigation measures proposed by the Applicant and conditions that NYSDEC proposes to attach to the Applicant's permit, if the permit is granted. As I explain below, more study is needed to characterize those noise impacts, particularly on residential and recreational receptors on the eastern shore of Seneca Lake. Until that study and characterization have been completed, the Applicant cannot identify all potentially significant impacts and cannot propose measures to mitigate some or all of them; nor can the Department ascertain the full extent of unmitigated significant noise impacts.

1.2 Noise Characteristics and Parameters

The Department defines noise as "any loud, discordant or disagreeable sound or sounds. More commonly, in an environmental context, noise is defined simply as an unwanted sound." (NYSDEC, 2001: 2)

Sound pressure level (SPL), or perceived loudness of noise, is expressed in decibels (dB) or measured on the A-weighted decibel (dBA) scale. The A-weighted scale is used for evaluating the effects of noise in the environment because it is "weighted towards those portions of the frequency spectrum . . . to which the human ear is most sensitive" (NYSDEC, 2001: 7) and therefore most closely approximates the response of the human ear. On this scale, the threshold of discomfort is 120 dBA, and the threshold of pain is about 140 dBA. Because the scale is logarithmic, an increase of 10 decibels represents a SPL that is 10 times higher. However, humans do not perceive a 10 dBA increase as 10 times louder; they perceive it as twice as loud. The following is typical of human response to relative changes in noise level:

Perception of Changes in Noise Levels

Change (dBA)	Average Ability to Perceive Changes in Noise Levels (Human Perception of Change)
2-3	Barely Perceptible
5	Readily Noticeable
10	A doubling or halving of the loudness of sound
20	A dramatic change
40	Difference between a faintly audible sound and a very loud sound

Source: Bolt Baranek and Neuman, Inc. *Fundamentals and Abatement of Highway Traffic Noise, Report No. PB-222-703*. Prepared for Federal Highway Administration, June 1973.

The SPL that humans experience typically varies from moment to moment. Therefore, a variety of descriptors are used to evaluate environmental noise levels over time. Some typical descriptors are defined below:

- L_{eq} is the continuous equivalent sound level. The sound energy from the fluctuating SPLs is averaged over time to create a single number describing the mean energy or intensity level. High noise levels during a monitoring period will have greater effect on the L_{eq} than low noise levels. The L_{eq} has an advantage over other descriptors because L_{eq} values from different noise sources can be added and subtracted to determine cumulative noise levels.
- L_{max} is the highest SPL measured during a given period of time. It is useful in evaluating L_{eq}s for time periods that have an especially wide range of noise levels.
- L_{10} is the SPL exceeded 10 percent of the time. Similar descriptors are the L_{01}, L_{50}, and L_{90}.

"Frequency (perceived as pitch) is the rate at which a sound source vibrates or makes the air vibrate." (NYSDEC, 2001: 7) Most sounds are composed of more than one frequency. Long-distance atmospheric transmission of noise affects its various constitutive frequencies differently than short-distance transmission. The higher frequencies attenuate faster in the atmosphere than do the mid- and lower frequencies.

To accommodate this phenomenon in a noise analysis, the whole frequency range is divided into bands, each of which covers a specific range of frequencies. A band is said to be an octave in width when the upper band frequency, expressed in Hertz (Hz), is twice the lower band frequency. Because the differential attenuation rates are not significant over short distances, an octave band analysis is typically not necessary for evaluation of noise at receptors within 1,000 feet of sources. Over long distances, an octave band analysis should be conducted for both the source and the receptor, to provide an accurate quantitative analysis of noise transmission and to allow an adequate assessment of the intrusiveness of that noise into the background.

1.3 Traffic Noise

Since traffic noise is the most important component of the baseline existing noise levels in the Project area, it is important to understand the disproportionate contribution of trucks to ambient noise. It is common industry practice to convert vehicular traffic volumes into Passenger Car Equivalent (PCE) values. This system is summarized in the *2014 CEQR Technical Manual* (NYC, 2014), as follows:

- autos and light trucks = 1 passenger car,
- medium trucks (9,900-26,400 pounds) = 13 passenger cars,
- heavy trucks (more than 26,400 pounds) = 47 passenger cars, and
- buses (capacity of at least 10 persons) = 18 passenger cars.

Thus, PCEs are the numbers of autos that would generate the same noise level as the observed vehicular mix of autos, medium trucks, and heavy trucks. PCEs are useful for comparing the effects of traffic noise on different roadways or for different future scenarios. These relationships highlight the need for traffic classification counts to understand existing traffic noise levels and to calculate future traffic noise.

1.4 Organization of this Noise Report

This report starts with a description of the independent work that I conducted, summarizes the significant deficiencies that I identified in the Applicant's sound studies (Hunt, 2011, 2013 & 2014)[2], and ends with recommendations for additional analysis and mitigation.

Section 2.0 summarizes the work that I performed.

Section 3.0 describes the following significant deficiencies in the Applicant's sound studies:

1. The region of influence has not been correctly delineated.
2. Noise sources and receptors have not been adequately mapped.
3. Background noise levels have not been properly monitored and reported.
4. Construction noise has not been analyzed and cannot be analyzed with currently available information.
5. Project-related rail and truck noise has not been properly analyzed.
6. Effective mitigation measures have not been identified.

Section 4.0 summarizes our recommendations for (1) additional analysis required before NYSDEC determines whether to grant the permit and (2) additional required permit conditions, should the permit be approved.

Section 5.0 provides a glossary of terms.

Section 6.0 is a bibliography of documents reviewed.

Section 7.0 includes three Appendices:

7.1: Georgia State University, *Refraction of Sound*
7.2: Three maps of the SEA study area and noise receptors
7.3: Curriculum vitae of A. Brook Crossan, Ph.D., P.E. and Nancy C. Neuman, Ph.D.

2.0 Work Performed by SEA

2.1 Review of Current Literature Regarding Noise Transmission over Water

Review of the literature shows several important quantitative studies relating to wind turbine noise traveling over large bodies of water to the shoreline. The studies (Bolin, Boue, & Karasalo, 2009: Harrison, 2012; and Institute of Acoustics, 2013) have shown that the traditional spherical noise transmission from a point source, which results in a six dB drop per doubling of distance, is not present over the water body. Rather, a cylindrical transmission occurs, with a 3 dB drop per doubling of distance at distances greater than 600' from the source. This reduction

[2] 2012-01-20, BSK to DEC Supplemental Information, Attachment 7; 2014-03-07, Hunt Revised Sound Study, with report revised July, 2013.

of attenuation has significant implications for noise transmission to the east side of Seneca Lake, as will be discussed further in Section 2.3.

These studies of sound transmission over water involve bays and oceans, which have far more wave action than does Seneca Lake. Also, the turbines do not generate noise under calm wind conditions, so noise from turbines are highest in windy conditions during which there is significant wave action. At Seneca Lake, the most sensitive conditions are during calm periods, when the water is flat with no waves, and the surface is even more reflective. Under those circumstances, there will be even less than a 3 dBA drop per doubling of distance from the noise source. (For more information on this effect, see Appendix 7.1.)

The Department has acknowledged this phenomenon:

> Temperature inversions may cause temporary problems when cooler air is next to the earth allowing for more distant propagation of sound**.** *Similarly, sound waves will bend towards water when it is cooler than the air and bounce along the highly reflective surface. Consequently, large water bodies between the sound source and the receptor may affect noise attenuation over distance.*

(NYSDEC, 2001: 10) (emphasis added) The scientific research thus adds credence to reports I have received that, under certain meteorological conditions, conversations on the west side of Lake Seneca are plainly audible (almost to the point of being able to understand the words) on the east side of the lake, a distance of 8,000 feet. The monitoring discussed in Section 2.3 below confirms that noise is transmitted across the lake.

2.2 Review of DSEIS and NYSDEC Guidance

Review of the DSEIS (Finger Lakes, 2011)[3] revealed that it falls far short of what is recommended in the Department's guidance (NYSDEC, 2001) and standard industry practice for SEQRA documents, as does the Sound Study (Hunt 2011, 2013, 2014)[4]. These shortcomings are discussed in detail in Section 3.0 Deficiencies.

2.3 SEA Noise Monitoring

Procedures

Appendices 7.2.1 through 7.2.3 are maps showing four locations or receptors (A, B, C, and D) where I performed noise monitoring or for which I made noise calculations. On Monday, 15 December 2014, SEA measured noise at A, B, and C locations, and on Tuesday, 16 December 2014, I measured noise at locations A and B.

- Location A is the deck at 4207 Phelps Road in Hector, NY, on the east side of Seneca Lake.

[3] Final DSEIS Text.
[4] 2012-01-20, BSK to DEC Supplemental Information, Attachment 7; 2014-03-07, Hunt Revised Sound Study, with report revised July, 2013.

- Location B is the top of the stairs to the dock to the south of Receptor A. These locations were selected to be representative of the western (lake-facing) frontage of the lakefront houses and recreational areas in Hector.
- Location C is 25' from the edge of Route 14, at the parking lot of the Glen Motor Inn at 3380 Route 14, south of the Project in Reading. It was selected to investigate why truck noise generated on the western side of Seneca Lake and monitored at Receptor A (on the eastern side) was louder when the trucks were *not* directly across the lake.
- Location D is in Reading directly across the lake from Receptor A in Hector.

