Appendix C: Noise Report

ARCADIS
Infrastructure · Water · Environment · Buildings

Imagine the result

Oregon Clean Energy, LLC

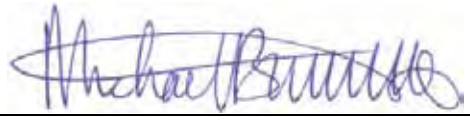
Noise Impact Analysis
Oregon Clean Energy Center
Oregon, Ohio

Project No.: MA001187.0001

January 10, 2013

ARCADIS

Kevin Fowler
Acoustical Project Scientist



Michael Burrill
Senior Acoustical Scientist

Noise Impact Analysis
Oregon Clean Energy Center, Oregon, Ohio

Prepared for:

Oregon Clean Energy, LLC

Prepared by:

ARCADIS U.S., Inc.
1525 Faraday Avenue, Suite 290
Carlsbad, California 92008
Tel 760.602.3800
Fax 760.602.3838

Our Reference:

MA001187.0001

Date:

January 10, 2013

ARCADIS

Table of Contents

Table of Contents

Figures

Appendices

1. Executive Summary

This noise analysis report presents the findings of a two-week ambient baseline noise study conducted at two locations within the proposed site for the Oregon Clean Energy Center. This report also evaluates the noise impacts associated with the construction and operation of the proposed Project. The proposed Project is proposed to be constructed in a mixed-use commercial/industrial area within the City of Oregon, Ohio.

The City of Oregon's noise ordinance provides property line noise threshold limits for both construction and operation of the Project. The ordinance limits noise from temporary construction equipment to 90 dBA at the Project property line. It further limits construction activities to operate between the time periods of 6:00 a.m. to 10:00 p.m. The ordinance also limits permanent stationary noise sources to 75 decibels – A weighted (dBA) at all Project property lines. The City's noise ordinance does not specify the noise metric of compliance. However, ordinance does state that the compliance measurements made at property line during the specified daytime and nighttime periods. This was assumed to be a time-integrated continuous sound level measurement, which is defined as Leq.

The ambient field noise measurement data collected at Measurement Location 1 shows that the average daytime noise levels range from 51.1 dBA Leq to 62.1 dBA Leq and the average nighttime noise levels range from 50.4 dBA Leq to 58.1 dBA Leq. The ambient field noise measurement data collected at Measurement Location 2 shows that the average daytime noise levels range from 47.1 dBA Leq to 58.1 dBA Leq and the average nighttime noise levels range from 46.1 dBA Leq to 60.6 dBA Leq. To characterize the Project site, four additional 15-minute spot check field measurements were conducted near sensitive residential receptor locations within the vicinity of the Project site. The noise levels measured at the four identified sensitive noise receptors range from 52.7 dBA Leq to 64.4 dBA Leq.

Construction of the Project will employ the use of a variety of mechanical equipment. The calculated construction noise impacts range from 49.8 dBA at the eastern property line to 83.6 dBA at the southern property line. Noise impacts from the construction activities will not exceed the City of Oregon's construction noise threshold limit of 90 dBA at the property lines. Furthermore, construction operations that produce significant noise will not be conducted outside of the ordinance limits of 6:00 a.m. to 10:00 p.m.

The Project is evaluating two alternative operational equipment layouts. These layouts include equipment from two separate manufacturers, Mitsubishi and Siemens. This study evaluated both layouts separately in order determine property line noise impact compliance.

Computer model calculations show that the worst-case noise impacts from the operation of mechanical equipment associated with the Mitsubishi layout, without mitigation, would range from 63.1 dBA Leq at the western property line to 80.1 dBA Leq at the northern property line. The noise impacts from the unmitigated Mitsubishi equipment layout would exceed the City of Oregon's property line noise threshold limit of 75 dBA. Therefore, additional noise mitigation was identified to reduce the noise impacts to below the regulated noise threshold limit.

Mitigation for the Mitsubishi equipment layout includes a 16-foot-high, 595-foot-long sound wall along the northern property line, along with a 16-foot-high, 200-foot-long sound wall along the southern property line, and acoustical material lagging of the heat recovery steam generator (HRSG) duct. With the incorporation of these mitigation features, the noise model calculations show that the noise impacts from the Mitsubishi equipment layout will range from 63.1 dBA Leq at the western property line to 74.4 dBA Leq at the northern property line. The mitigated noise impacts are shown to be below the City of Oregon's property line noise threshold limits of 75 dBA.

Computer model calculations show that the worst-case noise impacts from the operation of the mechanical equipment associated with Siemens layout would range from 68.2 dBA Leq at the western property line to 87.8 dBA Leq at the southern property line. The noise impacts from the unmitigated Siemens equipment layout would exceed the City of Oregon's property line noise threshold limit of 75 dBA. Therefore, additional noise mitigation was identified to reduce the noise impacts to below the regulated noise threshold limit.

Mitigation for the Siemens equipment layout includes a 16-foot-high, 595-foot-long sound wall along the northern property line, increased Sound Transmission Class (STC) ratings for the proposed mechanical equipment enclosures, acoustical material lagging of the HRSG duct and silencer system placed inline at both gas turbine inlets. With the incorporation of these mitigation features, the noise model calculations show that the noise impacts from the Siemens equipment layout will range from 64.7 dBA Leq at the western property line to 74.3 dBA Leq at the southern property line. The mitigated noise impacts are shown to be below the City of Oregon's property line noise threshold limits of 75 dBA.

The proposed mitigation measures for each layout are deemed reasonable for Project compliance at the property lines. However, once a vendor and a final layout have been selected, the mitigation measures should be re-evaluated to re-confirm compliance with noise ordinance limits.

2. Introduction

ARCADIS U.S., Inc. (ARCADIS) was retained by Oregon Clean Energy, LLC (OCE) to conduct a noise analysis in support of the development of a proposed natural gas-fired, combined-cycle power plant. This report presents the field noise monitoring findings of a two-week ambient baseline study conducted from October 16, 2012 to October 31, 2012, as well as a noise impact evaluation of the construction and operation of the proposed Project.

3. Project Location and Description

OCE is proposing to construct a natural gas-fired, combined-cycle power plant in Oregon, Ohio. The Project will be an 800-megawatt plant on an approximately 30-acre site. The proposed Project will consist of two natural gas-fired turbines, two HRSGs, one steam turbine, and ancillary plant equipment.

The proposed Project is located in a mixed-use commercial/industrial area within the City of Oregon, Ohio. As shown on Figure 1, scattered residential properties are located north and east of the Project site; commercial properties are located west and south of the Project site. Significant industrial facilities are located further to the north. A railroad track is located adjacent to the Project's southern property line.

4. General Noise Information

Sound is a physical disturbance in a medium, such as air, that is capable of being detected by humans and other animals. Sound waves in air are caused by variations in pressure above and below the relatively static value of atmospheric pressure. Sound is measured in units of decibels (dB) on a logarithmic scale. The "pitch" (high or low) of the sound is a description of frequency, which is measured in Hertz (Hz). Most common environmental sounds are composed of a composite of frequencies.

A normal human ear can usually detect sounds within frequencies from 20 Hz to about 20,000 Hz. However, humans are most sensitive to frequencies from 500 Hz to 4000 Hz. Certain frequencies are given more "weight" during assessment because human hearing is not equally sensitive to all frequencies of sound. The dBA scale corresponds to the sensitivity range for human hearing. Noise levels capable of being heard by humans are measured in dBA.

The metrics for evaluating a noise environment are based on measurements of noise exposure over a period of time in order to characterize and evaluate cumulative noise

impacts. These metrics are time-varying and are defined as statistical noise descriptors. The most common metrics for evaluating noise impacts are as follows:

Leq: The equivalent sound level, or the time-integrated continuous sound level, that represents the same sound energy as the varying sound levels, logarithmically averaged over a specified monitoring time period.

Lmax: The highest instantaneous noise level measured on a sound level meter during a designated time interval.

Lmin: The lowest instantaneous noise level measured on a sound level meter during a designated time interval.

5. Regulatory Noise Code

The noise impact report is based on characterizing field ambient noise conditions within and surrounding the Project site in order to establish a reasonable comparison to specific regulatory standards, as addressed below. (See Appendix A, *Relevant Excerpts from the Local Noise Standards*, which presents more detailed information regarding noise regulations and standards.)

5.1 Ohio Power Siting Board

The Ohio Power Siting Board (OPSB) does not have published noise threshold limits for zoning districts, but typically evaluates Project noise impacts based on compliance with local noise regulations if they are available.

5.2 City of Oregon

The following sections of the codified ordinances of the City of Oregon regulate noise:

- Section 531.11 - Construction – limits the hours of construction operations from 6:00 a.m. to 10:00 p.m., and further states that the sound level produced by any piece of construction equipment, with the exception of impulsive sound and critical construction equipment, shall not exceed 90 dBA at the property line within a residential area.

- Section 531.14 - Fixed Source Noise Levels – requires that noise levels not exceed the noise levels thresholds provided in Table 1 at the affected property boundary lines.

Table 1. City of Oregon Fixed Source Noise Threshold Limits

Zoning District	Time Period	Sound Level (dBA Leq)*
R-1, R-2	10:00 p.m. – 7:00 a.m.	55
	7:00 a.m. – 10:00 p.m.	60
R-3, R-4	10:00 p.m. – 7:00 a.m.	60
	7:00 a.m. – 10:00 p.m.	65
C-1, C-2, C-3	10:00 p.m. – 7:00 a.m.	65
	7:00 a.m. – 10:00 p.m.	70
M-1	Anytime	70
M-2, C-I**	Anytime	75

*Metric was not specified in the ordinances. However, Leq was selected based on the ordinance's noise measurement requirements.
** C-I zones are not currently reflected in the noise standard; communication with City officials confirms that M-2 standards are applicable with the C-I zone.

6. Methodology and Equipment

6.1 Monitoring Measurement Methodology

To characterize the existing ambient noise environment, two independent field noise monitors were placed at the site and strategically located along the northern and eastern property lines, as shown on Figure 2. The noise monitoring stations were placed in-line with existing residential structures to document the rise and fall of significant community noise sources in the area. Each of the noise monitors was programmed to collect ambient data from October 16, 2012 to October, 31, 2012. The microphones were extended 8 feet above the existing site grade to integrate and log noise data every 30 minutes spanning both daytime and nighttime periods. Noise data were recorded and documented in Leq, Lmin, and Lmax for every 30-minute time period. During the on-site ambient noise measurements, start and end times were recorded, along with background ambient noise sources, to characterize and quantify the noise environment in the area.

6.2 Spot-Check Noise Measurements

To document the existing daytime noise level at the defined sensitive receptor locations, a series of spot-check, short-term sound level measurement (15-minute Leq, A-weighted) were conducted in and around the community on Tuesday, October 16, 2012. Measurement locations are shown on Figure 3. During these measurements, the sound-level meter was programmed to log data continuously for each select short-term monitoring period. The microphones at the noise measurement locations were placed approximately 5 feet above the existing site grade. During these ambient spot-check noise measurements, start and end times were recorded, along with background ambient noise sources, to characterize and quantify the noise environment in the area.

6.3 Monitoring Equipment

The following equipment was used at the Project site to measure existing noise levels:

- Two Larson Davis Model 831 sound level meters
- One Larson Davis Model 824 sound level meter
- Larson Davis Model CA200 microphone calibrator
- Hand-held global positioning system (GPS)
- Microphone with windscreen
- Tripods, tape measure, and digital camera

The sound level meter was field-calibrated prior to and following the noise measurement period to ensure accuracy. All sound level measurements conducted and presented in this report were collected using equipment that conforms to the American National Standards Institute (ANSI) specifications for sound level meters ANSI SI.4-1983 (R2001). All instruments were maintained with National Bureau of Standards traceable calibrations, per the manufacturers' standards.

6.4 Noise Modeling Software

Modeling of the nose impacts of the Project to the surrounding residential community was accomplished using CadnaA (Computer-Aided Noise Abatement), which is a model-based computer program developed by DataKustik for predicting outdoor environmental noise impacts under a wide variety of conditions. CadnaA assists in the calculation, presentation, assessment, and mitigation of all types of noise exposure conditions. It allows for the input of information such as noise source data, sound barriers, sound enclosures, intervening

structures, ground absorption, and topography to create a detailed Computer-Aided Design (CAD) model, and uses the most up-to-date calculation standards to predict outdoor noise impacts for evaluating compliance with noise standards.

7. Measurement Results

7.1 Noise Monitoring Results and Evaluation

A noise monitoring study was conducted at the Oregon Clean Energy Center site to document the existing ambient noise levels at two property boundary line locations, previously shown on Figure 2. Two environmental noise monitors were strategically placed for a continuous operational period of two weeks from Tuesday October 16, 2012 to Wednesday October 31, 2012.

The ambient field noise measurement data for Measurement Location 1 shows that the average daytime noise levels range from 51.1 dBA Leq to 62.1 dBA Leq and the average nighttime noise levels range from 50.4 dBA Leq to 58.1 dBA Leq. The overall singular average Leq over the two week noise monitoring period during the daytime hours was 55.5 dBA Leq and during the nighttime hours was 54.6 dBA Leq. Table 2 below presents a summary of the collected daytime and nighttime average ambient noise level data for the two-week noise monitoring period at Measurement Location 1. Appendix B provides the noise monitoring data for Measurement Location 1.

Table 2. Measurement Location 1 - October 2012 Noise Monitoring Data Summary

Date	Daytime (dBA Leq) 7:00 a.m. to 10:00 p.m.	Nighttime (dBA Leq) 10:00 p.m. to 7:00 a.m.
October 16, 2012	55.0	54.6
October 17, 2012	55.5	56.1
October 18, 2012	57.6	55.8
October 19, 2012	57.4	55.3
October 20, 2012	53.6	53.9
October 21, 2012	51.1	55.1
October 22, 2012	55.3	56.2
October 23, 2012	54.9	55.4
October 24, 2012	55.4	55.0
October 25, 2012	56.8	56.4
October 26, 2012	62.1	54.2

October 27, 2012	57.2	50.4
October 28, 2012	52.6	51.0
October 29, 2012	54.8	53.1
October 30, 2012	55.6	58.1
October 31, 2012	53.5	52.9

The ambient field noise measurement data for Measurement Location 2 shows that the average daytime noise levels range from 47.1 dBA Leq to 58.1 dBA Leq and the average nighttime noise levels range from 46.1 dBA Leq to 60.6 dBA Leq. The overall singular average Leq over the two week noise monitoring period during the daytime hours was 51.6 dBA Leq and during the nighttime hours was 51.3 dBA Leq. Table 3 presents a summary of the collected daytime and nighttime average ambient noise level data for the two-week noise monitoring period at Measurement Location 2. Appendix B provides the noise monitoring data for Measurement Location 2.

Table 3. Measurement Location 2 - October 2012 Noise Monitor Data Summary

Date	Daytime (dBA Leq) 7:00 a.m. to 10:00 p.m.	Nighttime (dBA Leq) 10:00 p.m. to 7:00 a.m.
October 16, 2012	48.4	47.1
October 17, 2012	50.2	49.5
October 18, 2012	54.9	50.6
October 19, 2012	47.9	46.1
October 20, 2012	51.4	49.4
October 21, 2012	47.1	50.9
October 22, 2012	50.7	51.0
October 23, 2012	51.3	50.2
October 24, 2012	49.3	50.7
October 25, 2012	49.8	50.2
October 26, 2012	50.4	50.9
October 27, 2012	49.5	48.6
October 28, 2012	55.8	52.9
October 29, 2012	58.1	57.2
October 30, 2012	57.3	60.6
October 31, 2012	53.3	54.6

7.2 Spot-Check Noise Measurement Results

To document existing daytime ambient noise levels at several residential locations, a series of spot-check, short-term equivalent sound level measurements (15-minute dBA Leq, A-weighted) were conducted on Tuesday, October 16, 2012. A single spot-check, short-term noise measurement was conducted at a total of four locations within the vicinity of the proposed Project site, previously shown on Figure 3. The results of this monitoring are shown in Table 4 below.

Table 4. Existing Ambient Spot-Check Noise Level Measurements at Sensitive Receptors on October 16, 2012

Noise Measurement Location (Coordinates)	Location	Spot-Check Noise Level (dBA Leq)
41.673181°N, 83.448951°W	1	62.9
41.674061°N, 83.423502°W	2	52.7
41.659612°N, 83.430742°W	3	52.7
41.658875°N, 83.457969°W	4	64.4

The noise measurement data provided in Table 4 shows that the noise levels measured at the four identified sensitive noise receptors range from 52.7 dBA Leq to 64.4 dBA Leq. Appendix C provides the spot-check noise measurement data.

8. Construction Equipment Noise Impact Evaluation

Construction of the proposed Project will be conducted in phases, as identified below.

- Demolition
- Grading
- Foundation installation
- Erection of structures and buildings as well as operational equipment installation

- Testing, commissioning, and startup of systems

The phased construction activities, as well as the associated equipment incorporated within this analysis, are based on the construction equipment and workforce estimates provided by OCE engineers. Construction of the Project will employ a variety of equipment. Table 5 provides equipment type, quantity, utilization percentage, and noise level for each major piece of construction equipment.

Table 5. Oregon Clean Energy Proposed Construction Equipment

Phase	Equipment Type	Equipment Quantity	Utilization Percentage	Noise Source Level at 50 feet (dBA)
Demolition	Dump Truck	2	40	84
	Bulldozer	2	40	85
	Backhoe w/ Chipper	1	40	85
	Water Truck	1	40	84
Grading	Scraper	4	80	85
	Grader	2	40	85
	Water Truck	1	40	84
	Bulldozer	2	40	85
	Dump Truck	8	40	84
	Excavator	2	40	85
Foundation Installation	Compactor	4	50	80
	Pile Driver	1	60	95
	Ground Heater	2	50	80
	Concrete Truck	12	40	85
	Backhoe (trench)	3	60	80
	Flatbed Truck	2	40	84
	Crane (mobile)	2	60	85
	Generator	4	40	82
	Air Compressor	1	20	80
	Water Truck	1	40	84
Structure and Building Erection. Equipment Installation	Fork Lift	5	80	75
	Pneumatic Tools	10	50	85
	Dump Truck	2	40	84
	Water Truck	1	40	84
	Welder / Torch	12	80	74
	Flatbed Truck	2	50	84

Phase	Equipment Type	Equipment Quantity	Utilization Percentage	Noise Source Level at 50 feet (dBA)
	Crane (crawler)	2	80	85
	Crane (mobile)	3	80	85
	Air Compressor	1	40	80
	Generator	6	50	81
Testing, Commissioning, and Startup of Systems	Fork Lift	2	20	75
	Paver	2	50	84
	Pneumatic Tools	6	50	85
	Welder / Torch	2	40	74
	Package Boiler	1	20	85
	Air Compressor	1	20	80
	Crane (mobile)	1	80	85
	Generator	2	50	81

The noise prediction calculations of the construction equipment assume that the construction activities will operate for 10 hours per day. The calculated noise impacts range from 49.8 dBA at the eastern property line to 83.6 dBA at the southern property line. The calculated noise impacts at the Project property lines for each phase are provided in Table 6. Receiver locations are shown on Figure 4.