The instruments used were a Larson Davis Model 831 Sound Level Meter, an ANSI Type I-certified instrument. The device was either mounted on a tripod at a height of five feet above the ground and positioned at least six feet away from all surfaces capable of reflecting sound, or held in front of the body facing the noise source. I calibrated the noise monitor before and after use. I used a wind screen during all sound measurements, except for calibration. All measurement procedures conformed to the requirements of ANSI Standard S1.13-1971 (R1976). During the monitoring periods, the weather was clear to slightly overcast, with temperatures in the 20s° and 30s° Farenheit, and with calm to light winds from the southeast. The instruments were within their annual factory calibration times and all monitoring was above the instrument limit of 14° Farenheit.

Noise Monitoring Results – East Side of Seneca Lake in Hector

Naturally occurring background noise sources in Hector that were noted and monitored during the two days on-site varied depending on the meteorological conditions.[5] When winds were calm, the loudest source was nearby bird chirping. The next loudest, and relatively constant, source was a small intermittent stream that was flowing into the lake, because of recent rain events. Other intermittent events included the gentle rustle of leaves caused by squirrels moving through the understory. During such calm conditions in the summer months, cicada noise is likely to be a major component of the background during the evening and night-time.

When the wind blew, there were waves on the lake that broke against the shoreline and docks, raising the sound levels. The wind also caused the sound of rustling leaves. During a portion of the time of our observations, there was a SE wind that generated small waves in the lake.[6] While we were there, the waves lapping against the shore were the loudest natural sound source.

So in summary, the noise from natural (without human sources) background sources, as monitored by SEA, was:

- Calm Conditions

[5] These sounds do not appear to fit the NYSDEC definition of "noise," as they often are welcome, rather than "loud, discordant, or disagreeable." Natural sounds may not be perceived as intrusive even if they are as loud as industrial noise.

[6] Studies have shown that noise transmission downwind is not increased (NYSDEC, 2001). But noise is transmitted less well upwind, as the wind does disperse the sound waves. So noises on the west side will be more apparent and intrusive with a SW, W, or NW wind than with a SE, E, or NE wind.

    - Normal background – mid to high 20s dBA
    - Background with intermittent stream flowing after a rain – 29 to 31 dBA
    - Distant bird chirping – 32 to 35 dBA (peaks)
    - Nearby bird chirping – 40 to 44 dBA (peaks)
- Windy Conditions
    - Water lapping on shore – 44 to 52 dBA

In the summer months, I would expect cicada noise in the 50s or 60s dBA, based on monitoring I have done at similar locations. It is standard practice to acknowledge their presence but to exclude them from analysis, because they are intermittent in nature.

Anthropogenic (human-made) sources from Reading, produced the following noise, as monitored from the west-facing receptors in Hector:

- Trucks on Route 14 on the west side of the lake – 33 to 39 dBA (the 38 and 39 dBA values were from northbound trucks leaving Watkins Glen and climbing the hill toward the Project site)
- Trains on the spur near the lake west shore – 42 to 53 dBA
- Trains on the main line near the ridge line – 42 to 53 dBA
- "Industrial" activity (various audible thumps that were monitored) – 38 to 42 dBA
- General aviation aircraft – 33 to 36 dBA

These results demonstrate that existing transportation and industrial noise originating in Reading is up to 30 dBA higher than the natural background in Hector and thus can and does have significant noise impacts on occupants of west-facing homes. Notwithstanding the existing noise from Reading, the Project may have significant noise impacts on west-facing receptors in Hector, if Project noise occurs more frequently, for more extended periods of time, or at different times than current anthropogenic noise sources. For example, the Applicant currently estimates that more than 100 additional rail cars will travel to the Project site and unload propane during the summer months, creating the noisiest activity precisely when west-facing windows in Hector are likely to be open and temperature inversions will propagate sound farther over the lake. The Applicant's Sound Study analyzed receptors only in Reading, however, and thus failed to provide an adequate analysis of potentially significant noise impacts from the Project. That study should be supplemented with new measurements, taken at the appropriate time of year, under a variety of meteorological conditions, from receptors on the east side of Seneca Lake, and a new noise analysis should be performed.

Noise Monitoring Results – West Side of Seneca Lake in Reading

During the limited SEA noise monitoring on the west side of the lake, we were able to monitor noise levels of trucks traveling on Route 14 and a train on the lower (slower) track near the lakeside. Although closer to the receptors than the main line trains, the trains on the spur traveled slower and therefore were quieter at 50' than the faster trains.

For northbound trucks traveling up the hill after leaving Watkins Glen, the L_{max} was 87 dBA at 25', or 81 dBA at 50'. Monitoring was conducted at the hill because noise monitoring on the east side of the lake demonstrated that truck noise on that hill was greater than on the level stretch of highway directly west of the east-side receptors.

The train traveling at just a few miles an hour along the lakefront had a L_{eq} of 75 to 76 dBA at 50' for just the track noise. The L_{max} of the train whistle was 112 dBA.

This data reinforces the fact that off-site truck and train activity generates higher noise levels in Hector than the on-site activities, and therefore cannot be excluded from an adequate noise analysis.

- The trucks approaching the site from the south are 6 to 7 dBA louder at the lakeside receptors in Hector than the trucks on-site.
- The train whistles at the off-site road crossings are 23 dBA louder than the loudest on-site noise generator and exist for a longer period of time.

2.4 Calculation of Project-Induced Noise Levels in Hector

As has been discussed above, a variety of factors affect noise transmission over the lake. The best way to demonstrate these factors is to examine truck noise from two different locations. At Location C (in Reading) SEA-monitored truck noise had an L_{max} of 81 dBA at 50' for trucks climbing the hill. We then used the non-climbing L_{max} of 78 dBA at 50' at location D, which is in Reading directly across the lake from Receptor A in Hector. The distances from source to receptor are summarized below, and depicted In Appendix 7.2.3.

Source Location	Distance from Source to Receptor A, feet		
	Over Land	Over Water	Total
C	1,300	14,000	15,300
D	3,400	6,000	9,400

If the 6 dBA decrease per doubling of distance pertained to both land and water, the 81 dBA L_{max} at Location C would measure 31 dBA at Receptor A. However, SEA monitored an L_{max} of 39 dBA at Receptor A. If, following the scientific literature on cylindrical transmission over water discussed above, we assume a 6 dBA drop over land and the first 600 feet of water, and a 3 dBA drop for the remainder of the distance over the water, the predicted result for Receptor A is 40 dBA. We also did a calculation assuming a 7 dBA drop over land, to account for intervening vegetation, and a 3 dBA drop over the water, which resulted in a predicted L_{max} of 35 dBA at Receptor A. See the summary chart below.

Truck at Location C, L_{max} at 50', dBA	Decrease per doubling over land/water, dBA	Calculated L_{max}, dBA	Monitored L_{max}, dBA
81	6/6	31	39
	6/3	40	

	7/3	35	

These calculations demonstrate that the differential noise attenuation over distance for transmission of sound across a large water body as opposed to over land applies to transmission over Seneca Lake. Since SEA's monitoring was done on a cold day and does not account for the enhanced transmission when refraction occurs, we would expect even less attenuation when the air over the lake is warmer than the lake water, with noise levels higher than the 39 dBA monitored in December.

We did similar calculations for the truck at Location D, and the results are summarized in the chart below.

Truck at Location D, L_{max} at 50', dBA	Decrease per doubling over land/water, dBA	Calculated L_{max}, dBA	Monitored L_{max}, dBA
79	6/6	34	33
	6/3	38	
	7/3	32	

With regard to noises directly across the lake from Receptor A, and about 3,000' upslope from the lake, we anticipate that there will be about a 45 dBA reduction from the values at 50' that residents on the east side of the lake will experience. Thus, the L_{max} train noise of 89 dBA would be 44 dBA on the east side of the lake. This is more than 15 dBA higher than the normal background under calm conditions (of mid- to high-20s dBA) and would be very intrusive. The L_{eq} of 78 dBA would be 33 dBA, which also is above calm background conditions. These calculations do not include the train whistle that is 23 dBA louder.

For sources operating near the lake shore such as the fire pumps (Hunt 2013)[7], the decrease would only be 30 dBA. If not mitigated, this would result in noise at a level of about 54 dBA in Hector, which is 25 dBA above the existing calm background.

3.0 Deficiencies in the Sound Study

3.1 The Region of Influence (ROI) Has Not Been Correctly Delineated.

The ROI is the physical area that bounds the environmental, sociological, economic, or cultural feature of interest for the purpose of analysis. It can vary by resource area—for example, the ROI for visual impact analysis may be smaller than the ROI for socio-economic impact analysis. Sometimes multiple resource areas have the same ROI—for example, the traffic, noise, and micro-scale air quality analysis for a destination commercial development would be defined by the geography of intersections potentially affected by project-induced traffic. If the ROI is improperly defined, potentially significant impacts of the project may not be identified.

[7] 2014-03-07, Hunt Revised Sound Study, with report revised July, 2013.

Some EISs explicitly define the ROI for each resource area; in others, the ROI is implicit in the scope of analysis. Neither the DSEIS nor the Sound Study for the Project expressly defines the ROI for noise, but that ROI is implicit in their analysis, which includes only on-site noise sources and receptors only in Reading, in the immediate vicinity of the proposed storage facility.