Table 6. Oregon Clean Energy Construction Noise Impacts

Receiver	Receiver Location	Construction Operations Noise Impacts (dBA Leq)				
		Demolition	Grading	Foundation Installation	Structure and Building Erection. Equipment Installation	Testing, Commissioning, and Startup of Systems
1	Western Project Property Line	81.6	64.1	65.1	65.2	58.6
2	Northern Project Property Line	67.0	68.7	68.7	69.2	61.9
3	Northern Project Property Line	59.2	77.1	77.4	79.2	71.3
4	Northern Project Property Line	56.1	73.2	79.7	80.0	78.9

Receiver	Receiver Location	Construction Operations Noise Impacts (dBA Leq)				
		Demolition	Grading	Foundation Installation	Structure and Building Erection. Equipment Installation	Testing, Commissioning, and Startup of Systems
5	Northern Project Property Line	53.4	81.2	76.9	76.8	72.6
6	Eastern Project Property Line	49.8	64.6	67.4	67.1	62.3
7	Eastern Project Property Line	50.0	64.8	67.8	67.4	62.4
8	Southern Project Property Line	55.3	75.3	82.5	83.6	77.3
9	Eastern Project Property Line	60.2	75.9	77.5	76.2	67.9

The modeling results demonstrate that the noise impacts from the construction activities will not exceed the City of Oregon's construction noise threshold limit of 90 dBA at the property lines. Furthermore, construction operations will not occur outside of the ordinance limits of 6:00 a.m. to 10:00 p.m.

9. Operational Equipment Noise Impact Evaluation

The Oregon Clean Energy Center is evaluating two alternate equipment layouts. These layouts include equipment from two separate manufacturers, Mitsubishi and Siemens. This study evaluated both layouts separately in order determine property line compliance. These evaluations are provided below.

9.1 Mitsubishi Equipment Layout

The anticipated noise sources associated with the Mitsubishi layout will be primarily associated with the cooling tower, gas turbines, HRSG, steam turbine, pumps, compressors and transformers. The gas turbines, HRSG, and the steam turbine will be housed within enclosures, which will include inlets and exhaust for each piece of equipment. All equipment will operate 24 hours a day where, for the purpose of this study, all equipment utilization was assumed to be 100 percent. All noise emission data for the Mitsubishi layout was supplied

by the equipment vendor and OCE engineers. All mechanical equipment proposed for this layout is summarized below in Table 7. For more information please refer to Appendix D: Mitsubishi Layout Noise Emission Data.

Table 7. Mitsubishi Equipment Layout Noise Emission Data

Equipment Description	Referenced Distance (feet)	Sound Level (dBA)	Enclosure
GT Inlet Air Filter	3	85.0	Outside of Enclosure
GT Air Inlet Duct - I	3	85.0	Outside of Enclosure
Inlet Air Silencer	3	85.0	Outside of Enclosure
GT Air Duct - II	3	90.0	Outside of Enclosure
Gas Turbine Enclosure	3	85.0	Enclosed
GT Generator and Slip Ring Housing	3	85.0	Enclosed
GT Exhaust Duct A	3	85.0	Enclosed
GT Exhaust Expansion Joint	3	90.0	Outside of Enclosure
GT Lube Oil Unit	3	85.0	Enclosed
GT Ventilation Fan A	3	85.0	Outside of Enclosure
GT Ventilation Fan A	3	85.0	Outside of Enclosure
GT Fuel Gas Unit**	3	85.0	Enclosed

HRSG Inlet Duct	3	85.0	Outside of Enclosure
HRSG Module 1 - 3	3	85.0	Outside of Enclosure
HRSG Module 4 - 7	3	85.0	Outside of Enclosure
HRSG Stack Exit	PWL*	112.0	Outside of Enclosure
Steam Turbine (HP Portion)	3	85.0	Enclosed
Steam Turbine (LR Portion)	3	85.0	Enclosed
ST Generator and Slip Ring Housing	3	85.0	Enclosed
ST Lube Oil Unit	3	85.0	Enclosed
Circulating Water Pump (each of 2 operating)	PWL*	104.0	Outside of Enclosure
Plant Air Compressor A	PWL*	90.0	Enclosed
Plant Air Compressor B	PWL*	90.0	Enclosed
No. 1 GTG Transformer	PWL*	108.0	Outside of Enclosure
No. 2 GTG Transformer	PWL*	108.0	Outside of Enclosure
No. 1 GTG Exc. Transformer	PWL*	93.0	Outside of Enclosure
No. 2 GTG Exc. Transformer	PWL*	93.0	Outside of Enclosure

No. 1 Unit Transformer	PWL*	93.0	Outside of Enclosure
No. 2 Unit Transformer	PWL*	93.0	Outside of Enclosure
HP Feed Water Pump A	PWL*	108.0	Outside of Enclosure
HP Feed Water Pump B	PWL*	108.0	Outside of Enclosure
HP Feed Water Pump C	PWL*	108.0	Outside of Enclosure
HP Feed Water Pump D	PWL*	108.0	Outside of Enclosure
STG Transformer	PWL*	108.0	Outside of Enclosure
STG Exc. Transformer	PWL*	93.0	Outside of Enclosure
No. 1 HRSG Ammonia Dilution Air Blower	PWL*	100.0	Outside of Enclosure
No. 2 HRSG Ammonia Dilution Air Blower	PWL*	100.0	Outside of Enclosure
Cooling Tower	50	81.3	Outside of Enclosure
Demin Water Forwarding Pump	PWL	101.0	Outside of Enclosure

*PWL defines sound power level, which does not have a referenced distance.
**Gas compressor sound levels were not included and will require attenuation to meet noise regulation requirements.

9.2 Mitsubishi Equipment Layout Noise Impact Evaluation

As presented in Table 8 and depicted on Figure 3, computer model calculations indicate that the worst-case noise impacts from the unmitigated mechanical equipment associated with Mitsubishi layout range from 63.1 dBA Leq at the western property line to 80.1 dBA Leq at the northern property line.

Table 8. Mitsubishi Equipment Layout Noise Unmitigated Noise Impacts

Receiver	Receiver Location	Noise Threshold Limit (dBA)	Unmitigated Noise Level (dBA Leq)
1	Western Project Property Line	75.0	63.1
2	Northern Project Property Line	75.0	66.4
3	Northern Project Property Line	75.0	80.1
4	Northern Project Property Line	75.0	69.5
5	Northern Project Property Line	75.0	74.4
6	Eastern Project Property Line	75.0	64.6
7	Eastern Project Property Line	75.0	65.0
8	Southern Project Property Line	75.0	69.5
9	Eastern Project Property Line	75.0	73.8

As shown on Figure 4, noise impacts from the unmitigated Mitsubishi equipment layout would exceed the City of Oregon's property line noise threshold limit of 75 dBA at the northern and southern property lines. Therefore, mitigation will be required to reduce the noise impacts to below the regulated threshold limit.

9.3 Mitsubishi Layout Noise Mitigation Measures

The mechanical equipment noise sources associated with the predicted property line exceedances include the cooling tower, HRSG duct, and the gas turbine inlet. Mitigation measures will need to be incorporated into the Project site design to reduce noise impacts at the northern and southern property lines to below the regulated threshold limit of 75 dBA. These mitigation measures are discussed below, and depicted on Figure 5.

To reduce the noise impacts associated with the cooling tower, a 16-foot-high sound wall is recommended for placement along the northern property line. The length of the wall will run 595 feet and placed at the fence line of the northern property line. The sound wall should be 2 inches thick and provide an STC rating of 37. We recommend the Kinetics Noiseblock

barrier wall system, which will provide the recommended STC rating. More information regarding the sound wall recommendation is provided Appendix E.

To reduce the noise associated with the gas turbine inlet, a 16-foot high-sound wall is recommended for placement along the southern property line. The length of the wall will run 200 feet and placed at the fence line of the southern property line. The sound wall should be 2 inches thick and provide an STC rating of 37. Again, we recommend the Kinetics Noiseblock barrier wall system, which will provide the recommended STC rating. More information regarding the sound wall recommendation is provided in Appendix E.

To reduce the noise associated with the HRSG system, lagging of the duct work should be incorporated into the design. The duct lagging should be installed on the top of the duct and on the side facing the southern property line. The duct lagging should have a nominal thickness of 2 inches and provide an STC rating of 32. The duct lagging should be constructed with a layer of fiberglass and a layer of mass loaded vinyl. The layer of fiberglass should be placed against the duct creating an air gap between the duct and the mass loaded vinyl. This installation will effectively absorb and block the sound transmitting from the HRSG duct system. For this application we recommend Sound Seals BBC-13-2" duct lagging product. More information regarding the duct lagging mitigation is provided in Appendix F.

The Mitsubishi equipment layout noise impacts, with the recommended mitigation measures, are summarized in Table 9 and depicted on Figure 8.

With the incorporation of the mitigation designs as described above, the noise model calculations show that the noise impacts from the Mitsubishi equipment layout will range from 63.1 dBA Leq at the western property line to 74.4 dBA Leq at the northern property line. The mitigated noise impacts are shown to be below the City of Oregon's property line noise threshold limits of 75 dBA.

Table 9. Mitsubishi Equipment Layout Noise Mitigated Noise Impacts

Receiver	Receiver Location	Noise Threshold Limit (dBA)	Unmitigated Noise Level (dBA Leq)	Mitigated Noise Level (dBA Leq)
1	Western Project Property Line	75.0	63.1	63.1
2	Northern Project Property Line	75.0	66.4	66.1
3	Northern Project Property Line	75.0	80.1	66.0

Receiver	Receiver Location	Noise Threshold Limit (dBA)	Unmitigated Noise Level (dBA Leq)	Mitigated Noise Level (dBA Leq)
4	Northern Project Property Line	75.0	69.5	68.6
5	Northern Project Property Line	75.0	74.4	74.4
6	Eastern Project Property Line	75.0	64.6	64.6
7	Eastern Project Property Line	75.0	65.0	65.0
8	Southern Project Property Line	75.0	69.5	69.5
9	Eastern Project Property Line	75.0	73.8	73.8

9.4 Siemens Equipment Layout

The anticipated noise sources associated with the Siemens layout will be primarily associated with the cooling tower, gas turbines, HRSG, steam turbine, pumps, compressors and transformers. The gas turbines, HRSG, and the steam turbine will be housed within enclosures, which will include inlets and exhaust for each piece of equipment. No detailed information was provided regarding the construction material of the enclosures for evaluating the STC rating. Therefore, this study assumes basic construction material, which would provide an STC rating of 27. All equipment will operate 24 hours a day and for the purpose of this study all equipment utilization was assumed to be 100 percent. All noise emission data for the Siemens layout was supplied by the equipment vendor and OCE engineers. All mechanical equipment proposed for this layout is provided in Appendix G and summarized in Table 10.

Table 10. Siemens Equipment Layout Noise Emission Data

Equipment Description	Sound Power Level (PWL dBA)	Enclosure
GT Inlet Filter House - Overhead - Pulse Self-cleaning Filter + Evaporative Cooler - Each GT	99.0	Outside of Enclosure

Equipment Description	Sound Power Level (PWL dBA)	Enclosure
GT Inlet Duct Wall Radiated - Lagged - Each GT	105.0	Outside of Enclosure
GT Enclosure Walls	91.0	Outside of Enclosure
GT Enclosure Air Inlet Vents- Each GT	85.0	Outside of Enclosure
GT Enclosure Air Discharge Vents - Each GT	82.0	Outside of Enclosure
GT Exhaust Diffuser & Expansion Joint - Each GT	108.0	Outside of Enclosure
GT Fuel Gas Systems - Each GT	96.0	Outside of Enclosure
GT Generator, Hydrogen-cooled - Each GT	118.0	Enclosed
Enclosed Lube Oil Package - Each GT	98.0	Enclosed
HRSG Inlet Transition Duct Radiated - Each HRSG	99.0	Outside of Enclosure
HRSG Wall Radiated - Each HRSG	99.0	Outside of Enclosure
HRSG Exhaust Stack Exit - w/o Directivity - Each HRSG	114.0	Outside of Enclosure
HRSG Duct Burner Gas Piping - Each HRSG	105.0	Outside of Enclosure
Steam Turbine - Total - Indoor	113.0	Enclosed
Hydrogen-cooled Generator for Steam Turbine	118.0	Enclosed

Equipment Description	Sound Power Level (PWL dBA)	Enclosure
Unenclosed Lube Oil Package - Steam Turbine	104.0	Enclosed
Steam Turbine Control Oil Supply Skid	109.0	Enclosed
Boiler Feed Water Pump A -One of 3 X 50% total plant	108.0	Enclosed
Boiler Feed Water Pump B -One of 3 X 50% total plant	108.0	Enclosed
Boiler Feed Water Pump C -One of 3 X 50% total plant	108.0	Enclosed
Steam Surface Condenser	112.0	Enclosed
Condensate Extraction Pump A - One of 3 X 50%	104.0	Enclosed
Condensate Extraction Pump B - One of 3 X 50%	104.0	Enclosed
Condensate Extraction Pump C - One of 3 X 50%	104.0	Enclosed
Generation Building Enclosing GT and STG + Auxiliaries	103.0	Outside of Enclosure
Generation Building Roof Vent Fans - Each of TBD	94.0	Outside of Enclosure
Main GSU Transformer - Each GT and ST	108.0	Outside of Enclosure
Auxiliary Transformer - Each	93.0	Outside of Enclosure
Circulating Water Pump - Each	104.0	Outside of Enclosure

Equipment Description	Sound Power Level (PWL dBA)	Enclosure
Cooling Tower - Total	81.3 at 50 Feet*	Outside of Enclosure
SCR Ammonia Skid - Each	100.0	Outside of Enclosure
Demin Water Forwarding Pump - Each	101.0	Outside of Enclosure
Raw Water Forwarding Pump - Each	95.0	Outside of Enclosure

*Sound pressure level

9.5 Siemens Equipment Layout Noise Impact Evaluation

Computer model calculations show that the worst-case noise impacts from the unmitigated mechanical equipment associated with the Siemens layout will range from 68.2 dBA Leq at the western property line to 87.8 dBA Leq at the southern property line. Table 11 summarizes the calculated noise impacts at the Project property lines, which are depicted on Figure 7.

Table 11. Siemens Equipment Layout Noise Unmitigated Noise Impacts

Receiver	Receiver Location	Noise Threshold Limit (dBA)	Unmitigated Noise Level (dBA Leq)
1	Western Project Property Line	75.0	68.2
2	Northern Project Property Line	75.0	70.9
3	Northern Project Property Line	75.0	80.2
4	Northern Project Property Line	75.0	83.9
5	Northern Project Property Line	75.0	86.2

Receiver	Receiver Location	Noise Threshold Limit (dBA)	Unmitigated Noise Level (dBA Leq)
6	Eastern Project Property Line	75.0	74.0
7	Eastern Project Property Line	75.0	74.3
8	Southern Project Property Line	75.0	87.8
9	Eastern Project Property Line	75.0	79.7

The noise impacts from the unmitigated Siemens equipment layout would exceed the City of Oregon's property line noise threshold limit of 75 dBA at the northern, southern, and eastern property lines. Therefore, mitigation will be required to reduce the noise impacts to below the regulated threshold limit.

9.6 Siemens Layout Noise Mitigation Measures

The mechanical equipment noise sources associated with the property line exceedances include the cooling tower, HRSG duct, and the gas turbine inlet. Mitigation measures will need to be incorporated into the Project site design to reduce noise impacts at the northern, southern, and eastern property lines to below the regulated threshold limit of 75 dBA. These mitigation measures are discussed below.

To reduce the noise impacts associated with the cooling tower, a 16-foot-high sound wall is recommended for placement along the northern property line, as shown on Figure 8. The length of the wall will run 595 feet and placed at the fence line of the northern property line. The sound wall should be 2 inches thick and provide an STC rating of 37. We recommend the Kinetics Noiseblock barrier wall system, which will provide the recommended STC rating. More information regarding the sound wall recommendation is provided in Appendix E.

To improve the noise reduction of the HRSG, gas turbine, and the generation building, equipment enclosures upgrades will need to be incorporated within the construction of the enclosures. The current planned enclosures are assumed to provide an STC rating of 27. The overall building enclosure STC ratings will need to be increased to a minimum STC rating of 48. Also, all interior-to-exterior enclosure penetrations should be completely sealed. For enclosing mechanical equipment we recommend Kinetics industrial/environmental

acoustic enclosure system. More information regarding the enclosure recommendation is provided in Appendix H.

To reduce the noise associated with the HRSG inlets, lagging of the duct work should be incorporated into the design. The duct lagging should be installed on the top of the ducts and on the side facing the northern and southern property lines. The duct lagging should have a nominal thickness of 2 inches and provide an STC rating of 32. The duct lagging should be constructed with a layer of fiberglass and a layer of mass loaded vinyl. The layer of fiberglass should be placed against the duct creating an air gap between the duct and the mass load vinyl. This installation will effectively absorb and block the sound transmitting from the HRSG inlet. For this application we recommend Sound Seals BBC-13-2" duct lagging product. More information regarding the duct lagging recommendation is provided in Appendix F.

To reduce the noise associated with the gas turbine inlets, an inline silencer system should be installed at each turbine inlet. At this time more information is required to design the silencer system. However, the silencer system should be designed to provide a minimum of 20 decibels of reduction.

With the incorporation of the mitigation designs as described above, the noise model calculations show that the noise impacts from the Siemens equipment layout will range from 64.7 dBA Leq at the western property line to 74.3 dBA Leq at the southern property line. The mitigated noise impacts are shown to be below the City of Oregon's property line noise threshold limits of 75 dBA.

The Siemens equipment layout noise impacts, with the recommended mitigation measures, are summarized in Table 12, and shown on Figure 9.

Table 12. Siemens Equipment Layout Noise Mitigated Noise Impacts

Receiver	Receiver Location	Noise Threshold Limit (dBA)	Unmitigated Noise Level (dBA Leq)	Mitigated Noise Level (dBA Leq)
1	Western Project Property Line	75.0	68.2	64.7
2	Northern Project Property Line	75.0	70.9	67.2
3	Northern Project Property Line	75.0	80.2	66.9

Receiver	Receiver Location	Noise Threshold Limit (dBA)	Unmitigated Noise Level (dBA Leq)	Mitigated Noise Level (dBA Leq)
4	Northern Project Property Line	75.0	83.9	74.0
5	Northern Project Property Line	75.0	86.2	72.0
6	Eastern Project Property Line	75.0	74.0	65.4
7	Eastern Project Property Line	75.0	74.3	65.7
8	Southern Project Property Line	75.0	87.8	74.3
9	Eastern Project Property Line	75.0	79.7	72.9

10. Conclusions

The baseline noise study was designed to characterize the Project site by documenting the existing field ambient noise levels to allow for future planning. Noise monitoring was conducted for a two-week period from October 16, 2012 to October 31, 2012.

The ambient field noise measurement data collected at Measurement Location 1 shows that the average daytime noise levels range from 51.1 dBA Leq to 62.1 dBA Leq and the average nighttime noise levels range from 50.4 dBA Leq to 58.1 dBA Leq. The overall singular average Leq over the two-week noise monitoring period during the daytime was 55.5 dBA Leq and during the nighttime was 54.6 dBA Leq.

The ambient field noise measurement data collected at Measurement Location 2 shows that the average daytime noise levels range from 47.1 dBA Leq to 58.1 dBA Leq and the average nighttime noise levels range from 46.1 dBA Leq to 60.6 dBA Leq. The overall singular average Leq over the two week noise monitoring period during the daytime was 51.6 dBA Leq and during the nighttime was 51.3 dBA Leq.

Four additional spot-check measurements were conducted near defined sensitive residential receptor locations within the vicinity of the project site. The noise levels measured at the four identified sensitive noise receptors range from 52.7 dBA Leq to 64.4 dBA Leq.

The City of Oregon's noise ordinance provides property line noise threshold limits for both construction and operation of the Project. The ordinance limits noise from construction equipment to 90 dBA at Project property lines. It further limits construction activities to operate between the time period of 6:00 a.m. to 10:00 p.m. The ordinance also limits permanent stationary noise sources to 75 dBA at all Project property lines.

The phased Project construction activities, as well as the associated equipment incorporated within this analysis, are based on the construction equipment and workforce estimates provided by OCE engineers. The construction of the Project would require a variety of equipment. The calculated construction noise impacts range from 49.8 dBA at eastern property line to 83.6 dBA at western property line. The noise impacts from the construction activities will not exceed the City of Oregon's construction noise threshold limit of 90 dBA at the property lines. Construction operations will not occur outside of the time limits of 6:00 a.m. to 10:00 p.m.

The Oregon Clean Energy Center is evaluating two alternate equipment layouts. These layouts include equipment from two separate manufacturers, Mitsubishi and Siemens. This study evaluated both layouts separately in order determine property line compliance.

Computer model calculations show that the worst-case noise impacts from the unmitigated mechanical equipment associated with Mitsubishi layout will range from 63.1 dBA Leq at the western property line to 80.1 dBA Leq at the northern property line. The noise impacts from the unmitigated Mitsubishi equipment layout would exceed the City of Oregon's property line noise threshold limit of 75 dBA. Therefore, mitigation will be required to reduce the noise impacts to below the regulated threshold limit.

Mitigation for the Mitsubishi equipment layout include a 16-foot-high, 595-foot-long sound wall along the northern property line, along with a 16-foot-high, 200-foot-long sound wall along the southern property line, and lagging of the HRSG duct system. With the incorporation of the mitigation designs as described above, the noise model calculations show that the noise impacts from the Mitsubishi equipment layout will range from 63.1 dBA Leq at the western property line to 74.4 dBA Leq at the northern property line. The mitigated noise impacts are shown to be below the City of Oregon's property line noise threshold limits of 75 dBA.

Computer model calculations show that the worst-case noise impacts from the unmitigated mechanical equipment associated with Siemens layout will range from 68.2 dBA Leq at the western property line to 87.8 dBA Leq at the northern property line. The noise impacts from the unmitigated Siemens equipment layout would exceed the City of Oregon's property line

noise threshold limit of 75 dBA. Therefore, mitigation will be required to reduce the noise impacts to below the regulated threshold limit.

Mitigation for the Mitsubishi equipment layout include a 16-foot-high, 595-foot-long sound wall along the northern property line, increased STC ratings for the equipment building enclosures, lagging of the HRSG duct system, and an in-line silencer system placed along the gas turbine inlet. With the incorporation of the mitigation designs as described above, the noise model calculations show that the noise impacts from the Siemens equipment layout will range from 64.7 dBA Leq at the western property line to 74.3 dBA Leq at the southern property line. The mitigated noise impacts are shown to be below the City of Oregon's property line noise threshold limits of 75 dBA.

The proposed mitigation measures for each layout are deemed reasonable for Project compliance at the property lines. However, once a product vendor and a final site layout has been selected, the mitigation measure should be re-evaluated to re-confirm compliance with the ordinance limits.

11. References

American National Standards Institute (ANSI) SI.4. 1983. Specification for Sound Level Meters.

Beranek, Leo L. 1988. *Noise and Vibration Control*, Revised Edition. INCE.

City of Oregon. 1980. Municipal Code, Chapter 531: Noise Control.

FHWA. 2011. Construction Noise Handbook.

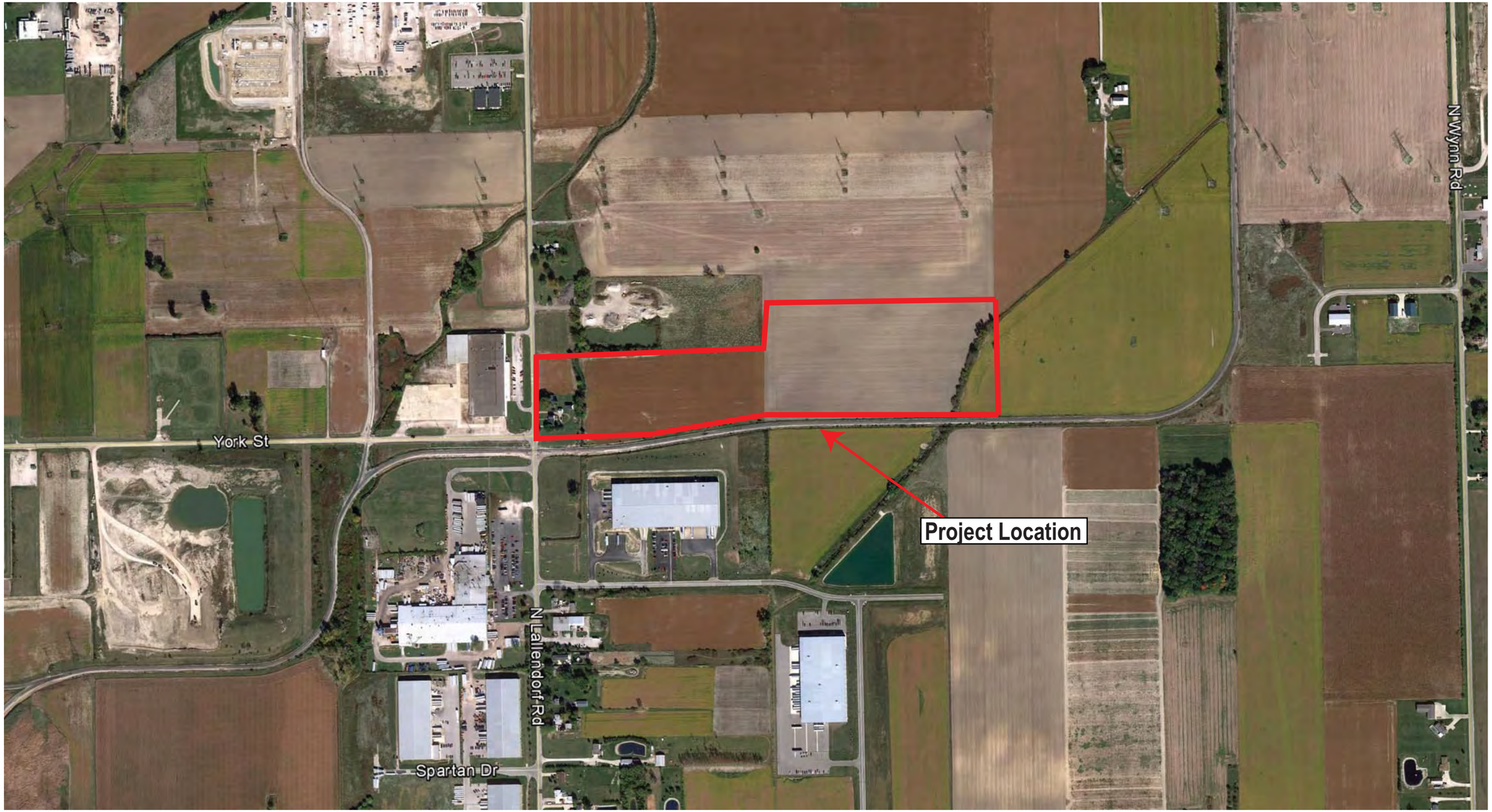
Harris, Cyril M. 1998. *Handbook of Acoustical Measurements and Noise Control*, 3rd Edition. Acoustical Society of America.

ISO. 1996. Acoustics – Attenuation of Sound during Propagation Outdoors. Part 2: General Method of Calculation. Geneva, Switzerland.

Raichel, Daniel R. 2000. *The Science and Applications of Acoustics*.