The Project will increase off-site rail and truck traffic over baseline conditions, but only on-site transportation noise has been evaluated so far. Off-site train noise cannot be ignored, because whistle noise is the peak noise, and it occurs off-site; moreover, the rumbling trains can be heard miles and miles away. Off-site truck traffic cannot be ignored, because trucks in Reading sound the loudest in Hector, when they are traveling northbound from Watkins Glen on Route 14 and are climbing the hill toward the Project site. If the off-site transportation noise is included, as it must be, noise will have to be evaluated at receptors in a geographic study area that could extend from Watkins Glen at the south to Geneva at the north.

It is standard industry practice in analyzing impacts under SEQRA to assess noise caused by project-related traffic not only when it is on the project site, but also as it approaches and leaves the site. The entire area affected by project-induced traffic is the relevant ROI for noise during both construction and operations. The Applicant ignored off-site rail and truck noise that will be caused by the Project, some of which is louder than on-site noise, and thus incorrectly delineated the ROI.

In addition, the Applicant failed to acknowledge the influence of temperature and wind on noise transmission over Seneca Lake. As the foregoing discussion of SEA noise monitoring demonstrates, both on- and off-site rail and truck noise sources are likely to have significant adverse impacts on receptors across the lake in Hector. The failure to identify receptors outside of Reading compounds the failure to analyze off-site noise sources, and the result is an indefensibly narrow ROI for noise.

With an incorrectly delineated ROI, the Applicant cannot adequately evaluate the potentially significant noise impacts of the Project (on receptors on both sides of Seneca Lake) and cannot identify appropriate mitigation measures to be included as conditions on its permit, should one be granted. Until those problems are cured, the analysis cannot demonstrate that significant noise impacts have been mitigated to the extent practicable. DEC therefore should deny the underground storage permit.

3.2 Noise Sources and Receptors Have Not Been Adequately Mapped.

A noise analysis that meets industry standards will provide maps that clearly identify all noise sources and receptors, at the variety of scales needed to illustrate the relationships among them and their relationship to the wider community. The understanding of noise in the wider context is important because the community's attitude to and tolerance for noise are part of what defines its character. The character of a community that has worked together to create a peaceful and bucolic retreat will be adversely affected by increasing industrial noise, even if some residents are out of earshot.

For the Project, there should be one overview map that covers Seneca Lake and shoreline communities (including Watkins Glen and Geneva); maps at smaller scales to portray specific sources and potentially impacted receptors; and the closest views would be reserved for the noise monitoring sites, to show exactly where noise monitoring data had been collected and where receptor calculations were being made. The Applicant's maps do not meet this standard, and the deficient mapping in the Sound Study made evaluation of the report very difficult. For example, without conducting independent research on Google, it was not clear that Figure 1 and Figure 2 were views of areas immediately adjacent to one another. When the ROI is properly redefined, and new noise sources and receptors are properly identified, the Applicant also should correct and supplement its maps.

3.3 Baseline Noise Levels Have Not Been Properly Monitored and Reported.

Accurate assessments of noise impacts involve both quantitative and qualitative analysis, and they depend on accurate accounts of "not only ambient noise levels, but also the existing land use." (NYSDEC, 2001: 20) If baseline noise levels are overstated, noise increases will appear lower than they actually are, and the significance of impacts will be understated. Similarly, the description of the human context must make it possible correctly to determine "whether an increased noise level or the introduction of a discernable sound . . . is out of character with existing sounds, [and thus] will be considered annoying or obtrusive." *Id.*

The reported values for the receptors in Reading were of limited utility for a variety of reasons:

- There was no sketch, with clearly delineated dimensions, showing the exact location of the monitoring with respect to the major existing noise source (adjacent roadway), the sensitive receptor (house), and the Project element of interest. These relationships are very important, as can be seen from the following examples:
    - If the monitoring is 10' from the edge of the road, and the house is set back 40' from the road, the real background could be 6 to 8 dBA lower than reported, and the potential for impacts would be greater.
    - For some receptors, road noise may impact the front of the house, while the train or pump noise impacts the side or rear of the house, where the background noise level is likely to be substantially lower. Adding Project noise to existing levels at the front of the house understates the impact.
- There was no description of what caused the L_{max} at each location. Was it a car, a truck, a train whistle, a dog barking, or an airplane overhead? Without that knowledge it is not possible to completely assess the impact of additional trucks and trains, either quantitatively or qualitatively. Nor is it possible to use that value for comparison to projected L_{max}s.
- No concurrent traffic counts were reported. When taking noise measurements along a roadway, it is standard industry practice to perform traffic classification counts (e.g. counts of the number of autos, medium trucks {2-axle, 6-wheel}, and heavy trucks {3 or more axles}) for that time period. Because, on average, one heavy truck is as noisy as 47 cars, an understanding of truck volumes is crucial.
- With the noise levels being influenced so much by individual heavy truck passbys, other noise parameters, such as L_{50} or $L_{90,}$ would give a much better idea of the typical background levels to which new sources would be added. The baseline is likely to be lower with use of these measures.

- The reported night-time noise levels were monitored in July between 8:30 and 10:30 P.M. and therefore were contaminated with cicada noise. In cooler weather, the ambient noise levels will be substantially lower, and the potential for Project impacts will be substantially higher.

The Sound Study Supplement (Hunt, 2014)[8] attempted to address the problem of noise levels monitored at the front of a motel as the base for Project noise coming from the rear. The revised analysis identified L_{eq}s of 42.4 dBA and 45.0 dBA, respectively, for daytime and night-time noise at the rear face of the motel, as compared with L_{eq}s of 61.7 dBA and 55.7 dBA, respectively, at the front face of the motel (used as the baseline in the original sound study). (Hunt, 2014: Appendix B, Table 2)[9] The 19.3 dBA difference in daytime values was caused by the building, which shields the rear from highway noise. Other receptors also should be checked for similar biases.

The new analysis, based on noise levels at the rear of the motel, does not wholly cure the bulleted problems with the Sound Study. The fact that the evening value at the rear was nearly 3 dBA *higher* than the daytime value demonstrates that summertime cicada noise was likely a dominant component at night. With traffic volumes lower in the evening, a more accurate night-time level would be 19.3 dBA less than the 55.7 dBA value at the front, or 36.3 dBA (rather than 45.0 dBA). Moreover, since truck volumes continue to decrease later in the night, it is quite likely that true baseline night-time levels (from about 2 to 4 A.M.), without cicadas, would be closer to 30 dBA. At either time, the projected noise levels from the Project would be 10 dBA above the baseline—a significant impact requiring mitigation. The current noise analysis thus fails to identify all significant impacts not only in Hector but also in Reading.

3.4 Construction Noise Has Not Been Analyzed and Cannot Be Analyzed with Currently Available Information.

Standard industry practice has evolved to perform a quantitative construction noise impact assessment, upon which mitigation measures can be evaluated. The Department plainly assumes that such an analysis will be done and recommends measures to mitigate significant construction noise impacts. For example, the guidance states:

> Alternative *construction* or operational methods, equipment maintenance, selection of alternative equipment, physical barriers, siting of activities, set backs, and established hours of *construction* or operation, are among the techniques that can successfully avoid or reduce adverse noise effects.

(NYSDEC, 2001: 3) (emphasis added) Specifically:

> Limiting hours of *construction* or operation can be an effective tool in reducing potential adverse impacts of noise. The impacts of noise on receptors can be significantly reduced by effectively managing the hours at which the loudest of the operations can take place.

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[8] 2014-03-07, Hunt Revised Sound Study, with report revised July, 2013.
[9] *Id.* at app. B, tbl. 2.

(NYSDEC, 2001: 23–24) (emphasis added) There is no analysis of Project construction noise in the Sound Study (Hunt, 2011, 2013, & 2014).[10] Moreover, there is no description of proposed construction activities—their duration, the types of equipment needed to conduct the operations, and the number of such pieces of equipment—on which such an analysis could be based.

Standard industry practice for a project with so much grading and construction, in part on steep slopes and over such a large area, is to provide a quantitative assessment of noise sources during construction. This analysis is especially important for construction activities that may occur on weekends or at night, when noise levels are typically lower. Construction noise that might not be noticed when people are at work also may be out of character and more intrusive on weekends, when residents and tourists are engaged in outdoor recreational activities. The risk of significant adverse Project construction noise impacts on receptors in both Reading and Hector is increased because the Applicant has made no commitments to limit the time of day, or day of week, within which construction activities can occur.

3.5 Project-Related Rail and Truck Noise Has Not Been Properly Analyzed.

Neither the DSEIS nor the Sound Study clearly quantifies either existing or Project-related transportation in the relevant ROI for noise. Baseline conditions with respect to train activity through the Project area (frequency, number of cars, and time of day) and vehicular trips on Route 14 (both northbound and southbound) have not been documented. The number and frequency of potential train trips and vehicle trips to and from the Project, during construction and operation, have not been definitively identified. Without accurate information about baseline and Project-generated train and truck traffic, an assessment of potential transportation noise impacts, during both construction and operation, is impossible.

What information there is about on-site Project-generated train and truck noise raises significant questions. Noise levels (L_{max} and L_{eq}) for the following train noises were based on monitoring at a similar site at 50' from the source:

Activity	L_{eq}, dBA	L_{max}, dBA
Train Entrance	72.4	81.2
Train Uncoupling	78.8	87.9
Full Train Car Removal	73.8	88.9
Empty Train Car Placement	77.2	87.3
Train Car Coupling Air Release	77.2	87.0
Total Train Time	76.1	88.9

[10] 2012-01-20, BSK to DEC Supplemental Information, Attachment 7; 2014-03-07, Hunt Revised Sound Study, with report revised July, 2013.