ARCADIS

Figures



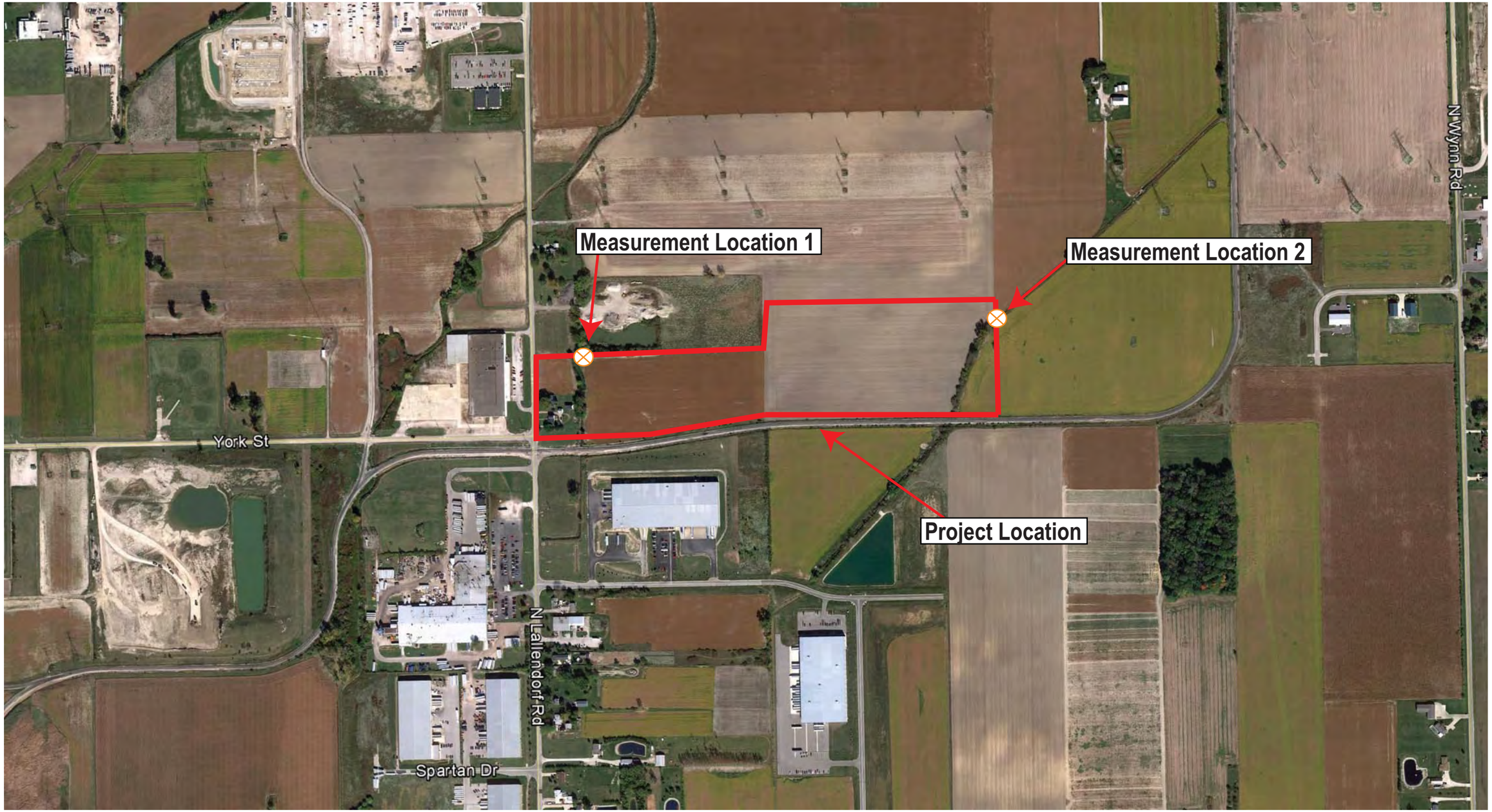
No Scale

Oregon Clean Energy, LLC
Oregon Ohio

Aerial Image Showing Project Location

ARCADIS

FIGURE
1



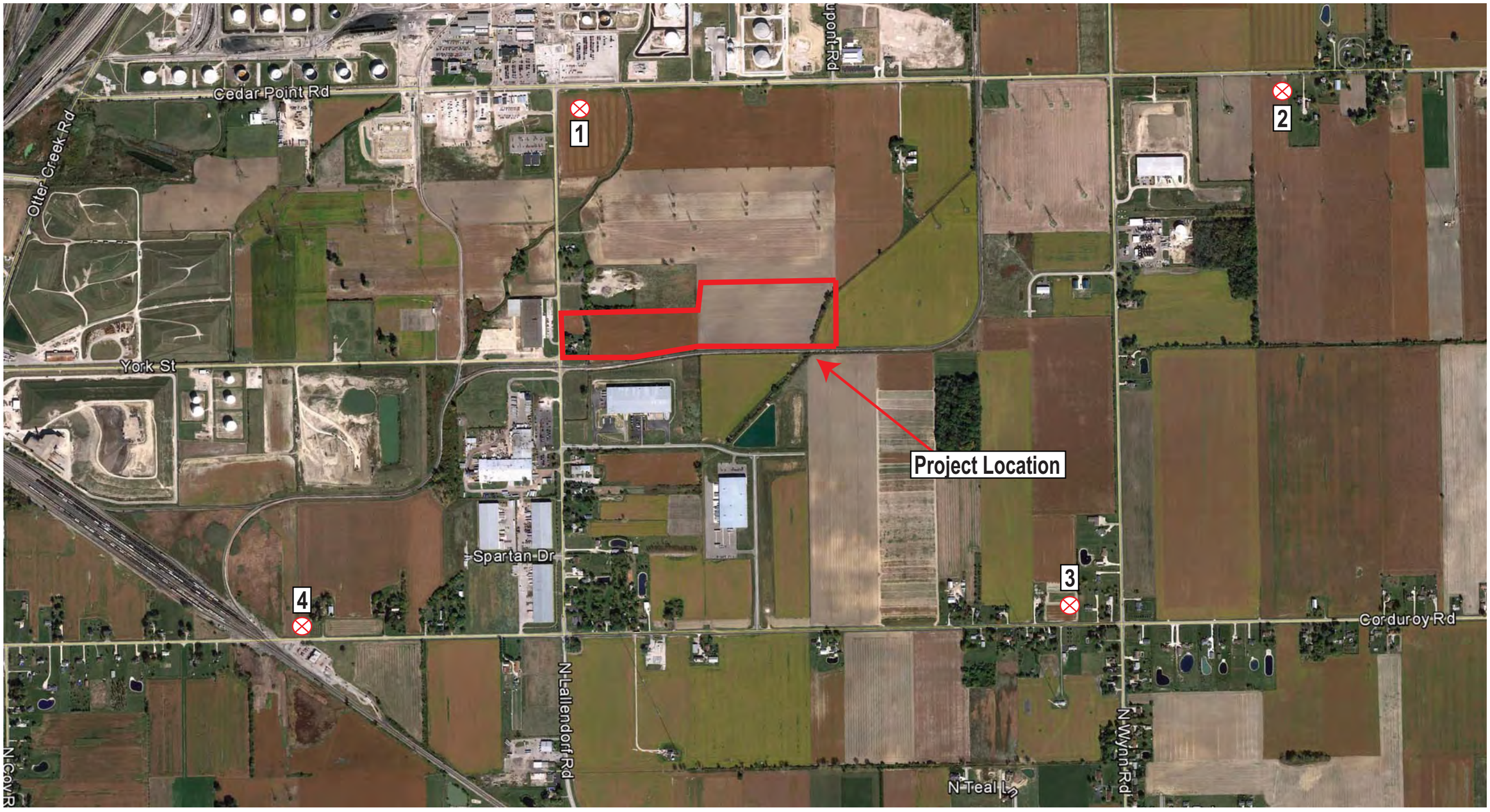
No Scale

Oregon Clean Energy, LLC
Oregon Ohio

Aerial Image Showing Noise Monitor Locations

ARCADIS

FIGURE
2



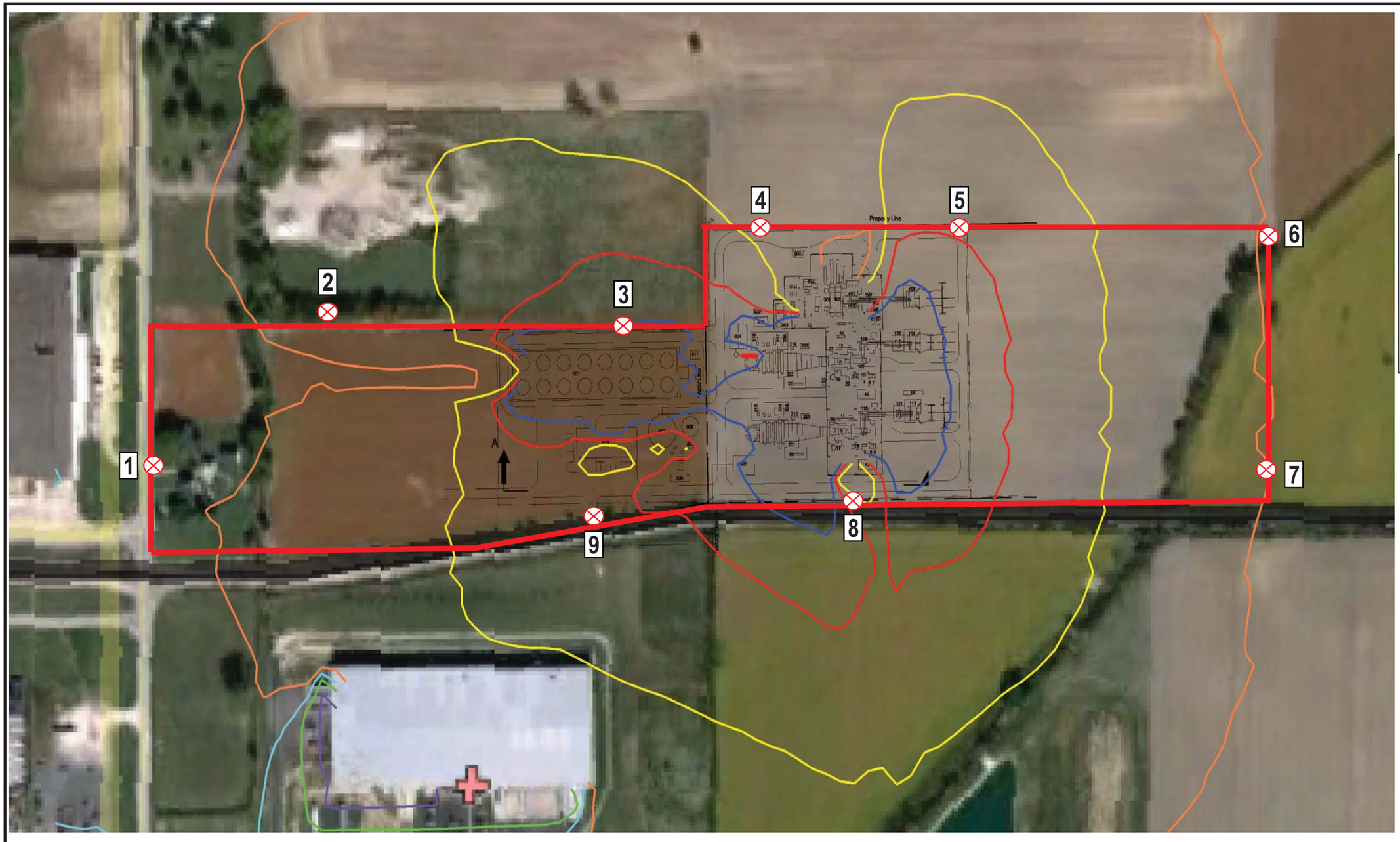
No Scale

Oregon Clean Energy, LLC
Oregon Ohio

Aerial Image Showing Short-term Noise Measurement Locations

ARCADIS

FIGURE
3



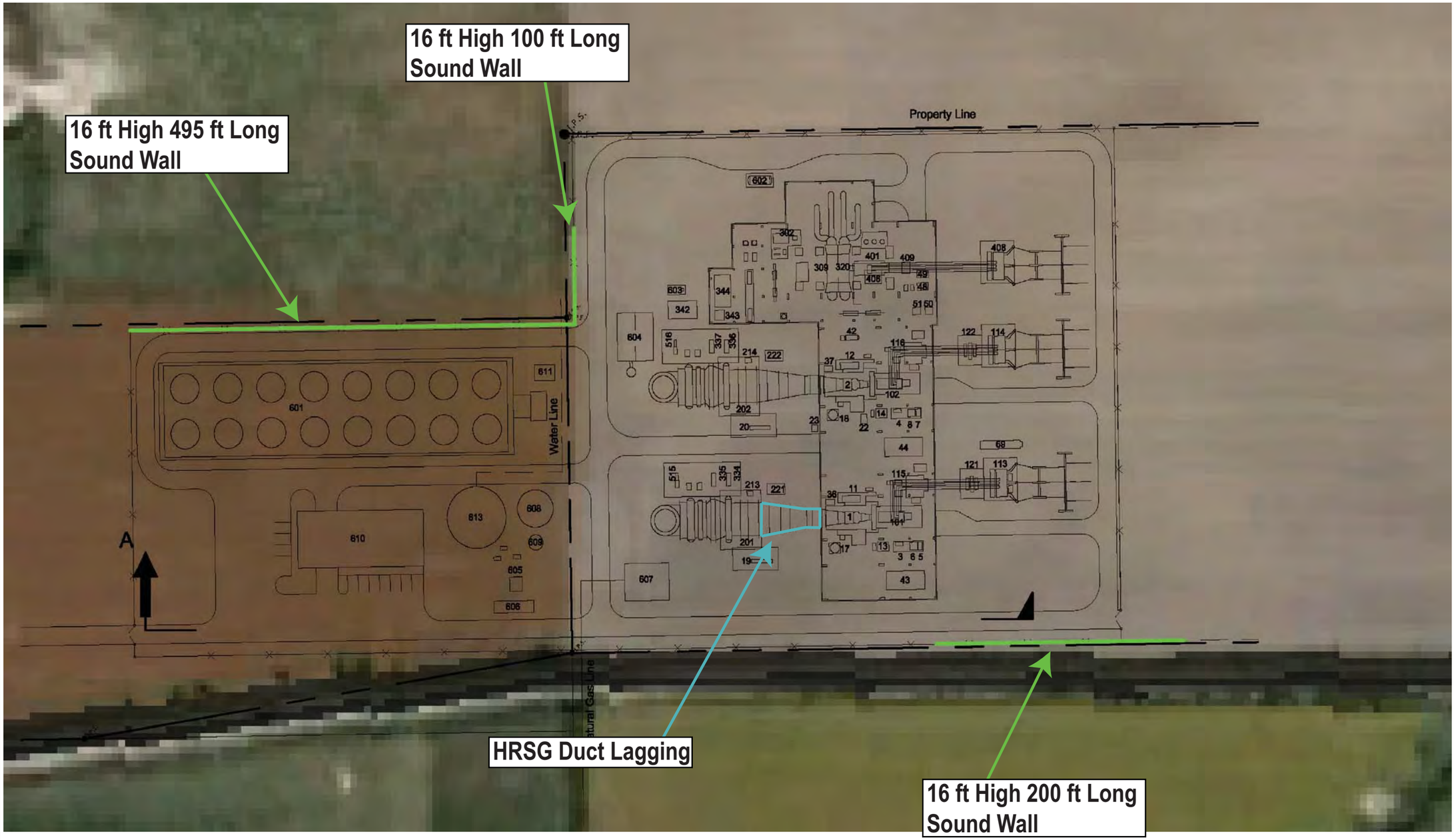
No Scale

Oregon Clean Energy, LLC
Oregon Ohio

Aerial Image Showing Mitsubishi Layout Unmitigated Noise Impact Contours at Project Property Lines

ARCADIS

FIGURE
4



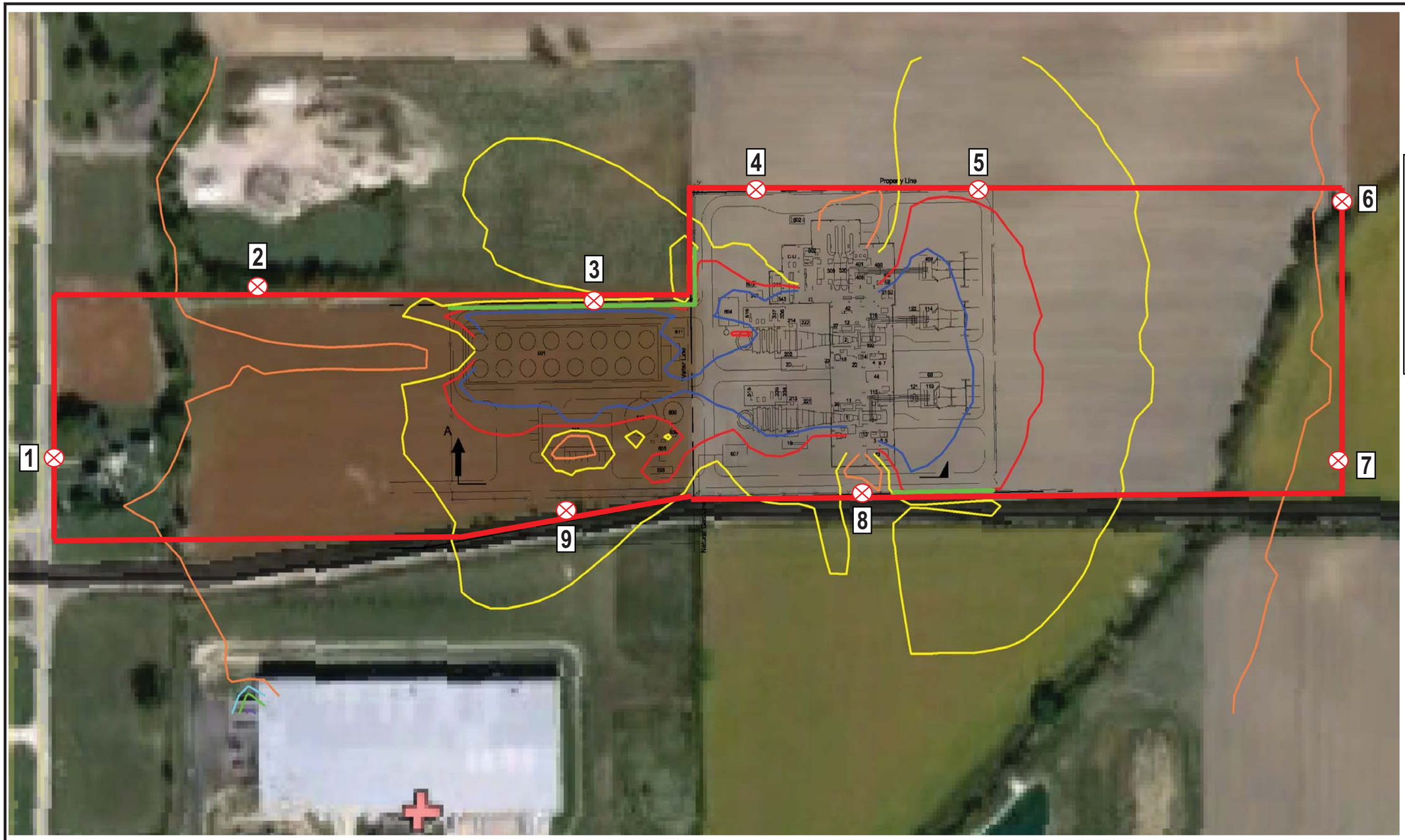
No Scale

Oregon Clean Energy, LLC
Oregon Ohio

Aerial Image Showing Mitsubishi Layout Mitigation Measures

ARCADIS

FIGURE
5



Noise Contour Legend

- 60 dBA
- 65 dBA
- 70 dBA
- 75 dBA
- 80 dBA

N

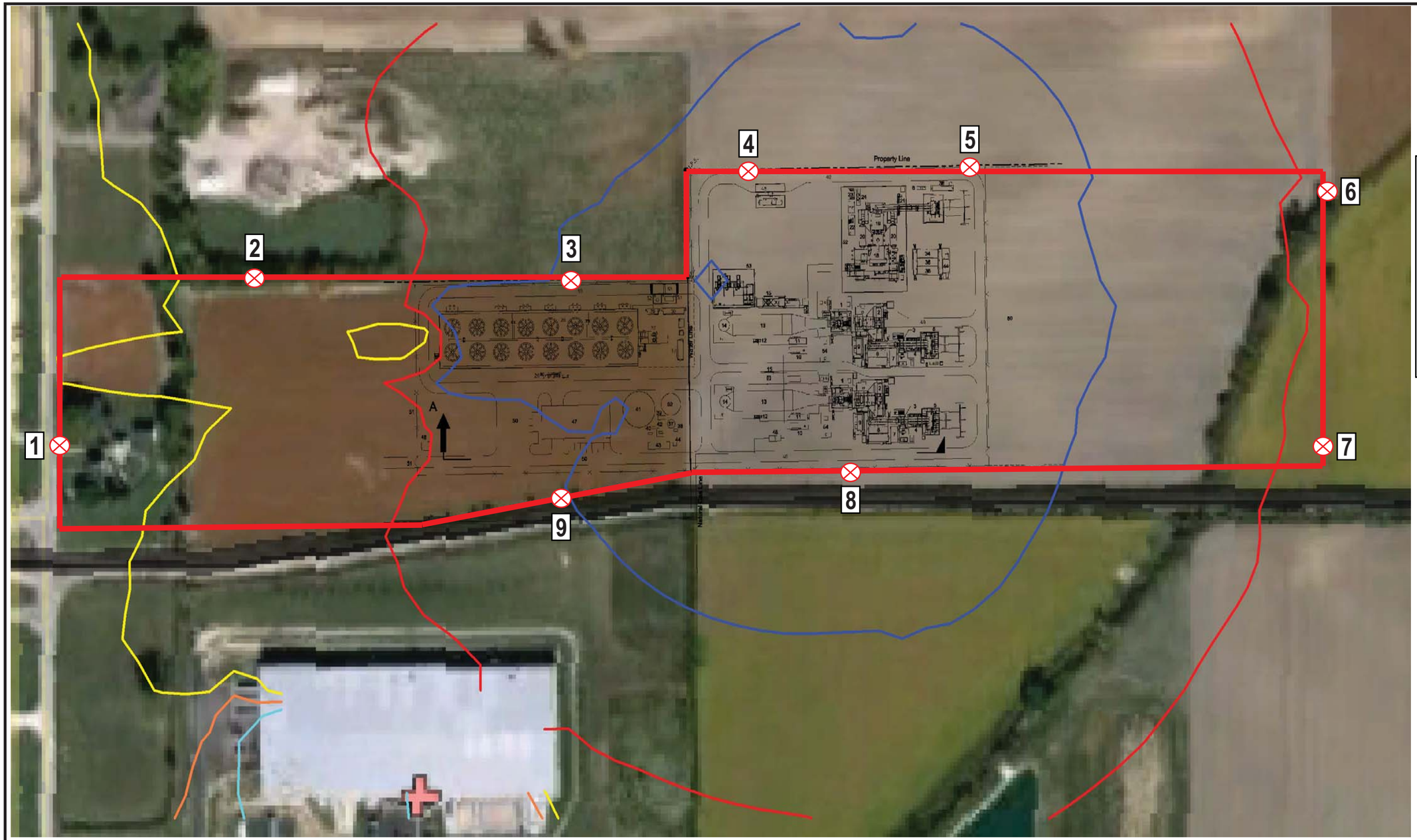
No Scale

Oregon Clean Energy, LLC
Oregon Ohio

Aerial Image Showing Mitsubishi Layout Mitigated Noise Impact Contours at Project Property Lines

ARCADIS

FIGURE
6



Noise Contour Legend

- 60 dBA
- 65 dBA
- 70 dBA
- 75 dBA
- 80 dBA

N

No Scale

Oregon Clean Energy, LLC
Oregon Ohio

Aerial Image Showing Siemens Layout Unmitigated Noise Impact Contours at Project Property Lines

ARCADIS

FIGURE
7

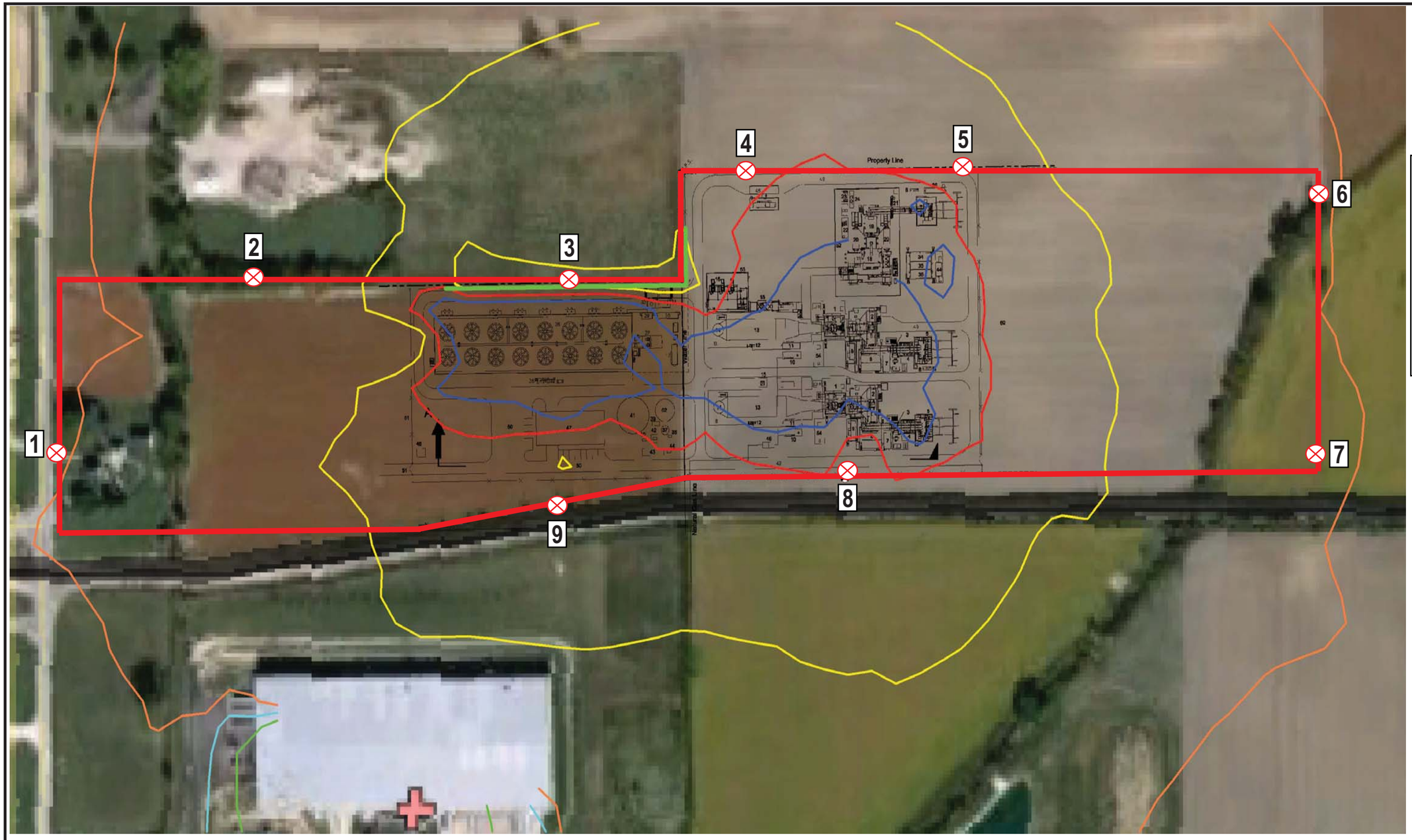
No Scale

Oregon Clean Energy, LLC
Oregon Ohio

Aerial Image Showing Siemens Layout Mitigation Measures

ARCADIS

FIGURE
8



Noise Contour Legend

- 60 dBA
- 65 dBA
- 70 dBA
- 75 dBA
- 80 dBA

N

No Scale

Oregon Clean Energy, LLC
Oregon Ohio

Aerial Image Showing Siemens Layout Mitigated Noise Impact Contours at Project Property Lines

ARCADIS

FIGURE
9

ARCADIS

Appendix A

Relevant Excerpts from the Local Noise Standards

Codified Ordinances of the City of Oregon, Ohio

Complete to January 1, 2012

DISCLAIMER

The Codified Ordinances and other documents that appear in this FOLIO Infobase may not reflect the most current legislation adopted by the Municipality. The Codified Ordinances are provided for informational purposes only and should not be relied upon as the definitive authority for local legislation. Additionally, the formatting and pagination of the posted documents vary from the formatting and pagination of the official copy. The official printed copy of the Codified Ordinances should be consulted prior to any action being taken.

For further information regarding the official version of any portion of the Codified Ordinances in this FOLIO Infobase, please contact the Municipality directly.

CHAPTER 531
Noise Control

CROSS REFERENCES

Squealing tires, etc. - see TRAF. 331.36
Mufflers required - see TRAF 337.20
Disturbing the peace - see GEN. OFF. 509.03

531.01 DECLARATION OF POLICY

It is hereby declared to be the public policy of the City to reduce the ambient noise level in the City, so as to preserve, protect and promise the public health, welfare and the peace and quiet of the residents, foster the convenience and comfort of its residents, and facilitate the enjoyment of the natural attractions of the City.
(Ord. 30-1980. Passed 3-10-80.)

531.02 DEFINITIONS.

As used in this chapter:

(a) "Acceleration" means the time rate of change of velocity.

(b) "Ambient noise" means the all-encompassing noise associated with a given environment, being usually a composite of sounds from many sources.

(c) "ANSI" means the American National Standards Institute or its successor bodies.

(d) "Construction noise" means the noise emanating from construction activities as described in Section 531.11 and 531.17.

(e) "Critical construction equipment" means construction equipment required to operate twenty-four hours a day to protect health and safety of the public and the workmen.

(f) "Cycle" means the complete sequence of values of a periodic quantity that occur during a period and is referred to as cycles per second or hertz.

(g) "dbA" means the A weighted sound pressure level obtained by the use of metering characteristics in the A weighting network specified in ANSI S1.4 - 1971 or later approved revision thereof.

(h) "Decibel (db)" means a unit of measure, on a logarithmic scale to the base 10, of the ratio of the magnitude of a particular sound pressure, which for the purposes of this chapter shall be 20 micronewtons per square meter (MN/m^2)

(i) "Displacement" means the magnitude of the motion.

(j) "Emergency work" means work made necessary to restore property to a safe condition following a public calamity or work required to protect persons or property from an imminent exposure to danger; work by private or public utilities when restoring utility services or protecting them from imminent danger.

(k) "Fixed source" means a machine or device capable of creating a noise level at the property upon which it is regularly located, including but not limited to: air conditioning and refrigeration apparatus, industrial and commercial process machinery, fan, etc.

(l) "Impulsive sound" means a noise characterized by brief excursions of sound pressure significantly exceeds the ambient noise, the duration of a single impulse of which is less than 1 second and which requires for accurate measurements a specific designed instrumentation.

(m) "Impulsive vibration" means vibration resulting from an impact source, e. g., blasting or pile driving.

(n) "Motor vehicle" includes, but is not limited to automobiles, trucks, motorcycles, minibikes, go-carts and snowmobiles.

(o) "Noise" means any undesired sound. "Noise level", for the purposes of this chapter, the terms "noise level" and "sound level" where used are synonymous.

(p) "Particle velocity" means the time rate of change of displacement.

(q) "Person" means any person, person's firm, association, co-partnership, joint venture, corporation or any entity public or private in nature.

(r) "Sound" means an oscillation in pressure in air.

(s) “Sound analyzer" means a device for measuring a specific band pressure level or pressure spectrum level of a sound as a function of frequency.

(t) "Sound level" means in decibels, a weighted sound pressure level, measured by the use of metering characteristics and frequency weightings specified in ANSI S1.4 - 1971 "Specification for Sound Level Meters".

(u) "Sound level meter" means an instrument including a microphone, an amplifier, an output meter and frequency weighting networks for the measurement of noise and sound levels in a specified manner. The meter must satisfy the applicable requirements for Type 2 sound level meter as defined in ANSI S1.4 - 1971 or the most recent revision.

(v) "Sound pressure level" means in decibels, 20 times the logarithm to the base 10 of the ratio of the magnitude of a particular sound pressure to a standard reference pressure, which for the purposes of this chapter shall be 20 micronewtons per square meter ($20\ MN/m^2$)

(w) "Steady state vibration" means continuous earthborn oscillations.

(x) "Unnecessary, excessive or offensive noise" means any offensive sound or noise which annoys, disturbs, injures or endangers the comfort, repose, health, peace or safety of others; or a noise level which exceeds the fixed source noise level for the zone as provided in Section 531.14 by 10 dbA or more, when measured at the nearest property line.

(y) "Zoning districts" means those established by Section 1121.02 of the Planning and

Zoning Code.
(Ord. 30-1980. Passed 3-10-80.)

531.03 UNNECESSARY, EXCESSIVE, OFFENSIVE NOISE PROHIBITED.

No person shall make, continue, or cause to be made or continued any unnecessary, excessive or offensive noise which annoys, disturbs, injures or endangers the comfort, repose, health, peace or safety of others within the limits of the City.
(Ord. 30-1980. Passed 3-10-80.)

531.04 MUSICAL INSTRUMENTS, RADIOS, ETC.

No person shall operate or permit to be operated any musical instrument, radio, phonograph, television set or any other instrument or device capable of producing noise, in such a manner or with such volume as to create unnecessary, excessive or offensive noise which annoys or disturbs the peace, quiet, comfort or repose of the neighboring inhabitants, particularly between the hours of 9:00 p. m. and 7:00 a. m.
(Ord. 30-1980. Passed 3-10-80.)

531.05 POOLS.

No person shall make, continue or cause to be made or continued at any swimming pool, unnecessary, excessive or offensive noise which annoys, disturbs, injures or endangers the comfort, repose, health, peace or safety of others particularly between the hours of 9:00 p.m. and 7:00 a.m.
(Ord. 30-1980. Passed 3-10-80.)

531.06 ANIMALS.

No owner, keeper or harborer of any animal shall permit or suffer such animal to continuously or frequently bark, howl or emit other audible sounds which create unreasonable, excessive or offensive noise to the annoyance or discomfort of any person of ordinary sensibilities in the vicinity of the animal.
(Ord. 30-1980. Passed 3-10-80.)

531.07 SCHOOLS, HOSPITALS, CHURCHES.

No person shall create any unnecessary, excessive or offensive noise on any street, sidewalk or property adjacent to any school, institution of learning or church while any of the same is in use, or adjacent to any hospital at any time, provided conspicuous signs are displayed in such streets, sidewalk or public place indicating the presence of a school, institution of learning, church or hospital.
(Ord. 30-1980. Passed 3-10-80.)

531.08 LOADING; UNLOADING.

No person shall create loud and excessive noise in connection with loading or unloading any vehicle or the opening and/or destruction of bales, boxes, crates and containers. If any noise for any duration is 7 dbA over the fixed source noise level for the zone as specified in Section 531.14, when measured at the property line of the property affected by the noise emission, between the hours of 9:00 p.m. and 7:00 a.m., then this in itself would declare the noise unnecessary and excessive.
(Ord. 30-1980. Passed 3-10-80.)

531.09 HOMEOWNERS OUTDOOR EQUIPMENT.

(a) No person shall operate engine or motor-powered lawn or maintenance tools intended for use in residential areas, typically capable of being used by homeowners such as power mowers,

garden tools, riding tractors, power saws, edgers, etc., which create a noise that exceeds the fixed source noise level for the zone as specified in Section 531.14 at the property line of the property affected by the noise emission except between the hours of 8:00 a.m. and 9:00 p.m. on weekdays and between the hours of 9:00 a.m. and 9:00 p.m. on weekends and legal holidays.

(b) Homeowners outdoor equipment must have mufflers where applicable and which are in good working condition

(c) Snow blowers and snow plows are exempted from the time requirements of this section when removing snow and ice.
(Ord. 30-1980. Passed 3-10-80.)

531.10 VEHICLE; NON-STATIONARY SOURCE REPAIRS.

No person shall repair, rebuild or test within any residential area any motor vehicle or nonstationary source in such a manner as to cause unnecessary, excessive or offensive noise. If the noise is 7 dbA over the fixed source noise level as specified in Section 531.14 for more than five minutes out of sixty minutes, then this in itself would declare the noise loud end excessive.
(Ord. 30-1980. Passed 3-10-80.)

531.11 CONSTRUCTION.

(a) No person shall use any pile driver, shovel, hammer derrick, hoist tractor, roller or other mechanical apparatus operated by fuel or electric power in building or construction operations between the hours of 10:00 p.m. and 6:00 a.m., within a residential area or within 500 feet of a school or hospital, except for temporary conditions approved by the Mayor or Chief of Police or the City's authorized representative.

(b) No person shall perform any construction or repair work on any structure or building; or perform any excavation or roadwork, which entails the use of any poweroperated, construction-type device in such a manner that the noise created thereby substantially exceeds the noise customarily and necessarily attendant to the reasonable and efficient performance of such equipment.

(c) The sound level produced by any piece of construction equipment manufactured twenty-four months after the effective date of this chapter, with the exception of impulsive sound and critical construction equipment shall not exceed 90 dbA when measured at the property line or at a distance of not less than fifty feet from the equipment when operating at the boundary line of the construction project within a residential area or within 500 feet of a school or hospital. Impulse-related activities such as pile driving type equipment, pavement breaker type equipment other than hand held, and blasting will be regulated by Section 531.17.
(Ord. 30-1980. Passed 3-10-80; ord. 61-1985. Passed 5-28-85.)

531.12 EXEMPTIONS.

The following uses and activities shall be exempt from noise level regulations:

(a) Noises of safety signals, warning devices and emergency pressure relief valves.

(b) Noises resulting from any authorized emergency cr public safety vehicle, when responding to an emergency call or acting in time of emergency.

(c) Noises resulting from emergency work.

(d) Noises resulting from authorized public activities such as parades, fireworks, sports events, musical productions and other activities which have the approval of the department who has been authorized this responsibility by Council.

(e) Noises resulting from sports events authorized by the Board of Education, private schools, colleges or universities.
(Ord. 30-1980. Passed 3-10-80.)

531.13 MOTOR VEHICLES

(a) No person shall operate within the speed limits specified in this section a motor vehicle of a type subject to registration at any time or under any condition of load, acceleration or deceleration in such manner as to exceed the following noise limits for the category of motor vehicle, based on a distance of not less than fifty feet from the center line of travel:

Type of Vehicle	Noise Limit in Relation to Posted Speed Limit 35 mph or less	Over 35 mph
(1) Trucks and busses Any motor vehicle with a manufacturer's GVW rating of 10,000 lbs. or more	86 dbA	90 dbA
(2) Passenger cars, light trucks and busses under 10,000 lbs.	76 dbA	82 dbA
(3) Motorcycles	82 dbA	86 dbA

(4) Noise from snowmobiles, minibikes, go-carts and other off-highway vehicles must not exceed 82 dbA when measured at a distance of not less than 50 feet.

(b) No person in charge or control of any vehicle shall:

(1) Make with such vehicle or any device connected therewith, any excessive noise to annoy the public, unnecessarily race his motor while running idle, or open the muffler on any vehicle, upon the street;

(2) Sound any horn or signal device on any vehicle for any unnecessary and excessive period of time, except as a danger signal;

(3) Operate any vehicle in a manner, such as by rapid acceleration, turning, backing or starting and stopping the vehicle, as to cause unreasonable or excessive noise from the contact of any tire of the vehicle upon the surface where the vehicle is being operated.

(Ord. 30-1980. Passed 3-10-80.)

531.14 FIXED SOURCE NOISE LEVELS.

(a) Except as provided in subsection (b) hereof, in Zoning Districts R-1, R-2, R-3, R-4 on and after a date six months after the effective date of this chapter in Zoning Districts C- 1, C-2, C-3 on and after a date twelve months after the effective date of this chapter and in Zoning District M-1 and M-2 on or after a date of eighteen months after the effective date of this chapter, no person shall operate any fixed machinery or equipment, or similar mechanical device in any manner so as to create any noise which would cause the noise level measured at the property line of the property affected by the noise emission, to exceed the applicable fixed noise level in this section. Noise limits shall not exceed the following:

Zoning District	Time Period	Sound Level dbA
R-1, R-2	10 p.m. - 7 a.m.	55
	7 a.m. - 10 p.m.	60
R-3, R-4	10 p.m. - 7 a.m.	60

	7 a.m. - 10 p.m.	65
C-1, C-2, C-3	10 p.m. - 7 a.m.	65
	7 a.m. - 10 p.m.	70
M-1	anytime	70
M-2	anytime	75

Unless such person has filed an application for variance in accordance with the provisions of this chapter.

(b) The provisions of subsection (a) hereof shall not be applicable to any emergency signaling devices required by law; nor to any standby equipment operated only in emergency situations, provided that such standby equipment shall not emit noise at a level in excess of 75 dbA when measured at the property line of the property whereon it is located.
(Ord. 30-1980. Passed 3-10-80.)

531.15 WASTE DISPOSAL SERVICES.

No person authorized to engage in waste disposal services or garbage collection shall provide such services so as to create an unnecessary amount of noise. For the purpose of this section, noise emitted by equipment shall not be deemed unnecessary or without justification if the person engaged in such services has to the extent reasonable and feasible in the judgment of the Mayor or Chief of Police or the City's authorized representative, incorporated available sound-deadening devices into equipment used in rendering those services.

No person authorized, shall engage in waste disposal services or garbage loading and/or compacting equipment or similar mechanical device in any manner so as to create any noise exceeding the following levels when measured at a distance of fifty feet from the equipment when within 500 feet of a residential zone:

	9 p.m.-7 a.m.	7 a.m.-9 p.m.
(a) On or after a date one year after the effective date of this chapter	80 dbA	87 dbA
(b) On or after a date 48 months after the effective date of this chapter	80 dbA	82 dbA

(c) Impulsive sounds must not exceed the levels specified in subsection (a) or (b) hereof by more than 5 dbA;

unless such person has filed an application for variance in accordance with the provisions of this chapter.
(Ord. 30-1980. Passed 3-10-80; Ord. 61-1985 Passed 5-28-85.)

531.16 AMPLIFIED SOUND.

No person, other than personnel of law enforcement, governmental agencies, utilities services or permitees duly authorized, shall install, use or operate within the City a loudspeaker or sound amplifying equipment in a fixed or movable position, or mounted upon any sound truck for the purposes of giving instructions, directions, talks, addresses, lectures or transmitting music to any persons or assemblages of persons in or upon any public street, alley, sidewalk, park, place or other public property except when installed, used or operated in compliance with the following provisions:

(a) Residential zones and within 500 feet thereof:

(1) No fixed or movable sound amplifying equipment shall be installed operated or used for commercial purposes at any time except as otherwise permitted in these Codified Ordinances.

(2) The operation or use of sound amplifying equipment for noncommercial purposes, except when used for regularly scheduled operative functions by any school or for the usual and customary purposes of any church, is prohibited between the hours of 9:00 p.m. and 8:00 a.m. of the following day.

(b) In all other zones, except such portions thereof, as may be included within 500 feet of any residential zone:

(1) The operation or use of sound amplifying equipment for commercial purposes is prohibited between the hours of 9:00 p.m. and 8:00 a.m. of the following day.

(2) The operation or use of sound amplifying equipment for noncommercial pur I poses is prohibited between the hours of 9:00 p.m. and 8:00 a.m. of the following day.

(c) The only sound permitted shall be either music, human speech or both.

(d) Sound emanating from sound amplifying equipment shall be limited in volume, tone and intensity so that the sound shall not be audible at a distance in excess of 200 feet from the sound equipment.

(e) Except as provided in subsection (b) hereof, no sound amplifying equipment shall be operated upon any property adjacent to and within 200 feet of any hospital grounds, school or church building while in use.

(Ord. 30-1980. Passed 8-10-80.)

531.17 VIBRATION.

(a) Steady state vibration shall not exceed 0.20 inches per second peak particle velocity or its equivalent in displacement or acceleration, in any one of the three mutually perpendicular components of motion; vertical, longitudinal or transverse.

(b) Impulsive vibration shall not exceed 0.4 inches per second peak particle velocity or its equivalent in displacement or acceleration, on any one of the three mutually perpendicular components of motion except blasting or pile driving, which shall not exceed 2.0 inches per second peak particle velocity.

(c) All vibration recordings shall be made on the ground adjacent to the closest struc ture neither contractor-owned nor leased.

(d) Traffic shall be excluded from this section.
(Ord. 30-1980. Passed 3-10-80.)

531.18 INSPECTIONS.

(a) The Mayor or Chief of Police or the City's authorized representative may enter at any reasonable time, with reasonable notice, into or upon any private or public property, except the administrative offices of any person, for the purposes of inspection and investigation of any condition or equipment which the Mayor or Chief of Police or the City's authorized representative shall have reasonable cause to believe to be causing unnecessary noise in violation of this chapter.

(b) The Mayor or Chief of Police or the City's authorized representative may inspect at any reasonable time and in a reasonable manner, with reasonable notice, any record relating to the use of equipment which creates or may create unnecessary noise.

(c) No person shall refuse, obstruct, delay, prevent or in any way interfere with the Mayor or Chief of Police or the City's authorized representative while carrying out an inspection or in the performance of their duties. Should such right of entry be unreasonably denied, then the Mayor or Chief of Police or the City's authorized representative is authorized to obtain a search warrant.
(Ord. 30-1980. Passed 3-10-80; Ord. 61-1985. Passed 5-28-85.)

531.19 VARIANCES.

(a) The Mayor or Chief of Police or the City's authorized representative may grant individual variances beyond the limitation prescribed by this chapter, whenever it is found upon presentation of adequate proof, that compliance with any section of this chapter or with any regulation or order of the Mayor or Chief of Police or the City's authorized representative, in respect to this chapter, would impose unreasonable hardship. In granting a variance, the Mayor or Chief of Police or the City's authorized representative may impose such conditions as the policies of this chapter may require.

(b) Any variance granted pursuant to this section shall be granted for the period of time, not exceeding one year, as specified by the Mayor or Chief of Police or the City's authorized representative at the time of the grant of such variance and upon the conditions that the person who receives such variance shall make such periodic progress reports as the Mayor or the Citys authorized representative shall specify. The variance may be extended for periods up to six months by affirmative action of the Mayor or Chief of Police or the City's authorized representative, but only if satisfactory progress has been shown. The Mayor or Chief of Police or the City's authorized representative may in the case of construction, grant a variancefor the duration of the project. A contract letting agency, public or private, may apply for this variance.

(c) If requested by the petitioner or if deemed desirable by the Mayor or Chief of Police or the City's authorized representative, a public hearing shall be held prior to the issuance of any variance for the purpose of allowing any person to present evidence with respect to the requested variance. Notice of the hearing shall be promulgated by the Mayor or Chief of Police or the City's authorized representative, a public hearing shall be held prior to the issuance of any variance for the purpose of allowing any person to present evidence with respect to the requested variance. Notice of the hearing shall be promulgated by the Mayor or Chief of Police or the City's authorized representative in the form of a news release at least ten days prior to the hearing

(d) The petition shall be accompanied by a fee of twenty-five dollars ($25.00).

(e) Governmental agencies are exempted from the payment of fees.
(Ord. 30-1980. Passed 3-10-80; Ord. 61-1985. Passed 5-28-85.)

531.20 TEST PROCEDURES.

(a) Test procedures to determine whether maximum noise levels are exceeded in Section 531.08 to 531.10, 531.14 and 531.16 shall be in substantial conformity with ANSI Standard S1.4 - 1971; ANSI Standard S1.12 - 1967, ANSI Standard S1.11 - 1966; SAE Recommended Practice J184; and such others that may be approved by the Federal Government, State Government and/or the Mayor or Chief of Police or the City's authorized representative.

(b) Test procedures to determine whether maximum noise emitted by motor vehicles in use to meet the noise limits stated in Section 531.13 shall be in substantial conformity with Standards and Recommended Practice established by the Society of Automotive Engineers, Inc, including SAE

Standard J366b; Recommended Practice J184; and others that may be approved by the Federal Government, State Government and/or the Mayor or Chief of Police or the City's authorized representative.