A few items are worthy of note with respect to train activity:

- Monitoring periods for the various train activities ranged from 10 minutes to 35 minutes, depending upon the duration of the activity.
- The values reported for the total train time (1 hour & 55 minutes) included 15 minutes that was reported as background. The L_{eq} for the 1 hour & 40 minutes of actual total activity is higher than reported and is approximately 78 dBA.
- The Sound Study reports that, at a distance of 800', the train had a L_{eq} of 67.3 and a L_{max} of 76.6 dBA. If that measurement is correct, a 6 dBA change per halving of distance would translate to an increase of 24 dBA at 50', or an L_{eq} of 91.3 and an L_{max} of 100.6 dBA, which is 19 dBA higher than what was monitored at 50' from the train entrance. The discrepancy is very significant and is unexplained. It suggests that the monitoring at 50' did not capture peak noise levels and therefore should be redone.

Truck activities were also monitored at 50' as summarized below.

Activity	L_{eq}, dBA	L_{max}, dBA
Trucks	71.3	79.2
Unloading Trucks	73.6	77.8

It is unclear as to whether large differences (up to 15 dBA) between the reported L_{eq}s and L_{max}s for the train and truck activities are based on true variations of noise from the source or reflect that the noise source was moving and was not always 50' away from the monitor. Given the variable nature of the truck and especially rail noise, a one-hour L_{eq} is not an appropriate measure from which to assess impacts. The L_{max} should be used to assess rail and truck noise. Out-of-character fluctuating industrial noise sources in a residential and recreational area cannot be assessed adequately using one-hour L_{eq}s, which averages out the peaks and valleys.

In addition, there ostensibly has been a major revision of proposed Project operations since completion of the noise analysis. As recently as December 2014, the Applicant filed a "transportation allocation" that purports to utilize pipelines for 95 percent of propane transportation to the Project and for 100 percent of propane transportation from the Project. The Applicant suggests that all propane would be piped directly to Selkirk (south of Albany), but no commitment has been made not to pipe propane to the TEPPCO site for truck distribution over Route 14 and throughout the Finger Lakes or not to use trucks or rail for propane transportation in the future. Moreover, a complete noise analysis has not been performed for the various transportation options.

In my expert opinion, noise evaluation should be based upon worst-case conditions, if they cannot be ruled out for a particular project. In the case of noise generated by the Project, that approach requires an analysis of the original transportation allocation, because the Applicant has made no binding commitment to adhere to the new one for the life of the Project. It would defeat the intent of SEQRA to allow the Applicant to obtain a permit by analyzing almost exclusive use of pipelines for propane transportation, if future lack of pipeline capacity would allow the use of trucks or trains. Analysis of the worst-case scenario should be required unless the Applicant makes a legally binding written commitment to permanent use of the December 2014 transportation allocation.

3.6 Effective Mitigation Measures Have Not Been Identified.

Because potentially significant noise impacts have not been adequately analyzed, the Applicant must identify or demonstrate the efficacy of proposed mitigation measures. Without an adequate analysis of effective mitigation for significant adverse environmental impacts, NYSDEC cannot design permit conditions that would enable it to make the requisite findings under SEQRA and may not approve the permit.

4.0 Recommendations Additional Study and Permit Conditions

4.1 Recommendations for Further Analysis

To address the deficiencies describe above, the Applicant must expand and revise the Sound Study in the following ways:

4.1.1. Establish a proper ROI for both construction and operation noise (including from pumps and transportation).

Include at least the corridor from Watkins Glen to Geneva and the entire eastern shore of Seneca Lake.

4.1.2. Conduct a special study of noise transmission over Lake Seneca during different meteorological conditions.

Since noise transmission over water is dramatically influenced by meteorological conditions, sufficient monitoring needs to be performed to document the full range of conditions, especially those days with calm conditions and warm air. More work needs to be done with concurrent monitoring on both sides of the lake under various meteorological conditions to determine what are reasonable parameters to use for calculations of noise transmission across Seneca Lake. Without such work, SEA has no confidence in any projections that would be made for the east side of the lake.

4.1.3. Obtain octave band information for all sources to use in modeling of noise transmission across the lake.

Perform an octave band analysis of all construction and operation sources in order to properly calculate projected noise levels on the east side of the lake. The octave band sources should either be based on manufacturer's data or monitored data from similar equipment. The calculations at the eastern receptors should reflect the fact that higher frequency noise levels do not travel as well across long distances as do the mid- and low-range frequencies.

4.1.4. Add, and monitor noise at, new receptors for the appropriate conditions, time, and days of week.

Establish appropriate receptors on the east side of Lake Seneca. Multiple receptors are necessary to cover the full length of the construction activities and off-site transportation. Additional receptors also will have to be added on the west to evaluate the transportation noise impacts along the full Seneca Lake corridor.

4.1.5. Monitor at old receptors for appropriate conditions, time and days of week.

Monitoring at the existing receptors needs to be done to:

- Capture the full range of night-time background, including late-night hours (2 to 4 AM), without cicada noise;
- Take proper notes for the source of L_{max} values in all time periods;

- Where front yard monitoring is appropriate, take concurrent traffic classification counts;
- Change monitoring locations to side and rear yards as appropriate.

4.1.6. Document the construction materials, equipment, and schedule.

To perform the required construction noise analysis, the Project must be defined in far greater detail. The following items require clarification, but this list should not be considered exhaustive:

- For brine ponds, specify:
  - Number of pieces of earthmoving equipment
  - Duration of clearing & grubbing and grading
  - Cut and fill calculations to demonstrate the volume of fill needed to be imported (if any)
  - Number of trucks and/or trains required for that fill
- For the train yard, specify:
  - Volume of sub-ballast needed
  - Volume of ballast needed
  - Length of track
  - Number of ties needed
  - Number of trucks and/or trains required
  - Number and type of equipment needed for the construction
  - Duration of the construction
- For the 2-mile pipeline, specify:
  - Duration of the construction
  - Width of construction zone
  - Equipment to be used
  - Whether there are any locations where it will be "jacked" under roads or streams.
- Overall construction schedule

4.1.7. Document commitments on hours of construction and operation.

Either exclude nighttime and weekend/holiday operation by binding commitment or evaluate baseline noise levels by monitoring throughout the entire 24 hours including weekdays, weekends, and holidays. It should be noted that background values are lower at all receptors during the night and on holidays and weekends. Thus, potential noise impacts are greater during those time periods.

4.1.8. Document the existing conditions for rail, traffic, and pipeline.

There needs to be better documentation of the existing conditions for rail, traffic, and the pipeline, so that, if it is determined that there are 100 truck trips/day during certain construction activities, or 32 rail cars per day during certain period of operation, we can ascertain whether those numbers will represent a 5, 50, or 200 percent increase in truck or rail traffic. There also needs to be information on the availability of pipeline capacity, if loss of capacity would allow the Applicant to convert pipeline transmission of propane back to rail or truck.

4.1.9. Clearly describe all operational details, especially all of the transportation options.

Provide an up-to-date description of the operational noise sources (including all rail and trucking operations under currently proposed, previously proposed, and potential future scenarios), including anticipated number of trucks, trains, and rail cars per train; location of operation; duration of operation; and time of operation by hours of the day and days of the week. The rail and truck noise should include travel of new or lengthened trains as they travel to and from the site. The pipeline scenarios should address the percentage of available and projected capacity that they will use.

4.1.10. Model construction and operation noise at all receptors for all times and scenarios.

Once all of the monitoring and special studies are completed, quantitative modeling of construction and operation noise should be performed. The draft permit conditions recommend use of an L_{eq}, but they do not specify a length of time for monitoring. The Department staff also discusses using the L_{max} as a comparison. In order to do that, the source of the baseline L_{max} needs to be described. For example, it should not be unusual events such as an aircraft flying overhead or a barking dog. Since compliance monitoring would exclude an event like that, as the Applicant would not take responsibility for someone else's noise, the baseline L_{max} should represent common noise events such as truck traffic on adjacent roads.

SEA believes that, while the L_{eq} is appropriate for sources that are relatively constant, such as the pumps in this case, for sources such as rail and truck that are highly variable, the L_{eq} is not an appropriate measure. A measure, such as the $L_{90,}$ should be used to allow the analyst to determine whether there is intrusion of peak noises into the quiet background or other high intensity noise that presents disturbances to residents.

4.1.11. Develop appropriate impact criteria.

Appropriate impact criteria need to be developed. Quantitative thresholds are not sufficient. The land use and community character context needs to be taken into account in developing impact criteria.

4.1.12. Compare results to impact criteria to assess the need for mitigation.

The modeling results the need to be compared to the impact criteria to assess the need for mitigation.

4.1.13. Propose and evaluate alternate mitigation measures.

The Department guidance clearly specifies various types of appropriate mitigation. (NYSDEC, 2001) Limiting the times of day when certain activities can take place is an acknowledged mitigation strategy and, in this situation, could be one of the most effective means to mitigate adverse noise impacts, should the permit be approved. Additional sound barriers also may be required around noise generating equipment.