(c) Test procedures to determine whether maximum noise emitted by engine- powered equipment in use to meet the noise limits stated in Section 531.15 shall be in substantial conformity with Standards and Recommended Practice established by the Society of Automotive Engineers including SAE Standard J952b; SAE Recommended Practice J184; and others that may be approved by the Federal Government, State Government and/or the Mayor or Chief of Police or the City's authorized representative.
(Ord. 30-1980. Passed 3-10-80; Ord. 61-1985. Passed 5-28-85.)

531.21 DISCLAIMER.

The noise levels as established by Section 531.01 et seq. will be preempted by Federal requirements as promulgated by the provisions of the Federal Noise Control Act if the two laws are in conflict with each other.
(Ord 30-1980. Passed 3-10-80.)

531.22 APPEALS.

Any person who is the subject of a final order by the Mayor or Chief of Police or the City's authorized representative and who has not been criminally charged under the provisions of this chapter shall have the right to a review of the order by the Board of Zoning Appeals, which is created by Section 1107.01 provided that the jurisdictional requirements of Chapter 1107 have been satisfied.
(Ord. 30-1980. Passed 3-10-80; Ord. 61-1985. Passed 5-28-85.)

531.99 PENALTY.

Whoever violates any provision of this chapter is guilty of a minor misdemeanor. Each day such violation is committed or permitted to continue shall constitute a separate offense and shall be punishable as such hereunder. Citations shall be issued to a person, firm or corporation and/or individual present at the time of the alleged offense.
(Ord. 30-1980. Passed 3-10-80.)

ARCADIS

Appendix B

Field Noise Monitoring Data

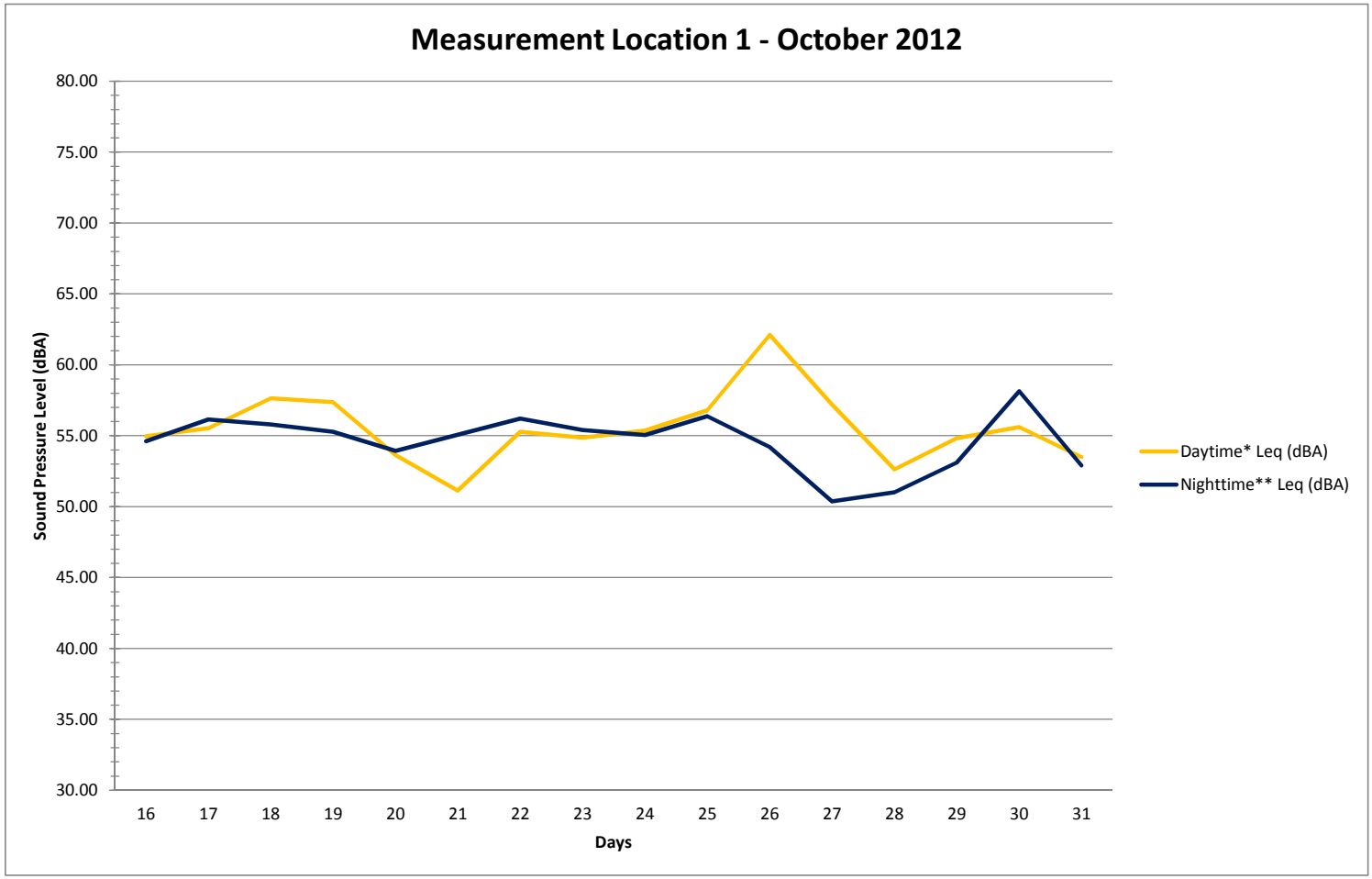
ARCADIS
Infrastructure, environment, buildings

Project Name: Oregon Clean Energy - Oregon - Ohio
Project Number: MA001187.0001

Measurement Location 1 - October 2012 Monitor Data

Date	Leq (dBA)		Lmin (dBA)		Lmax (dBA)	
	Daytime*	Nighttime**	Daytime*	Nighttime**	Daytime*	Nighttime**
16-Oct	55.0	54.6	49.9	49.3	65.5	66.7
17-Oct	55.5	56.1	50.6	49.9	69.3	74.0
18-Oct	57.6	55.8	51.4	50.0	69.6	69.3
19-Oct	57.4	55.3	50.4	71.0	79.3	71.0
20-Oct	53.6	53.9	49.1	49.3	62.0	62.9
21-Oct	51.1	55.1	47.0	51.3	61.6	62.8
22-Oct	55.3	56.2	50.5	51.6	65.6	70.2
23-Oct	54.9	55.4	50.4	50.5	65.0	67.8
24-Oct	55.4	55.0	50.9	50.9	65.3	64.6
25-Oct	56.8	56.4	51.3	52.0	68.8	72.2
26-Oct	62.1	54.2	48.7	49.4	78.3	62.1
27-Oct	57.2	50.4	46.5	46.1	72.0	60.2
28-Oct	52.6	51.0	48.0	47.1	60.6	58.7
28-Oct	54.8	53.1	50.0	48.4	65.8	63.5
30-Oct	55.6	58.1	50.6	51.3	66.7	70.8
31-Oct	53.5	52.9	49.2	48.6	64.7	63.1

* Daytime noise levels are averaged over 1-hour time periods from 7:00 a.m. to 10:00 p.m.
** Nighttime noise levels are averaged over 1-hour time periods from 10:00 p.m. to 7:00 a.m.


Measurement Location 1 - October 2012
80.00
75.00
70.00
65.00
60.00
55.00
50.00
45.00
40.00
35.00
30.00
Sound Pressure Level (dBA)
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
Days
Daytime* Leq (dBA)
Nighttime** Leq (dBA)

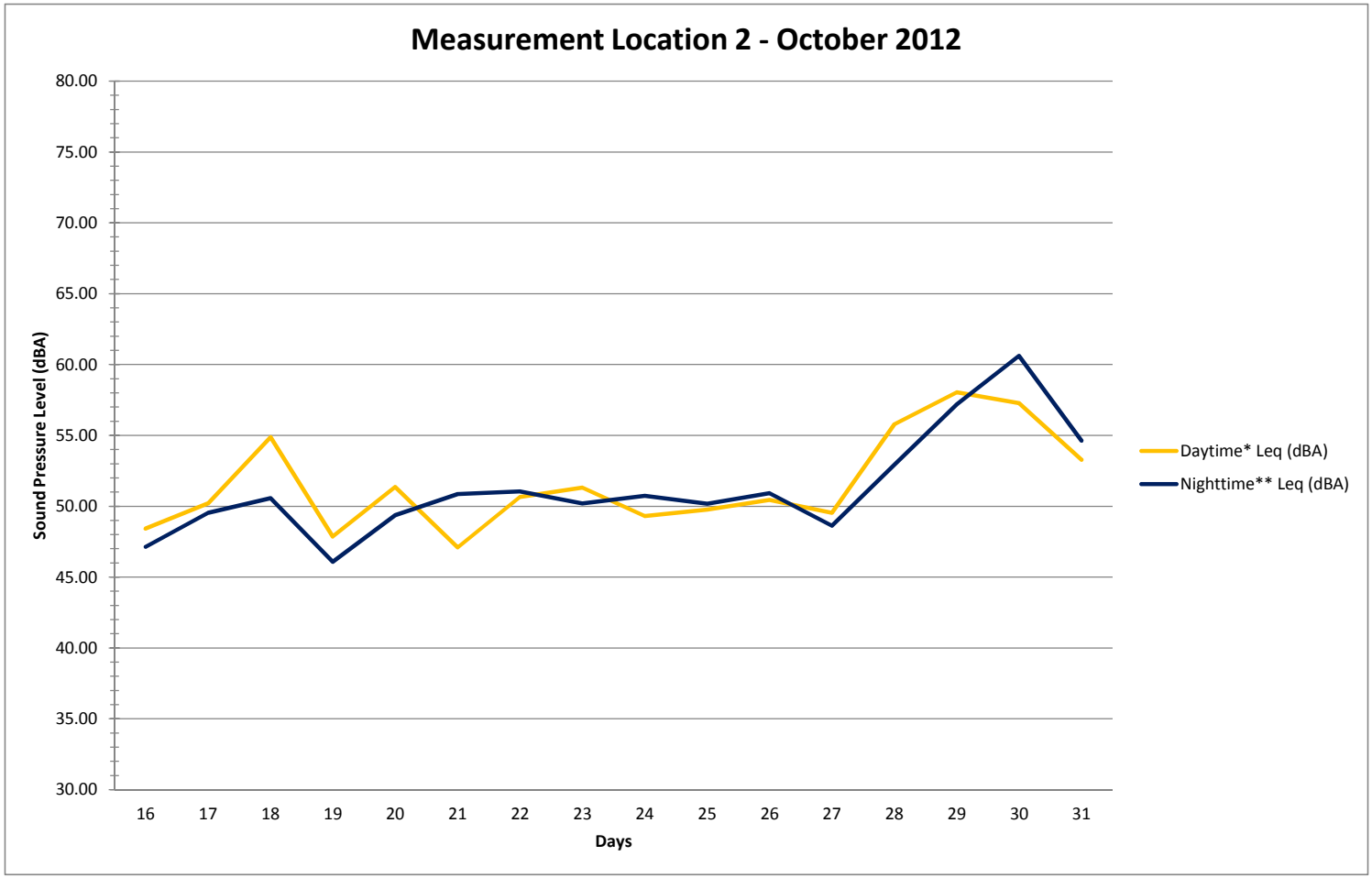
ARCADIS
Infrastructure, environment, buildings

Project Name: Oregon Clean Energy - Oregon - Ohio
Project Number: MA001187.0001

Measurement Location 2 - October 2012 Monitor Data

Date	Leq (dBA)		Lmin (dBA)		Lmax (dBA)	
	Daytime*	Nighttime**	Daytime*	Nighttime**	Daytime*	Nighttime**
16-Oct	48.4	47.1	43.8	42.2	64.3	63.5
17-Oct	50.2	49.5	46.0	45.0	61.7	65.2
18-Oct	54.9	50.6	46.4	45.5	70.8	61.9
19-Oct	47.9	46.1	43.2	58.9	64.1	58.9
20-Oct	51.4	49.4	46.0	45.3	60.1	59.2
21-Oct	47.1	50.9	43.0	47.8	60.9	58.1
22-Oct	50.7	51.0	46.6	46.7	63.6	60.8
23-Oct	51.3	50.2	46.4	46.3	61.4	68.6
24-Oct	49.3	50.7	45.7	47.8	58.6	60.0
25-Oct	49.8	50.2	45.3	46.7	61.6	60.7
26-Oct	50.4	50.9	45.9	46.7	59.1	59.3
27-Oct	49.5	48.6	43.9	44.2	59.8	55.7
28-Oct	55.8	52.9	46.6	45.7	67.2	63.2
29-Oct	58.1	57.2	49.1	47.5	68.7	68.3
30-Oct	57.3	60.6	50.2	51.3	67.4	71.1
31-Oct	53.3	54.6	48.4	48.5	64.0	64.7

* Daytime noise levels are averaged over 1-hour time periods from 7:00 a.m. to 10:00 p.m.
** Nighttime noise levels are averaged over 1-hour time periods from 10:00 p.m. to 7:00 a.m.


Measurement Location 2 - October 2012
80.00
75.00
70.00
65.00
60.00
55.00
50.00
45.00
40.00
35.00
30.00
Sound Pressure Level (dBA)
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
Days
Daytime* Leq (dBA)
Nighttime** Leq (dBA)

ARCADIS

Appendix C

Short-term Noise Measurement Data

ARCADIS
Infrastructure, environment, buildings

Project Name: Oregon Clean Energy - Oregon - Ohio
Project Number: MA001187.0001

Short-term Noise Measurements - October, 16 2012 Monitor Data

Location	Leq (dBA)	Lmin (dBA)	Lmax (dBA)
1	62.9	56.2	71.6
2	52.7	42.4	68.2
3	52.7	40.9	65.5
4	64.4	42.7	90.3

ARCADIS

Appendix D

Mitsubishi Layout Noise Emission Data

OCE Project
Noise Data - Mitsubishi Layout

Location Number	Piece of Equipment	SPL or PWL	Reference Distance in Feet	Octave Band Levels in Hz									Overall dBA
				31.5	63	125	250	500	1000	2000	4000	8000	
G-1	GT Inlet Air Filter	SPL	3	45.6	58.8	71.9	69.4	73.8	80	80.2	77	65.9	85
G-2	GT Air Inlet Duct - I	SPL	3	45.6	58.8	71.9	69.4	73.8	80	80.2	77	65.9	85
G-3	Inlet Air Silencer	SPL	3	45.6	58.8	71.9	69.4	73.8	80	80.2	77	65.9	85
G-4	GT Air Duct - II	SPL	3	51.6	64.8	74.9	75.4	78.8	85	85.2	81	69.9	90
G-5	Gas Turbine Enclosure	SPL	3	54.6	67.8	66.9	72.4	74.8	81	79.2	77	65.9	85
G-6	GT Generator and Slip Ring Housing	SPL	3	47.2	62.5	84.7	63.4	66.8	70.5	61.8	56.3	44.7	85
G-7	GT Exhaust Duct A	SPL	3	46.2	59.4	68.3	76.5	75.4	78.5	79.7	77.9	64.8	85
G-8	GT Exhaust Expansion Joint	SPL	3	40.6	53.8	61.9	69.4	71.8	79	80.2	80	71.9	90
G-9	GT Lube Oil Unit	SPL	3	41.6	54.8	69.9	77.4	78.8	81	76.2	66	51.9	85
G-10	GT Ventilation Fan A	SPL	3	50.6	63.8	69.9	74.4	78.8	78	79.2	76	64.9	85
G-11	GT Ventilation Fan A	SPL	3	50.6	63.8	69.9	74.4	78.8	78	79.2	76	64.9	85
G-12	GT Fuel Gas Unit	SPL	3	54.6	67.8	66.9	72.4	74.8	81	79.2	77	65.9	85
H-1	HRSG Inlet Duct	SPL	3	45.6	63.8	74.9	79.4	76.8	75	81.2	72	56.9	85
H-2	HRSG Module 1 - 3	SPL	3	54.6	66.8	71.9	71.4	66.8	60	63.2	52	35.9	85
H-3	HRSG Module 4 - 7	SPL	3	54.6	66.8	71.9	71.4	66.8	60	63.2	52	35.9	85
H-4	HRSG Stack Exit	PWL	----	84.6	98.8	106.9	106.4	105.8	102	100.2	92	85.9	112
S-1	Steam Turbine (HP Portion)	SPL	3	60.2	62.2	69.2	73.2	82.2	78.2	74.2	73.2	69.2	85
S-2	Steam Turbine (LR Portion)	SPL	3	60.2	62.2	69.2	73.2	82.2	78.2	74.2	73.2	69.2	85
S-3	ST Generator and Slip Ring Housing	SPL	3	45.3	54.2	84.8	62.3	67.2	69.6	59.1	52.6	38.6	85
S-4	ST Lube Oil Unit	SPL	3	28.5	48.4	65.6	70.7	79.4	81.1	77.8	72.9	62.3	85
CWP-1	Circulating Water Pump (each of 2 operating)	PWL		102	102	99	97	98	102	93	90	81	104
48	Plant Air Compressor A	SPL	3										90
49	Plant Air Compressor B	SPL	3										90
113	No. 1 GTG Transformer	PWL		106	106	110	110	110	94	89	82	77	108
114	No. 2 GTG Transformer	PWL		106	106	110	110	110	94	89	82	77	108
115	No. 1 GTG Exc. Transformer	PWL		87	87	91	88	94	86	76	71	65	93
116	No. 2 GTG Exc. Transformer	PWL		87	87	91	88	94	86	76	71	65	93
121	No. 1 Unit Transformer	PWL		87	87	91	88	94	86	76	71	65	93
122	No. 2 Unit Transformer	PWL		87	87	91	88	94	86	76	71	65	93
334	HP Feed Water Pump A	PWL		101	106	108	99	104	103	102	97	93	108
335	HP Feed Water Pump B	PWL		101	106	108	99	104	103	102	97	93	108
336	HP Feed Water Pump C	PWL		101	106	108	99	104	103	102	97	93	108
337	HP Feed Water Pump D	PWL		101	106	108	99	104	103	102	97	93	108
408	STG Transformer	PWL		106	106	110	110	110	94	89	82	77	108
409	STG Exc. Transformer	PWL		87	87	91	88	94	86	76	71	65	93
515	No. 1 HRSG Ammonia Dilution Air Blower	PWL		99	98	90	92	95	97	93	88	86	100
516	No. 2 HRSG Ammonia Dilution Air Blower	PWL		99	98	90	92	95	97	93	88	86	100
601	Cooling Tower	SPL	50										81.3
606	Demin Water Forwarding Pump	PWL		88	82	82	85	92	95	96	92	84	101

ARCADIS

Appendix E

Sound Wall Recommendation

KINETICS
Noise Control

Noise Control Solutions with Noiseblock Barrier Wall Systems

for Utilities, Highways/Transportation, Rooftop Equipment and Residential Noise Compliance

VIBRON PRODUCTS GROUP

CONTROL OF NOISE AND VIBRATION

is essential for Health, Safety, Environment, and Quality. Kinetics Noise Control has the expertise to provide cost effective, practical solutions - standard or custom engineered.