4.1.14. Propose construction noise compliance monitoring plan.

There should be a construction noise compliance monitoring plan that sets limits for equipment noise and establishes a monitoring protocol to ensure that excess noise is not generated.

4.1.15. Propose operational noise compliance monitoring plan.

There should be an operational noise compliance monitoring plan similar to what is in NYSDEC's draft permit conditions. It should, however, be more detailed. For example, the duration of any L_{eq} monitoring and reporting should be specified.

4.1.16. Prepare and submit revised sound study.

A revised Sound Study needs to be prepared that addresses all of the deficiencies discussed above. The report should include a consolidated map that shows all noise sources including the 2-mile pipeline, laydown areas, the rail yards, and the various pumps in relation to all receptor locations on the east and west side of the lake.

4.2 Permit Conditions Required

Until the additional study recommended above is complete, and the numerous major deficiencies that I have identified in the Sound Study have been cured, it will be impossible for NYSDEC to make the findings required under SEQRA, and the permit therefore should not be issued. If the additional study is completed, effective mitigation is identified for significant noise impacts, and the permit it granted, those measures should be incorporated as additional conditions in the permit.

5.0 Glossary

A-Weighted Sound Level - A measurement of the sound pressure level, weighted to most closely approximate the range of frequencies detectable by the human ear. The sound level measurement is weighted by filtering out sounds in the lower and upper frequencies that the human ear is less capable of detecting. Expressed as dBA.

Decibel - A logarithmic scale used to quantify sound measurement. Use of a decibel scale reduces a dynamic range of sound pressures of a million to one to a more manageable range of sound pressure levels of only 1 to 120, zero indicating the reference minimum threshold and 120 the approximate threshold of pain.

Decibel Sound Level ($L_{\%}$) - the sound level which is equaled or exceeded for a specified percentage of the time period of interest; L_1, L_5, L_{10}, L_{50}, etc., are the sound levels exceeded for 1%, 5%, 10%, 50%, etc., of the time period, respectively.

Equivalent Sound Level (L_{eq}) - The long-term A-weighted sound level which is equal to the level of a steady-state continuous noise having the same energy as the time-varying noise, for a given situation and time period. Therefore, it is a time-integrated average sound level.

Maximum Sound Level (L_{max}) – The maximum sound level measured during the period of measurement.

Octave Band Frequencies - Noise can be broken down into different frequencies to better define the spectral characteristic of the noise source. An octave is any two frequencies whose ratio is exactly two to one; therefore, a standard center frequency has been established to identify the frequency range in which the octave changes. This information is important in order to evaluate a noise source in relation to the frequencies that the human ear is capable of detecting. Since the human ear is most sensitive to the mid-range frequencies (1000-4000 Hz), high sound levels in the lower and upper frequencies are not as easily detectable or annoying (see A-weighted definition above).

6.0 Bibliography

Bond et al.	2014a	Letter to Mr. David L. Bimber, Regional Permit Administrator NY State Department of Environmental Conservation, Region 7 dated March 7, 2014; From Kevin M. Bernstein. (2014-03-07, Hunt Revised Sound Study, with report revised July, 2013, BSK to DEC Cover Letter)
Bond et al.	2014b	Letter to Lisa Schwartz, Esq., Assistant Regional Attorney, NYS DEC, dated December 2, 2014 Re: Product Transportation Allocation, From Kevin M. Bernstein. (2014-12-02, Product Transportation Allocation – Revised December 2014, letter and attachment)
Bolin et al.	2009	Long Range Sound Propagation Over a Sea Surface; Bolin, K., Boue', I. Karasalo, J. Acoust. Soc. Am. 126 (5), November 2009, pp. 2191–2197.
Finger Lakes	2011	Draft Supplemental Environmental Impact Statement (DSEIS), Finger Lakes LPG Storage, LLC, LPG Storage Facility, Finger Lakes LPG Storage, LLC, August 2011. (Final SSEIS Text)
Harrison	2012	Sound Propagation From Off-Shore Wind Turbine Arrays, John Harrison, January 2012.
Hunt	2011	Sound Study Prepared for Finger Lakes LPG Storage, LLC, Proposed Watkins Terminal, NY State Route 14, Watkins Glen, NY, Hunt, January 2011, Revised January 2012. (2012-01-20, BSK to DEC Supplemental Information, Attachment 7)

Hunt	2013	Sound Study Prepared for Finger Lakes LPG Storage, LLC, Proposed Watkins Terminal, NY State Route 14, Watkins Glen, NY, Hunt, January 2011, Revised July 2013. (2014-03-07, Hunt Revised Sound Study, with report revised July, 2013)
Hunt	2014	Memorandum to Kevin Bernstein, Bond, Schoeneck & King, March 7, 2014, From Paul Congdon, Re: Sound Study Supplement. (2014-03-07, Hunt Revised Sound Study, with report revised July, 2013)
Institute of Acoustics	2013	Supplementary Guidance Note 6: Noise Propagation Over Water for On-Shore Wind Turbines, Institute of Acoustics, December 2013.
NYC	2014	City Environmental Quality Review (CEQR) Technical Manual, Mayor/s Office of Environmental Coordination, March 2014.
NYSDEC	2001	Assessing and Mitigating Noise Impacts, NY State Department of Environmental Conservation, Division of Environmental Permits, Issuance Date: October 6, 2000, Revised: February 2, 2001.
NYSDEC	2011	Draft Supplemental Environmental Impact Statement (DSEIS) Final Scoping Outline, Finger Lakes LPG Storage LLC, Watkins Glen LPG Storage Facility. DEC 8-4432-00085/00001, 15 February 2011 by cover letter from David L. Bimber. (2011-02-15, DEC to BSK – Final Scope)
NYSDEC	2014	Letter to James T. McClymonds, Chief Administrative Law Judge, NYS Dept. of Environmental Conservation, Office of Hearings and Mediation Services, Attachment: Draft permit conditions, which Department staff propose in the event that a determination is made, after the hearing process, to issue a permit, November 10, 2014, From Lisa Schwartz, Assistant Regional Attorney. (2014-11-10, DEC Staff Draft Permit Conditions)
Reading	1995	Town of Reading, Local Law No. 1 of the year 1995, Land Use Law for the Town of Reading, New York.

7.0 Appendices

7.1 Georgia State University, Refraction of Sound, http://hyperphysics.phy-astr.gsu.edu/hbase/sound/refrac.html (last visited Jan. 6, 2015)

7.2 Maps

7.2.1. SEA Noise Monitoring Sites in Hector

7.2.2. SEA Noise Monitoring Site in Reading

7.3.3. Truck Noise Calculation Locations

7.3 Curriculum Vitae

7.3.1 A. Brook Crossan, Ph.D., P.E.

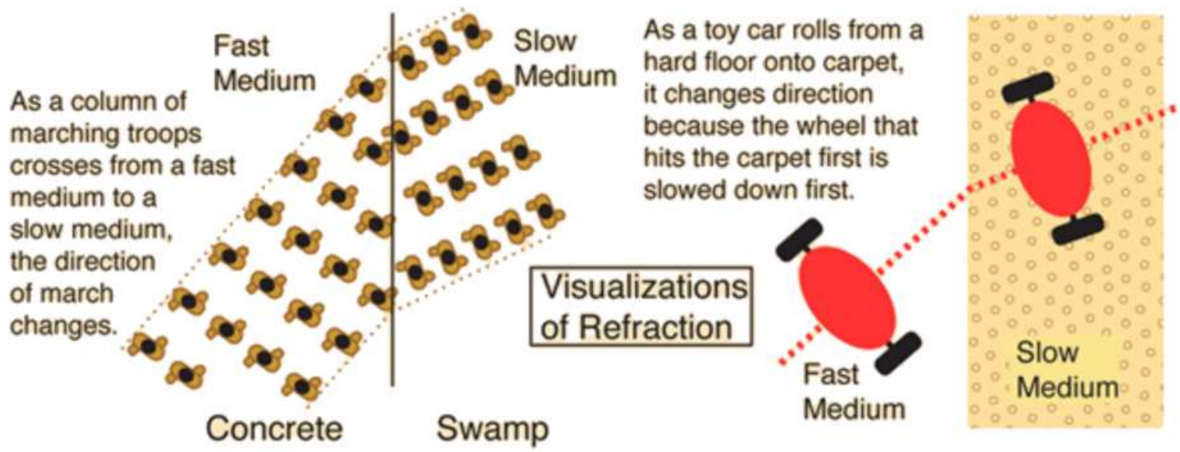
7.3.2 Nancy C. Neuman, Ph.D.

Appendix 7.1

Georgia State University, *Refraction of Sound*

Refraction of Sound

Refraction is the bending of waves when they enter a medium where their speed is different. Refraction is not so important a phenomenon with sound as it is with light where it is responsible for image formation by lenses, the eye, cameras, etc. But bending of sound waves does occur and is an interesting phenomena in sound



These visualizations may help in understanding the nature of refraction. A column of troops approaching a medium where their speed is slower as shown will turn toward the right because the right side of the column hits the slow medium first and is therefore slowed down. The marchers on the left, perhaps oblivious to the plight of their companions, continue to march ahead full speed until they hit the slow medium.