The control of noise in every day life is very important. Unwanted noise can cause stress related illness and severe noise can cause hearing damage. To meet these requirements and to help solve many noise problems, Kinetics manufactures a complete line of acoustical panels called *Noiseblock Barrier Panels*. These panels can be quickly and easily assembled to provide complete or partial walls for utilities, transportation/highways, cooling towers, chillers, condensers, rooftop equipment and residential noise barriers. These panels are designed to be easily erected in the field and are also designed to provide optimum noise control through sound absorption and sound transmission loss and structural stability.

UTILITIES

Electrical sub-stations which contain transformers, generators, etc. cause unwanted noise and at times can be unpleasant to view. They can be treated with our barrier panel systems which reduce the unwanted noise to acceptable levels. The panels are more aesthetically pleasing when treated with a coating system to match the surrounding areas.

TRANSPORTATION/HIGHWAYS

Noise from traveling motorists on major highways/interstates, airport areas, and railways are effectively reduced using our reflective or absorptive barrier panel systems.

ROOFTOP EQUIPMENT

Chillers, Condensers, Cooling Towers, etc. are equipment which can cause unwanted noise for surrounding residential and business communities. Our barrier panel systems can be constructed to reduce the noise to acceptable levels in these working or living environments.

RESIDENTIAL COMPLIANCE

Most neighborhoods have a strict compliance that should be maintained for hearing protection as well as comfort levels. Our barrier panels can be used for shopping malls, schools, recreational facilities, parks and many other outdoor applications that may need noise control.

Noiseblock Barrier Panel System

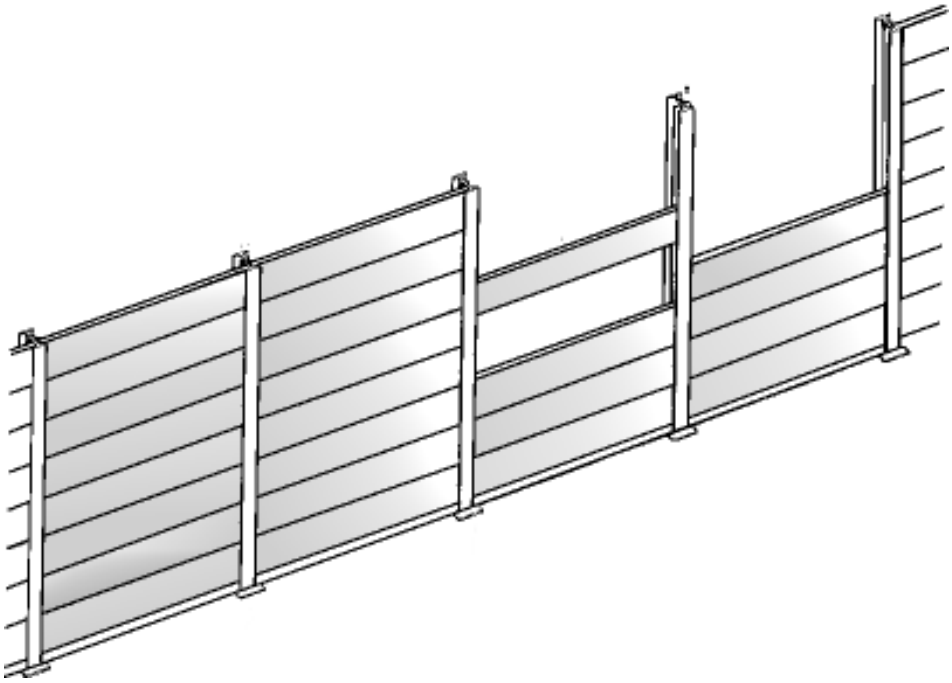


TABLE 1							
SOUND ABSORPTION COEFFICIENTS PER ASTM C-423-66							
Octave Band Number	**2**	**3**	**4**	**5**	**6**	**7**	**NRC**
Center Frequency (Hz)	**125**	**250**	**500**	**1000**	**2000**	**4000**	**------**
			ABSORPTION COEFFICIENTS				
NOISEBLOCK* (BP) - 2"	0.15	0.66	1.07	1.06	0.97	0.86	0.95
NOISEBLOCK* (BP) - 4"	0.60	1.13	1.12	1.09	1.03	0.91	1.00

TABLE 2							
SOUND TRANSMISSION LOSS PER ASTM E90-70							
Octave Band Number	**2**	**3**	**4**	**5**	**6**	**7**	**STC**
Center Frequency (Hz)	**125**	**250**	**500**	**1000**	**2000**	**4000**	**------**
			TRANSMISSION LOSS				
NOISEBLOCK* (BP) - 2"	17	23	34	47	55	57	37
NOISEBLOCK* (BP) - 4"	21	28	39	48	56	58	40

* (BP) = Barrier Panel
Contact your local Kinetics representative for your next BARRIER PANEL SYSTEM project.

SPECIFICATIONS

1.0 General

Acoustical Barrier Panels shall be insulated double wall construction and shall be provided as indicated on drawings by a recognized manufacturer with published standards of construction and technical performance. The manufacturer shall have produced a standard factory fabricated panel system and components for at least 10 years. Performance of the fabricated and installed system shall conform to all specifications listed herein.

2.0 Materials

2.1 Acoustical Metal Panels

A. All barrier panels and their components shall be pre-fabricated, sectional, all metal-clad, modular and designed for easy and accurate field assembly. The panels and components shall not be susceptible to damage due to extended exposure to vibration, air temperature or humidity with the passage of time.

B. Panel Construction

1. All panels shall be (2)/(4) inches thick, as noted on drawings, with a solid galvanized steel type G90 exterior shell and a perforated/solid galvanized steel interior shell. The panels shall be connected together by means of a tongue and groove connection and held together rigidly by the use of self-drilling sheet metal screws.

2. The panel shells, framing members, and internal reinforcements shall be welded, screwed and/or riveted together to form a metal-sheathed panel of sufficient strength for maximum operating loads specified in the structural performance section of these specifications.

3. The outer galvanized steel shell thickness shall be 18 ga. minimum and the inner galvanized steel shell shall be 22-gauge minimum thick.

4. Where perforated materials are indicated, all perforations shall be 3/32" dia. holes on 3/16" staggered centers and shall result in an open area of no less than 23 percent.

5. All panel internal and external reinforcing members shall be minimum 18 ga. galvanized steel.

6. Each panel shall be filled with sound absorbing materials that are inert, mildew-resistant, verminproof, and incombustible.

C. Panel Components

1. All accessory trim items shall be of 18 ga. minimum galvanized steel and shall be furnished in factory standard lengths to be field cut to specified dimensions. Location and quantity of sheet metal screws and trim requirements shall be in accordance with the manufacturers installation details.

2. Base channel shall be installed on a level and structurally sound surface.

3. All external panel connectors, trim items, accessories, base channel/panel interfaces/base channel/floor interfaces, and other sections as noted on the drawings shall be sealed with an acoustical sealant that shall not harden and prevent disassembly in the future.

D. Structural Performance

1. Any special external panel loading conditions including wind, snow, and equipment shall be provided for as per specifications.
2. Under the indicated loading conditions, the entire barrier panel system shall be self-supporting and/or will be supported as per the specifications. The installer shall furnish and assemble all structural members in strict accordance with drawings and manufacturers installation details.
3. Under the above loading conditions, the assembled acoustical structure shall not exhibit any panel joint deflection in excess of L/360, where L is the unsupported span length of any panel section in the erected structure.

E. Acoustical Performance

1. The manufacturer shall provide certified independent test data indicating sound absorption and transmission loss characteristics of the panel assembly.

F. Accessory Items

Doors, windows, electrical systems, ventilating systems, accessory components, etc., shall be provided in accordance with drawings.

G.Manufacturer

All materials shall be provided by Kinetics Noise Control, Inc. - Vibron Products Group

United States: 6300 Irelan Place • Dublin, Ohio 43017 • Phone: 614-889-0480 • Fax: 614-889-0540
Canada: 1720 Meyerside Drive • Mississauga • Ontario L5T 1A3 • Phone: 905-670-4922 • Fax: 905-670-1698
Vibron is a subsidiary of Kinetics Noise Control, Inc.

ARCADIS

Appendix F

Duct Lagging Recommendations

Industrial
NOISE CONTROL PRODUCTS

Bulletin
SS-108

Barrier & Quilted Fiberglass Absorber Composites

FEATURES:

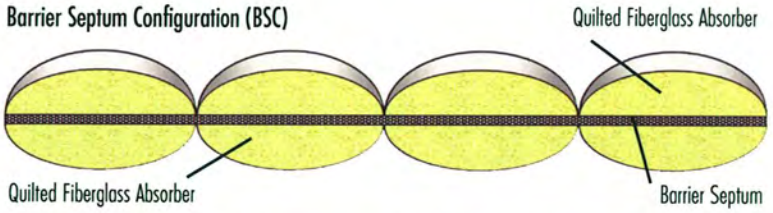
- ♦ Maximum noise reduction by combining sound absorber and noise barrier
- ♦ Sound Absorption Rating to NRC-1.05
- ♦ Transmission Loss Rating to STC-32
- ♦ Offered in two styles with a variety of combinations
- ♦ Acoustical liners, jackets, wraps and panels
- ♦ Available in curtain panels, bound or unbound rolls, custom fabrications or die-cut pieces
- ♦ Flexible composites conform to any shape
- ♦ Fire safe and low smoke emissions per ASTM E-84, Class 1

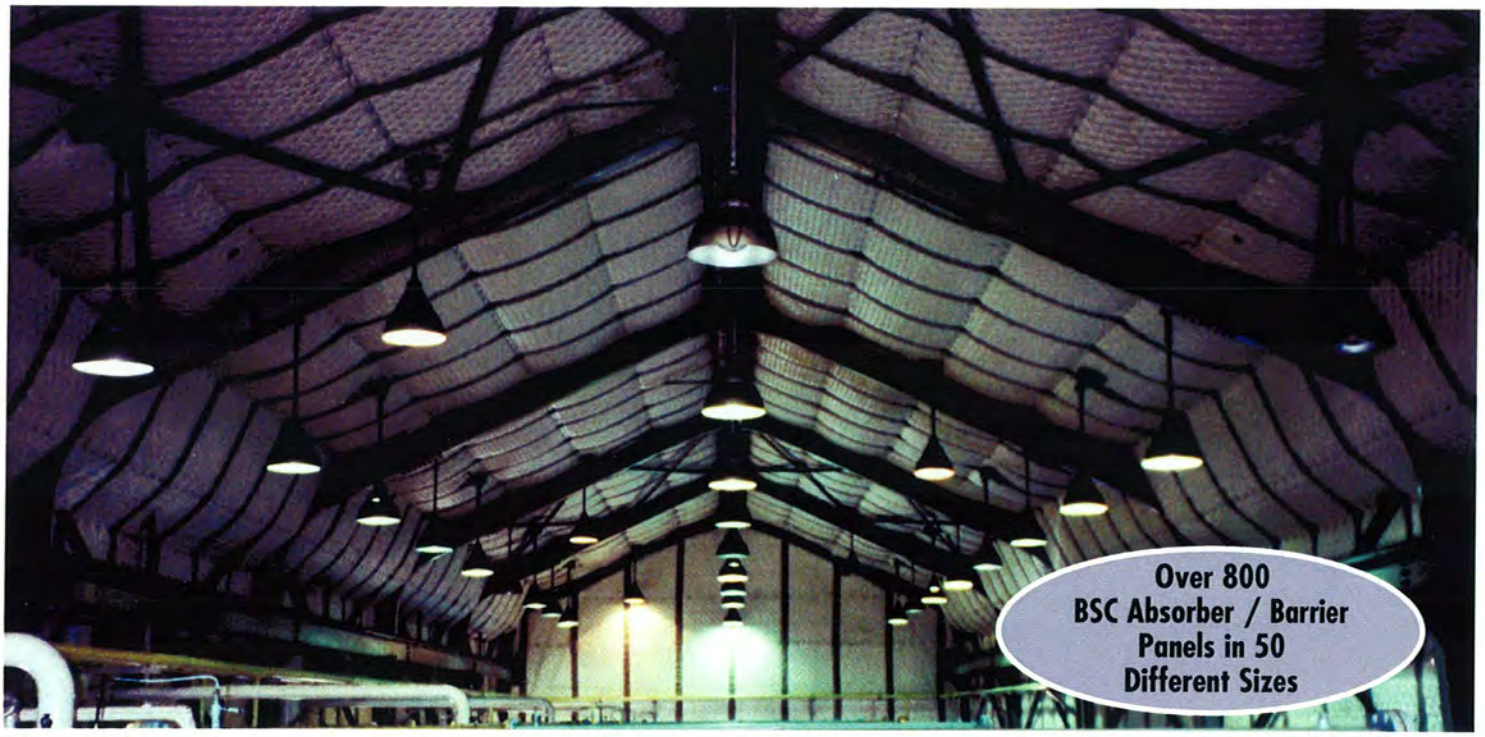
SOUND SEAL®

"BSC" Style: Barrier Septum Composite

Sound Seal's Industrial Division "BSC" *composite features a* ***non-reinforced*** *loaded vinyl noise barrier septum (middle) with a quilted fiberglass sound absorber on* ***both*** *sides. Ideally suited as an acoustical liner, the inner layer of quilted fiberglass decouples the barrier from the surface to improve its noise blocking ability while the outer layer adds sound absorption to the treated environment.*

Barrier Septum Configuration (BSC)





Industrial "BSC" Acoustical Panels were used to line the interior of a large natural gas compressor station. The sound absorptive quilted fiberglass portion of the composite panel reduced the noise levels inside the building by 6 to 8 decibles, and combined with the noise barrier septum and quilted fiberglass decoupler on the opposite side of the product, produced a 15 dB(A) noise reduction outside of the building. See Sound Off Case History Vol. 1, No.1 for additional information.

Also Available As:

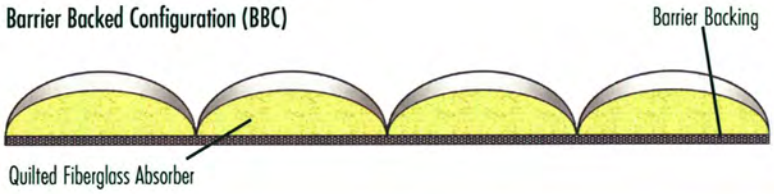
- Rolls with edges bound and sewn with matching edge binding
- Unbound rolls-edges exposed
- Standard roll size 4'W x 25'L
- Curtain panels with grommets at top and Hook & Loop fasteners sewn along edges
- Liner panels with bound edges
- Die-cut pieces, custom fabrications
- **Types of facing material on quilted fiberglass:**
  VCFC — Vinyl - Coated - Fiberglass - Cloth
  SCFC — Silicone - Coated - Fiberglass - Cloth
  NPS — Non-Woven - Porous Scrim
  GUILFORD — Decorative Fabric
- **Available Barriers:**
  BSC products utilize a flexible 1 lb. PSF non-reinforced loaded
  vinyl noise barrier septum (B-10NR).
  Also available with a 2 lb. PSF or 1/2 lb. PSF barrier

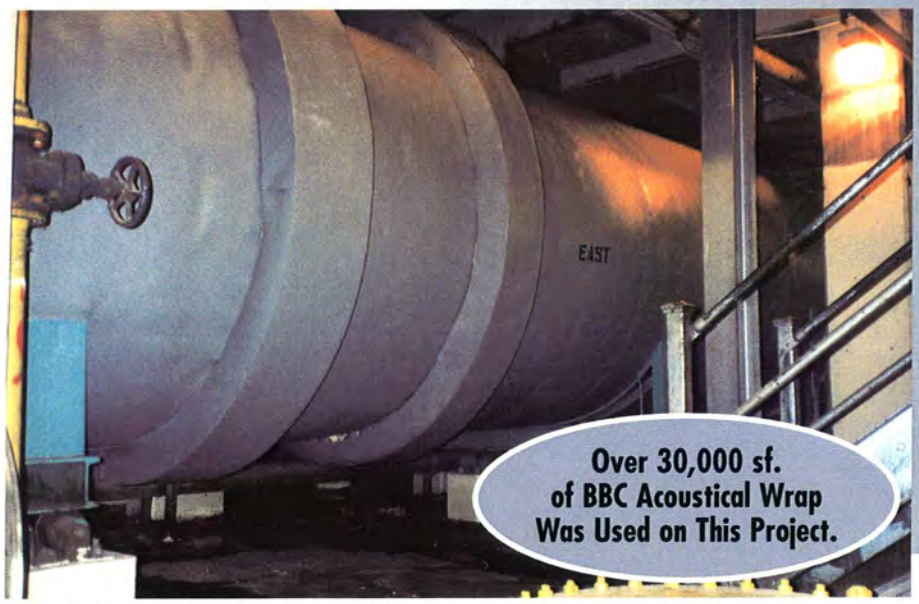
See back page for specifications

"BBC" Style: Barrier Backed Composite

Sound Seal's Industrial Division "BBC" *composite features a* ***reinforced*** *loaded vinyl noise barrier with a quilted fiberglass sound absorber on* ***one*** *side. The rugged durable exterior barrier is commonly used as a wrap or acoustical jacket due to its ability to conform to any shape. The quilted fiberglass layer decouples the noise barrier to enhance its acoustical performance.*

Barrier Backed Configuration (BBC)





Industrial "BBC" acoustical composite was used as an acoustical wrap on large diameter piping at a Waste Water Treatment facility. The durable reinforced barrier exterior combined with the quilted fiberglass decoupler offers maximum longevity as well as a 15 dB(A) noise reduction.

Also Available As:

- Rolls with edges bound and sewn with matching edge binding
- Unbound rolls with quilted fiberglass edges exposed
- Standard roll size 54" wide barrier, with 48" wide quilt, 25' long
- Curtain panels with grommets at top and Hook & Loop fasteners sewn along edges
- Custom fabricated acoustical jackets
- Die-cut pieces

Barrier:

- BBC products utilize a flexible 1 lb. PSF center reinforced barrier back (B-10R). Available in standard gray color. Tan and light blue are also available. 2 lb. PSF and 1/2 lb. PSF reinforced barriers are optional
- See back page for types of facing available on quilted fiberglass and specifications

BBC-13-2" acoustical jacket custom fabricated to fit blower. Hook and Loop fasteners allow for quick and easy installation and removal.

The most effective noise reduction products combine both sound absorption and noise barrier properties. Tested under strict compliance to appropriate ASTM standards, we offer the following results.