Not only does the direction of march change, the separation of the marchers is decreased. When applied to waves, this implies that the direction of propagation of the wave is deflected toward the right and that the wavelength of the wave is decreased. From the basic wave relationship, $v=f\lambda$, it is clear that a slower speed must shorten the wavelength since the frequency of the wave is determined by its source and does not change.

Another visualization of refraction can come from the steering of various types of tractors, construction equipment, tanks and other tracked vehicle. If you apply the right brake, the vehicle turns right because you have slowed down one side of the vehicle without slowing down the other.

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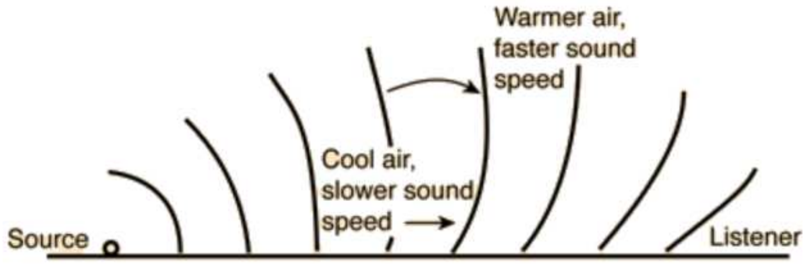
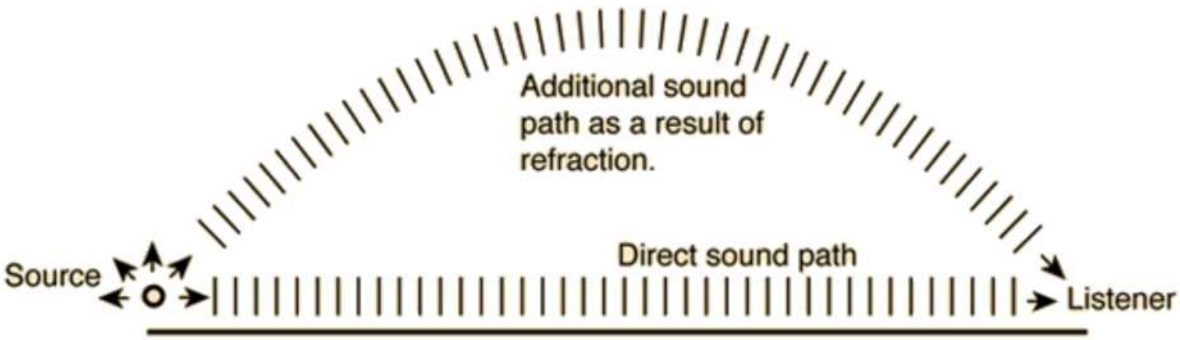
Refraction of Sound

If the air above the earth is warmer than that at the surface, sound will be bent back downward toward the surface by refraction.



Sound propagates in all directions from a point source. Normally, only that which is initially directed toward the listener can be heard, but refraction can bend sound downward. Normally, only the direct sound is received. But refraction can add some additional sound, effectively amplifying the sound. Natural amplifiers can occur over cool lakes.



Further discussion

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Refraction of Sound

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Sound propagation

Early morning fishermen may be the persons most familiar with the refraction of sound. Consider that you have gone out to a lake before dawn. Just as the sun rises over a cool lake, you may hear someone speak to you, saying "Good morning!". You look around and can't see anyone. You are just about at the point of questioning your sanity anyway, being out at this time of the morning, so you decide to ignore it. But the voice comes again,

"Good morning". Finally you locate the other nut who has gotten up at this hour, far across the lake -- much further than you could normally hear a voice. That fisherman is aware of the early morning lake's effect on sound transmission. The cool water keeps the air near the water cool, but the early sun has begun to heat the air higher up, creating a "thermal inversion". The fact that the speed of sound is faster in warmer air bends some sound back downward toward you - sound that would not reach your ear under normal circumstances. This natural amplification over cool bodies of water is one of the few natural examples of sound refraction. Illustration	concepts
HyperPhysics***** Sound *R Nave*	Go Back

Appendix 7.2.1

SEA Noise Monitoring Sites in Hector

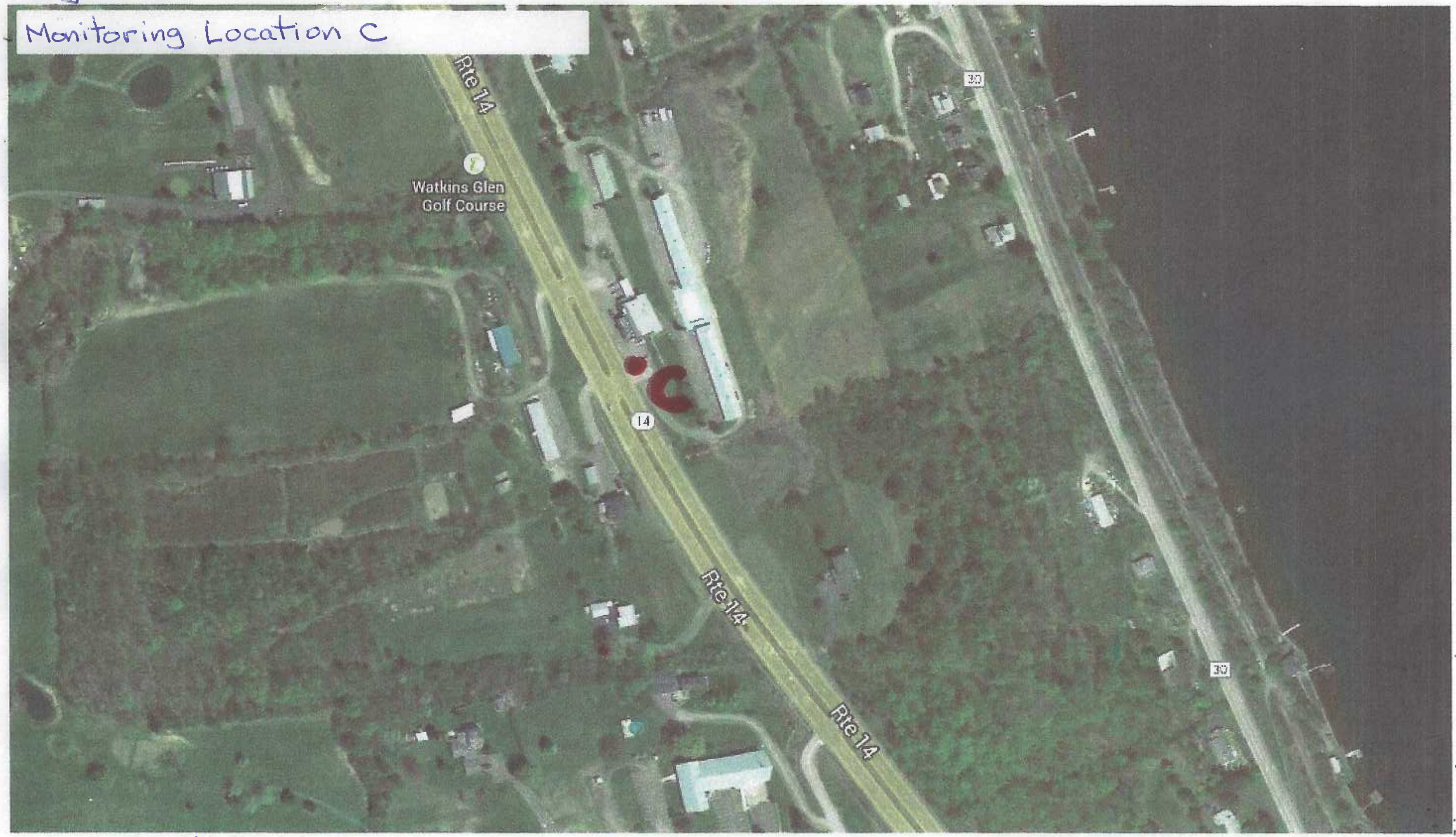
Hector, NY

Source: Google Maps

Appendix 7.2.2

SEA Noise Monitoring Sites in Reading

Figure 2



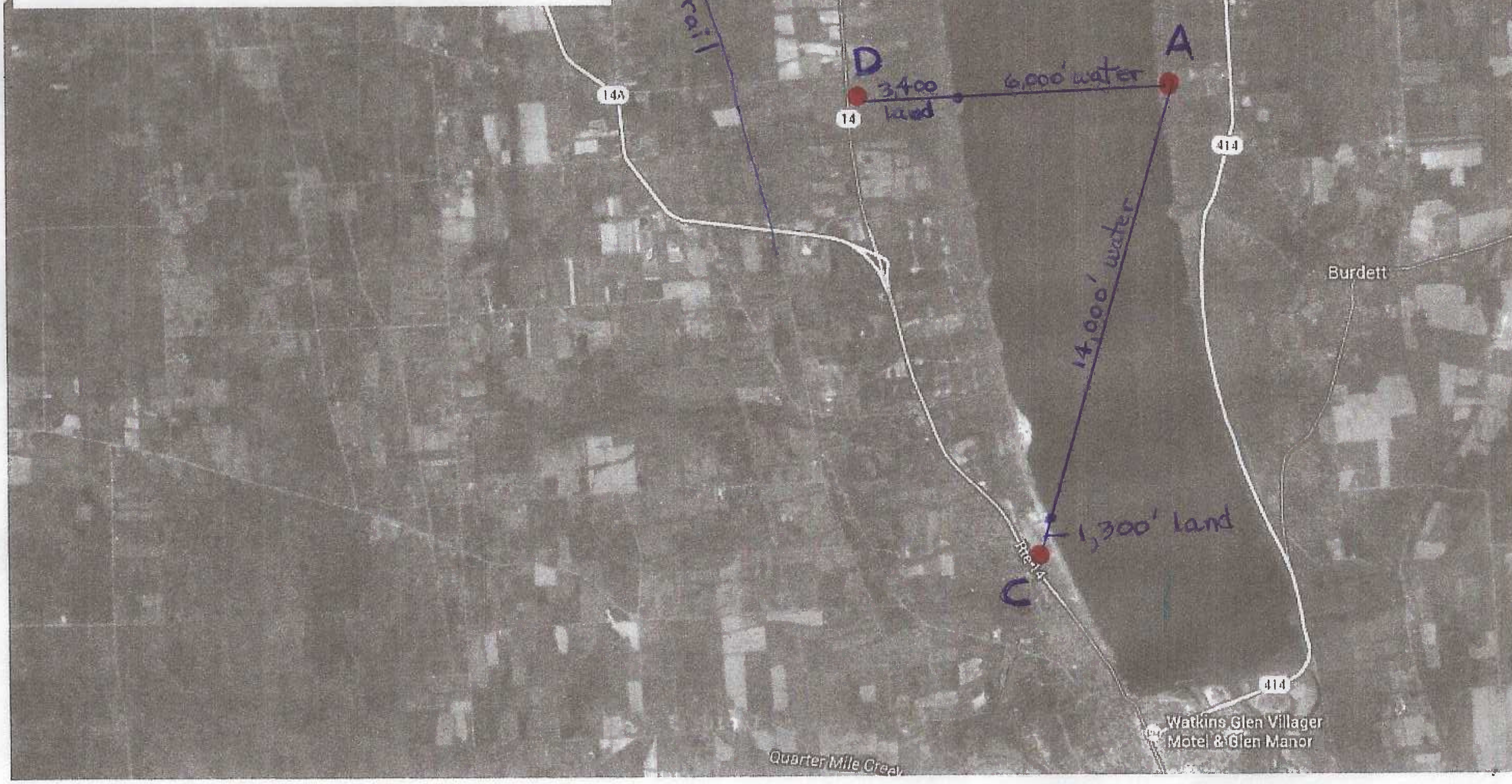
Reading, NY

Source: Google Maps

Appendix 7.2.3

Truck Noise Calculation Locations

Figure 3. Distances A-C and A-D



Appendix 7.3.1

Curriculum Vita
A. Brook Crossan, Ph.D., P.E.

A. Brook Crossan, Principal Environmental Engineer

Years of Experience	Education
40	Ph.D., Geophysical Fluid Dynamics, Rutgers University, 1974 M.S., Mechanical Engineering, Rutgers University, 1971 B.S., Mechanical Engineering, University of Pennsylvania, 1969

Employment

Sandstone Environmental Associates, Inc., 2009-Present
MACK Associates, LLC 2009-2013 part-time
Potomac Hudson Engineering, Inc., 1988-2008
Maser Sosinski & Associates, 1989-1991
The Hudson Partnership, Inc. 1984-1988
Louis Berger & Associates, Inc. 1975-1984
Ecolsciences, Inc., 1973-1974

Professional Registrations/Certifications

Professional Engineer - New Jersey, Pennsylvania, New York
Professional Planner - New Jersey
Community Noise Enforcement – Rutgers Noise Technical Assistance Center, 2000, 2002, 2004, 2006, 2008, 2010 & 2012
Certificate, Basic, Advanced and Expert Seminar in CadnaA, Datakustics, 2014
Certificate, Air Quality Dispersion Modeling with AERMOD, Lakes Environmental, 2014

Professional Summary

Dr. Crossan has more than 40 years' experience in conducting noise studies, environmental impact statements, and environmental assessments in over 30 states. His environmental experience includes: noise monitoring (in rural, suburban, and urban sites), modeling (CadnaA, STAMINA and TNM), and mitigation design (barriers, berms, site plan changes, and equipment changes for example); air monitoring, modeling (most recently AERMOD and CAL3QHC), permitting and impact assessment; as well as management of comprehensive Environmental Impact Statements. Noise assessments have included equipment noise, transportation noise and has included both construction and operation impacts and mitigation. He has also prepared greenhouse gas inventories for several projects.

The transportation impact assessment has included: truck loading docks, interstate and state highways (for Georgia, Maryland, Pennsylvania, New Jersey, New York, Connecticut, Massachusetts, Maine, and Idaho), both construction and highway noise; county and local roads; electric, diesel, and natural gas buses and bus maintenance facilities; subways, passenger and freight rail; and waterborne including tugs, barges, ferries and berthing facilities; and expansion at general aviation and international airports.

Dr. Crossan also has wide experience in the monitoring, modeling and mitigation design of construction and industrial noise. He has both prepared (more than 400) and critically reviewed (more than 70) many noise studies and EISs. These noise reviews have been performed for: municipal planning boards; citizen groups; environmental groups; and federal agencies.

Relevant Experience

Sterling Forest Resort, Tuxedo, NY,
Review of Air Quality and Noise Analyses for EIS
Client: Town of Tuxedo, NY
Period: May 2014 – Ongoing

Reviewed materials prepared by developer's consultants for proposed resort/casino on the NY Renaissance Faire property as well as new Interchange 15B on I-87. Reviewed proposed EIS scope of work and recommended modifications for traffic, air quality, and noise tasks. Reviewed DEIS analyses and advised Town Board on completeness with respect to scope of work. Contact: Bonnie Franson, H2M architects + engineers, New City, NY. 845-499-2264

Casino Impact Study Review
Air/Noise Impact Review, Orange County, NY
Client: Town of Tuxedo
Period: 2014 to present

Dr. Crossan has attended meetings in Tuxedo and reviewed and commented extensively on the Scoping Document with emphasis on alternatives, cumulative impacts, construction impacts, and air/noise impacts. He will be reviewing these sections in the DEIS and FEIS when they are submitted.

Indian Casino Impact Study
Air/Noise Analyses, Sullivan County, NY
Client: Parish & Weiner
Period: 2002 - 2009

Prepared an air and noise quality impact assessment for a NEPA EA and another impact assessment for a SEQRA EIS for a proposed Indian Casino at Monticello Raceway in Sullivan County NY. These included noise monitoring (with concurrent traffic counts), assessment of construction impacts, and modeling of future air quality and noise levels.

Review of Construction Noise Impact Study
CadnaA Noise Analysis, Wappinger, NY
Client: Town of Wappinger Planning Board.
Period: January 2012 – May 2012

Project manager at MACK Associates for noise consultant services to the Town of Wappinger Planning Board. Reviewed the construction noise impacts for the DEIS for a new eastern portal in Wappinger for a new aqueduct crossing under the Hudson River for the water supply of the City of New York (*DEIS for the Water for the Future Program: Delaware Aqueduct Rondout-West Branch Tunnel Repair*). Reviewed and commented on the CadnaA modeling carried out for the DEIS and determined that there would be significant adverse noise impacts for the 7- to 8-year construction project that were not identified in the DEIS and that must be further mitigated. Testified at Planning Board meetings.

Tappan Zee Replacement Bridge DEIS & FEIS, and Construction
Review of Noise Analyses and Mitigation, Tarrytown, NY
Clients: Village of Tarrytown, The Quay, Salisbury Point Cooperative, and the Village of South Nyack
Period: October 2011– 2014

Project manager at MACK Associates to provide noise consulting services to the Village of Tarrytown in Westchester County, The Quay Condominiums in Tarrytown, and the Salisbury Point Cooperative in Rockland County for the review of the noise analyses contained in the DEIS and FEIS and their appendices. Generated over 100 pages of detailed comments relating to deficiencies in methodologies, noise monitoring, noise modeling, and proposed mitigation measures. Participated in meetings with NYSDOT and the NYS Thruway Authority. He is currently assisting Salisbury Point and The Quay Condominiums with respect to replacement windows and other measures to mitigate construction and operation noise. At Sandstone he is assisting The Quay with replacement window specifications, and the Village of South Nyack with respect to excessive pile driving noise and additional measures to mitigate it.

Taylorville Energy EIS
Noise Analysis, Taylorville, IL
Client: Potomac Hudson Engineering, Tinton Falls, NJ
Period: September 2009 – April 2010

Task manager for several components of EIS for proposed energy center. Responsibilities for noise analysis included supervision of noise monitoring field work throughout rural municipalities through which coal trucks would travel. Noise monitoring occurred in October 2009 for peak AM, Midday, PM, evening, and nighttime periods. Prepared noise sections for Existing Conditions, No Build Conditions, and Build Conditions for DEIS.

Shopping Center DEIS
Review of Air/Noise Analyses, New Haven, CT
Client: Cowdery, Ecker & Murphy, LLC
Period: January 2004 – August 2004

Reviewed the air quality analysis and noise analysis of potential impacts of the Galleria at Long Wharf Project in New Haven, CT as documented in the FONSI and appendices. Dr. Crossan testified on these matters in State superior court and the project was ultimately withdrawn.

Western Greenbrier Co-Gen Facility EIS
Traffic /Noise and CadnaA Noise Analyses, Rainelle, WV
Client: Potomac Hudson Engineering, Inc.
Period: April 2004 – May 2006

Technical lead (wetlands, surface water quality and fisheries, hydrology, floodplains and transportation resources) for the preparation of an EIS for the construction and demonstration of a 90-MW Co-Production Facility in rural Rainelle, West Virginia. Also assisted with monitoring of traffic noise. Coordinated with client in obtaining site plans and equipment information for use in CADNA modeling of noise from proposed power plant equipment. Assisted in developing noise impact criteria.

Additional Experience

Expert Testimony

- Provided expert environmental/noise testimony to planning boards, zoning boards of adjustment, and/or governing bodies in more than 120 different municipalities in NJ and NY (including Rockland, Orange, Westchester, Putnam and Dutchess Counties).
- Provided expert noise testimony to State Superior Court in NJ (Bergen and Ocean Counties) and CT, Administrative Law Judges in NY and NJ, and Condemnation Commissioners in NJ.

Additional Industrial & Commercial Noise

Performed monitoring of noise levels and assessment of night-time compliance with noise regulations for:

- salvage yards (Wappinger, NY);
- asphalt batching plant (Edison, NJ);
- emergency generators (multiple sites in NJ and NY, several using CadnaA in the design);
- plastics extrusion plants (Piscataway, NJ and Brewster, NY);
- concrete batching plants (North Castle, NY and Edison, NJ);
- home improvement center loading docks (Old Bridge, NJ);
- gasoline service stations (Cranford and Aberdeen, NJ);
- 8-plex movie theater (East Brunswick, NJ);
- bar/restaurants (North Plainfield, Morristown and Cranford, NJ and Yonkers, NY);
- truck terminals(East Brunswick, Washington and Hamilton Townships, NJ);
- truck loading docks (Cranbury, East Brunswick, Hightstown, Monroe, Union and Washington Township, NJ);
- transfer station (Closter, NJ);
- recycling facilities (North Bergen & Jersey City, NJ);
- coal fired power plants (Rainelle, WV, Meredosia, IL and Taylorville, IL);
- gasoline & diesel service stations (Aberdeen and Mahwah, NJ);
- hospital – rooftop HVAC equipment (Bronxville, NY); and
- mixed use city center – rooftop HVAC (White Plains, NY).

Performed monitoring and assessment of construction and/or operation noise at more than 300 sites in total, including:

- single family residential
- apartments
- solid waste transfer station
- courthouses
- shopping centers
- parking decks
- asphalt batching plants
- plastic extrusion factories
- automobile junkyards
- townhouses
- dormitories
- new roadways
- offices
- industrial
- hotels
- prisons
- quarries

Proposed and designed/specified mitigation measures as necessary and appropriate including: increased setbacks, berms, operational changes, acoustic barriers, acoustic louvers on equipment.

Rail Noise

Performed monitoring of noise levels and assessment of impacts to residential developments adjacent to numerous CONRAIL, AMTRAK and New Jersey Transit lines in New Jersey (5 sites), and METRONORTH, AMTRAK, and elevated subway lines in New York (10 sites), as well as rail lines in IL and Edmonton, Canada.

Appendix 7.3.2

Curriculum Vita
Nancy C. Neuman, Ph.D.

Nancy C. Neuman, Principal Environmental Analyst

Years of Experience	Education
35	Ph.D., Geography, Rutgers University, 1986 M.C.R.P. (Master of City and Regional Planning) Rutgers University, 1976 B.S., Urban Affairs, Boston University, 1973

Employment

Sandstone Environmental Associates, Inc., 1993-Present
Metcalf & Eddy of New York, Inc., 1990-1993
Urbitran Associates, Inc., 1987-1990
Louis Berger & Associates, Inc. 1981-1987
Rutgers University Center for Urban Policy Research, 1976-1981

Professional Registrations/Certifications

Certificate: Environmental Due Diligence: Principles and Practice, Commonground University, 2009
Certificate, Building Acoustics, Bruel & Kjaer, 2009
Certificate, Advanced Seminar in CADNA, Datakustics, 2008
Certificate, Community Noise Enforcement, Rutgers University Noise Technical Center, 2000, 2002, 2004, and 2006
Certificate, TNM Traffic Noise Model, Bowlby & Associates, Inc., 2000
Certificate, Improving Indoor Air Quality in Non-Industrial Buildings, Environmental Occupational & Health Safety Institute, 1995
Qualified Environmental Professional, 1993
Certificate, Air Quality Dispersion Modeling, Trinity Consultants, 1986
Certificate, Traffic Noise Analysis, Vanderbilt University, School of Engineering, 1985

Professional Summary

Dr. Neuman is president of Sandstone Environmental Associates, Inc. She has over 30 years of experience in environmental studies in New York City and New York State, as well as other parts of the U.S. This includes studies of air quality and noise impacts from proposed fire stations, diesel-powered equipment for construction and other off-road activities, and numerous other residential or transportation-oriented projects. She has also served as an expert witness for both air quality and noise analyses, and she has been a guest lecturer on community noise assessment at New York University for the Summer Institute in Environmental Impact Assessment and the Science and Environmental Reporting Program. She has also conducted over 100 Phase I ESAs. The following selected projects are representative of her experience with on-call projects, large complex projects, projects using off-road diesel equipment, and projects for NYC agencies.

Relevant Experience

NYC Fire Station On-Call
Air/Noise Analyses
Client: New York City Fire Department
Period: 2001 - 2006

Project Manager for air quality and noise components of Environment Assessments for proposed projects by the NYC Fire Department. A representative example was the proposed rehabilitation and expansion of an existing fire facility for Engine 201/ Ladder114/ Battalion 40, in Sunset Park, Brooklyn. Tasks included monitoring background noise at nearby sensitive receptors; calculating noise level impacts from sirens during typical daytime and nighttime periods; and preparing a written report to be submitted with the EAS. Reference: Philip Habib, Philip Habib & Associates, New York, NY 212-929-5656

Astoria Cove EIS, Air Quality and Noise Analyses, Queens, NY
Client: Astoria Developers, LLC
Period: September 2013 - 2014

Directed operational air quality and construction air quality and noise analyses for EIS. Tasks included modeling and analysis with MOVES2010b, CAL3QHCR, AERMOD, RCNM, and CADNA for motor vehicles, parking facilities, stationary source stacks, and construction equipment. Prepared EIS materials. Used MOVES2010b and CAL3QHCR in a Tier II analysis of $PM_{2.5}$ over a 1 km area. Prepared detailed construction analysis and modeling for air quality. Reference: Philip Habib, Philip Habib & Associates, New York, NY 212-929-5656

NYC School Construction Authority On-Call, Air Quality and Noise Analyses, Manhattan, NY
Client: New York City School Construction Authority.
Period: 2012 - 2014

Project manager for air quality and noise analyses for on-call studies for NYCSCA. Directed or carried out air quality traffic screening and stationary boiler analyses, as well as traffic and recreation noise analyses for proposed school construction projects. Carried out CO intersection modeling with MOBILE6.2 and CAL3QHC when warranted. Monitored noise levels, calculated PCEs from traffic and buses, and determined noise level impacts from playground activities. Modeled traffic noise and barrier mitigation measures with the FHWA's TNM model. Studies were prepared according to methods in NYC *CEQR Technical Manual.* Reference: Philip Habib, Philip Habib & Associates, New York, NY 212-929-5656

Courtlandt Community Supportive Housing Development EAS, Noise Analysis, Bronx, NY
Client: Phipps Houses
Period: July 2009 – October 2010

Directed noise monitoring of peak AM, Midday, and PM periods for proposed residential building adjacent to Melrose Station on Metro North rail line. Identified required window attenuation as well as manufacturers that could provide suitable windows. Calculated Day-Night Average Sound Level (Ldn). Presented results in terms of US HUD and NYCDEP criteria for residential uses. Recommended site plan changes to comply with HUD noise requirements for passive recreation spaces. Coordinated with NYC Department of Housing Preservation and Development. Reference: Karen Hu, Phipps Houses, New York, NY 212-243-9090

Chappaqua Crossing EIS, Air/Noise Analyses, Rye Brook, NY
Client: Summit Development Corp., Inc..
Period: July 2008 – May 2011, et al

Task manager for air quality and noise studies for EIS to redevelop Readers Digest Headquarters into a residential village. Calculated greenhouse gas (GHG) contributions in the form of equivalent CO_2. Directed noise monitoring at multiple locations in study area, including evening noise levels associated with rail passbys. Directed projections of future traffic noise based on passenger car equivalents (PCEs). Determined impact criteria based upon NYSDEC guidelines. Modeled construction noise for worst-case days during each quarter during multi-year construction period using FHWA's RCNM construction noise model for diesel-powered construction equipment. Prepared technical appendices and EIS text for nearly a dozen alternatives to the proposed action. Responded to comments from review agencies. Reference: Lisa Baker, Diviney Tung Schwalbe, White Plains, NY 914-428-0010

47 NYCHA Properties, Phase I Environmental Assessments, Brooklyn and Queens, NY
Client: NYC Department of Housing
Period: 2008 – 2010

Project manager responsible for preparing Phase I ESAs for 47 NYCHA properties in Queens and Brooklyn according to ASTM E1527-05.and and 40 CFR, Part 312. Carried out site visits. Reviewed historical materials, regulatory database, and government correspondence. Wrote reports. Reference: Katherine Gray, NYCHA, New York, NY 718-9923-8656