Acoustical Data:

Sound Transmission Loss (dB) Octave Band Center Frequencies (Hz)									
Product	Thickness (In./Nom.)	Wt. Lb./S.F.	125	250	500	1000	2000	4000	STC
BBC-13-2"	2	1.5	13	20	29	40	50	55	**32**
BBC-13	1	1.3	11	16	24	30	35	35	**27**
BBC-14-2"	2	1.5	13	20	29	40	50	55	**32**
BBC-14	1	1.3	11	16	24	30	35	35	**27**
BSC-25	2	1.5	12	16	27	40	44	43	**29**
BSC-25-2B	2	2.5	19	22	28	40	56	61	**33**
BSC-31	2	1.5	12	16	23	33	38	39	**27**

Per ASTM: E 90

Barrier Specifications:

Barrier Component	Style	Weight Lb./Sq. Ft.	Thickness Inches	Composite
B - 10 NR	Non-Reinforced	1	.107	BSC
B - 5 NR	Non-Reinforced	1/2	.042	BSC
B - 20 NR	Non-Reinforced	2	.225	BSC
B - 10 R	Reinforced	1	.090	BBC
B - 5R	Reinforced	1/2	.050	BBC

Available Facings on Quilted Fiberglass:

- Vinyl - Coated - Fiberglass - Cloth (Standard)
  Colors: Gray, White, Tan or Black
  Temp. Range: -20°F to + 180°F
  Durable, resists most chemicals
- Silicone - Coated - Fiberglass - Cloth (High Temp)
  Color: Silver
  Temp. Range: -90°F to + 550°F
  Used on high temperature applications
  Also suitable for outdoor UV exposure
- Non-woven Porous Scrim (Economy)
  Colors: Off White
  Temp. Range: -40°F to + 350°F
  Readily accepts any adhesive
- Guilford fabric facing (Decorative)
  Colors: Over 60 colors to choose from (see swatch booklet)
  Temp. Range: -20°F to + 350°F
  FR 701 Fabric is Class 1 Flammability Rated
  For commercial or architectural applications

For additional information see:
SS101 Curtain Systems
SS104 Flexible Barriers
SS106 Quilted Fiberglass Absorbers

Sound Absorption Data-Absorber Component Random Incident Sound Absorption							
Product	125	250	500	1000	2000	4000	NRC
BBC 1" thick	.12	.47	.85	.84	.64	.62	**.70**
BBC 2" thick	.07	.27	.96	1.13	1.08	.99	**.85**
BBC 4" thick	.21	.89	1.09	1.17	1.13	1.07	**1.05**
BSC 2" thick	.19	.99	.96	.80	.57	.33	**.85**

Also Available from Sound Seal:

The tables on this page refer to some of the more common BSC and BBC composites. There are many others which combine the wide variety of barriers and quilted fiberglass absorbers available to address any industrial application. For example, BSC-26 utilizes a silicone-coated-fiberglass cloth faced quilted fiberglass absorber (instead of the vinyl-coated-fiberglass cloth faced quilted fiberglass on BSC-25) combined with a 1 lb. PSF loaded vinyl noise barrier septum for high temperature application.

Likewise, BBC-14 or BBC-14-2" incorporates the silicone facing, instead of the vinyl-faced BBC-13 or BBC-13-2", combined with a 1 lb. PSF reinforced loaded vinyl backing. In addition to high temperature applications, these U.V. resistant curtain panels are suitable for outdoor applications.

Another example such as BSC-25-2B substitutes a 2 lb. PSF noise barrier for the 1 lb. PSF version in BSC-25 to improve acoustical performance, especially at lower frequencies.

Distributed By

SOUND SEAL®

50 H. P. Almgren Drive
Agawam, MA 01001
TEL: 413.789.1770
FAX: 413.789.2248
e-mail: sales@soundseal.com
www.soundseal.com

ARCADIS

Appendix G

Siemens Layout Noise Emission Data

NAPD Oregon Clean Energy Project

Siemem's Layout

			Estimated Sound Power Levels For Major Noise Sources, dB re 1 picowatt									
Source			Octave Band Center Frequency in Hz									
Number	**Description**	**SPL or PWL**	**31.5**	**63**	**125**	**250**	**500**	**1K**	**2K**	**4K**	**8K**	**A-Weighted**
G-1	GT Inlet Filter House - Overhead - Pulse Self-cleaning Filter + Evaporative Cooler - Each GT	PWL	127	120	111	96	74	88	77	78	84	99
G-2	GT Inlet Duct Wall Radiated - Lagged - Each GT	PWL	121	119	117	104	90	101	91	88	91	105
G-3	GT Enclosure Walls	PWL	93	105	88	79	78	83	85	85	75	91
G-4	GT Enclosure Air Inlet Vents- Each GT	PWL	88	101	82	77	72	69	72	78	83	85
G-5	GT Enclosure Air Discharge Vents - Each GT	PWL	90	102	85	76	71	71	69	74	78	82
G-6	GT Exhaust Diffuser & Expansion Joint - Each GT	PWL	133	124	111	110	103	101	100	95	79	108
G-7	GT Fuel Gas Systems - Each GT	PWL	104	100	89	81	80	86	88	91	89	96
G-8	GT Generator, Hydrogen-cooled - Each GT	PWL	117	123	120	112	113	109	113	111	108	118
G-9	Enclosed Lube Oil Package - Each GT	PWL	94	94	100	95	97	92	89	85	80	98
H-1	HRSG Inlet Transition Duct Radiated - Each HRSG	PWL	115	114	104	100	92	90	93	87	75	99
H-2	HRSG Wall Radiated - Each HRSG	PWL	115	114	104	100	92	90	93	87	75	99
H-3	HRSG Exhaust Stack Wall Radiated - Each HRSG	PWL	112	111	101	96	88	84	82	73	60	93
H-4	HRSG Exhaust Stack Exit - w/o Directivity - Each HRSG	PWL	119	111	120	115	115	105	84	63	48	114
H-5	HRSG Duct Burner Gas Piping - Each HRSG	PWL	104	101	91	84	85	93	98	101	98	105
S-1	Steam Turbine - Total - Indoor Unenclosed Design	PWL		115	116	111	110	105	106	106	100	113
S-2	Hydrogen-cooled Generator for Steam Turbine	PWL	117	123	120	112	113	109	113	111	108	118
S-3	Unenclosed Lube Oil Package - Steam Turbine	PWL	96	100	98	105	102	97	97	92	83	104
S-4	Steam Turbine Control Oil Supply Skid	PWL		109	103	105	104	105	100	99	96	109
A-1	Boiler Feed Water Pump A -One of 3 X 50% total plant	PWL	101	106	108	99	104	103	102	97	93	108
A-2	Boiler Feed Water Pump B -One of 3 X 50% total plant	PWL	101	106	108	99	104	103	102	97	93	108
A-3	Boiler Feed Water Pump C -One of 3 X 50% total plant	PWL	101	106	108	99	104	103	102	97	93	108
A-4	Steam Surface Condenser	PWL	110	110	106	105	104	106	105	105	101	112
A-5	Condensate Extraction Pump A - One of 3 X 50%	PWL	92	106	101	99	99	98	98	93	91	104
A-6	Condensate Extraction Pump B - One of 3 X 50%	PWL	92	106	101	99	99	98	98	93	91	104
A-7	Condensate Extraction Pump C - One of 3 X 50%	PWL	92	106	101	99	99	98	98	93	91	104
A-8	Generation Building Enclosing GT and STG + Auxiliaries	PWL	125	124	116	101	92	85	88	88	88	103
A-9	Generation Building Roof Vent Fans - Each of TBD	PWL	96	106	97	94	91	90	85	77	66	94
A-10	Main GSU Transformer - Each GT and ST	PWL	106	106	110	110	110	94	89	82	77	108
A-11	Auxiliary Transformer - Each	PWL	87	87	91	88	94	86	76	71	65	93
A-12	Circulating Water Pump - Each	PWL	102	102	99	97	98	102	93	90	81	104
A-13	Cooling Tower - Total	PWL	70	74	81	86	101	103	103	105	101	110
A-14	SCR Ammonia Skid - Each	PWL	99	98	90	92	95	97	93	88	86	100
A-15	Demin Water Forwarding Pump - Each	PWL	88	82	82	85	92	95	96	92	84	101
A-16	Raw Water Forwarding Pump - Each	PWL	71	78	79	86	91	88	86	88	85	95

ARCADIS

Appendix H

Enclosure Recommendation

KINETICS
Noise Control

Noise Control Solutions with Industrial/Environmental Acoustic Enclosure Systems

ENCLOSURES FOR:

- Fans
- Blowers
- Pumps
- Generator Sets
- Test Chambers
- Grinders
- Dryers
- Processes
- Compressors
- Saws
- Quench Operations
- Conveyors
- Chillers
- Shakers
- Vibratory Feeders
- Condensors
- Process Equipment
- Presses
- Water Jet Cutters
- Granulators
- Shredders
- Parts Washers
- Swedgers
- Milling Machines

Noiseblock Acoustical Panel Enclosure Exploded View

Application

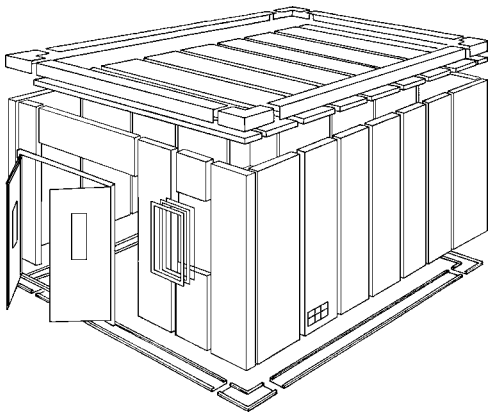
The control of noise in industry is very important. There have been sharp increases in worker compensation claims for hearing damage, and legislative, safety and economic requirements make a noise reduction program essential for many industries.

To meet these requirements and to help solve many in-plant noise problems, Kinetics Noise Control manufactures a complete line of acoustical panels which can be quickly and easily assembled to provide complete or partial enclosures for noisy equipment or to provide a quiet office in a manufacturing area. These panels are designed to provide optimum noise control through sound absorption and sound transmission loss. Enclosures can be sized to meet your requirements.

Standard Kinetics Noiseblock STL panels are fabricated with outer skins of 18 gauge galvanized steel and inner skins of 22 gauge perforated galvanized steel. Panels are stiffened with 18 gauge steel channels. Sound absorption is provided by 2.5 to 6 pcf fiber glass or mineral wool depending on the application. Standard panels are nominally 4" thick, but optional 2" and 6" panels are available to meet special requirements. 2" panels are rated at STC 37 and NRC .95, 4" panels are rated at STC 40 and NRC 1.00.

Kinetics Noiseblock HTL panels are designed for applications where more transmission loss is required. The HTL panels are fabricated of a 16 gauge outer skin, a 22 gauge perforated inner skin, 18 gauge stiffener channels and a high mass septum. The 4" thick HTL panels have an STC of 48 and a NRC of 1.00.

Enclosures can be designed with doors, windows, access panels and removable panels. Doors are equipped with heavy-duty hardware and with seals to prevent noise leakage. Window panels are framed and sealed units utilizing 1/4" safety and/or wire reinforced glass. If constant access to the equipment is needed, removable panels can be incorporated in the enclosure design.



For specialized requirements, Kinetics manufactures panels of various thicknesses or single-skin panels fabricated from 18 gauge steel and faced with acoustical foam.

Kinetics offers complete design and engineering assistance including layout as well as providing acoustical, structural and ventilation requirements.

HVAC Installations

The control of noise in modern buildings due to air-conditioning is a normal procedure in most projects. Kinetics designs and manufactures a complete line of pressure enclosures for Heating, Ventilating and Air-Conditioning installations. Our panel enclosures are designed to be erected in the field. They are designed to provide thermal and optimum noise control through sound absorption and sound transmission loss.

Industrial Installations

Claims for hearing damage, safety and economic requirements make a noise reduction program essential for many industries. In the past, many manufacturing facilities were regulated by a government agency such as OSHA, but today the vast majority of noise regulation is driven by insurance companies who seek to keep claims for hearing damage to a minimum for the facilities they insure.

TABLE 1 - NOISEBLOCK STL - 2" & 4"
Sound Absorption Coefficients per ASTM C-423-66

Octave Band Number	2	3	4	5	6	7	NRC
Center Frequency (Hz)	125	250	500	1000	2000	4000	------
Absorption Coefficients							
NOISEBLOCK (STL) - 2"	0.15	0.66	1.07	1.06	0.97	0.86	0.95
NOISEBLOCK (STL) - 4"	0.60	1.13	1.12	1.09	1.03	0.91	1.00

TABLE 2- NOISEBLOCK STL - 2" & 4"
Sound Transmission Loss per ASTM E90-70

Octave Band Number	2	3	4	5	6	7	STC
Center Frequency (Hz)	125	250	500	1000	2000	4000	------
Transmission Loss							
NOISEBLOCK (STL) - 2"	17	23	34	47	55	57	37
NOISEBLOCK (STL) - 4"	21	28	39	48	56	58	40

TABLE 3 - NOISEBLOCK HTL - 4"
Sound Absorption Coefficients

Octave Band Number	2	3	4	5	6	7	NRC
Center Frequency (Hz)	125	250	500	1000	2000	4000	-----
Absorption Coefficients							
NOISEBLOCK (HTL) - 4"	0.60	1.13	1.12	1.09	1.03	0.91	1.00

TABLE 4 - NOISEBLOCK HTL - 4"
Sound Transmission Loss

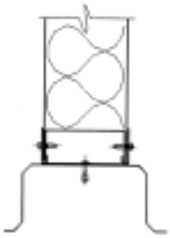
Octave Band Number	2	3	4	5	6	7	STC
Center Frequency (Hz)	125	250	500	1000	2000	4000	-----
Transmission Loss							
NOISEBLOCK (HTL) - 4"	27	34	48	61	66	70	48

When tested in accordance with ASTM E90-70 standard or a subsequent version of this standard, the panel assembly shall have minimum airborne sound transmission loss as follows:

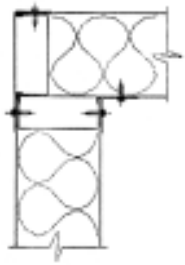
Doors, windows, electrical systems, ventilating systems, accessory components, etc., shall be provided in accordance with drawings.

Kinetics Noiseblock Panel System Section Views

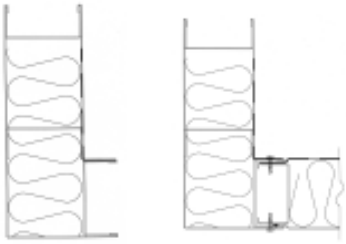
1- Tongue and groove connection



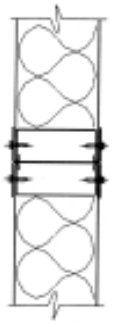
2- Curb connection



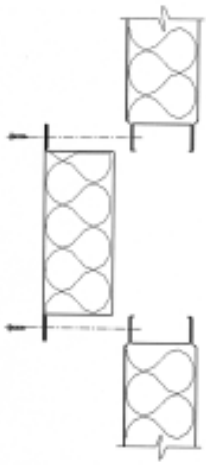
3- Right angled corner



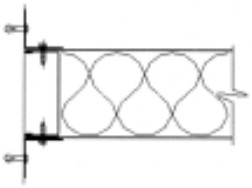
4- Corner panel



5- Vertical panel connections

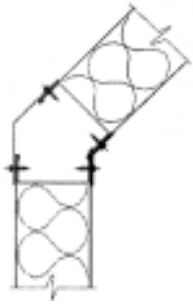


6- Removable panel

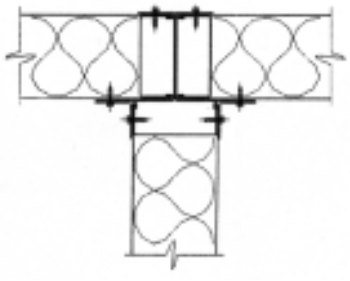


7- Connection to a wall or partition

8- Window

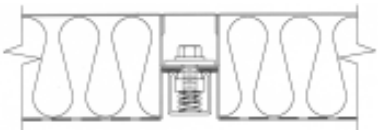


9- Angled corner



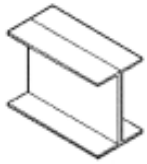
10- Tee connection

11- Opening through a panel

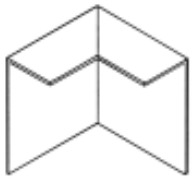


12- Non-sequential removable panel

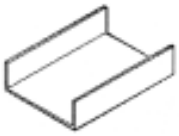
Trim and Accessories for Kinetics Noiseblock Enclosures



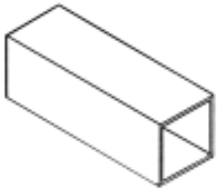
A. Panel Connector



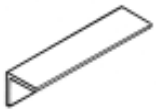
F. Outside Corner



B. Base Channel



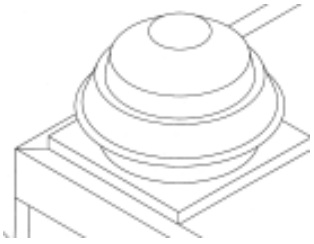
G. HSS Structural Tube



C. Inside Trim

H. Base Plate

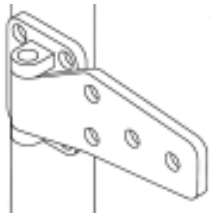
D. Outside Trim



I. Ventilation Fan

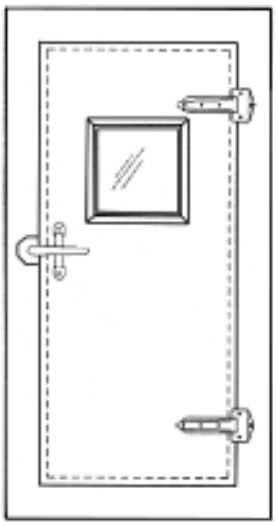
E. Drip Shield

J. Door Latch

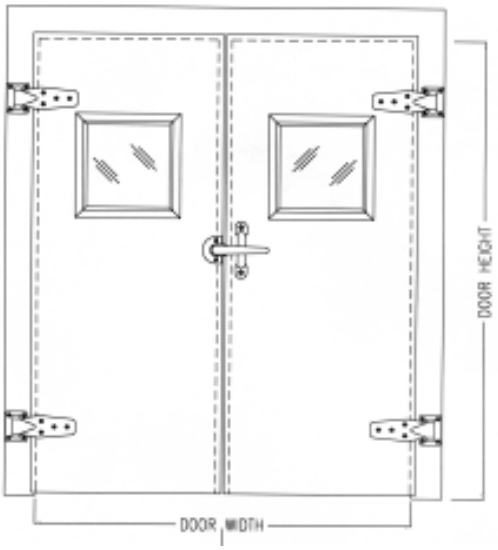


K. Door Hinge

Doors and Windows for Kinetics Noiseblock Enclosures



Optional window shown



Single Standard Doors

Standard Sizes W x H (in)	Door Opening
20 x 60 20 x 72 24 x 24 24 x 60 24 x 72 24 x 84 30 x 60 30 x 72 30 x 84 36 x 84	Left Right
	window options w x h (in) 12 x 12 12 x 24 24 x 24

Standard Double Glazed Windows

W x H (in)
12 x 12 12 x 24 24 x 12 24 x 24 18 x 24

Double Standard Doors

Standard Sizes W x H (in)	Door Opening
60 x 84 or 96 72 x 84 or 96 84 x 84 or 96 96 x 84 or 96	window options w x h (in) 12 x 12 12 x 24 24 x 24

Custom size doors, windows and hardware are available upon request.

OTHER DOOR TYPES

- HIGH STC SINGLE AND DOUBLE DOORS
  - CAM-LIFT HINGES
  - MAGNETIC SEALS
- HORIZONTAL & VERTICAL SLIDING DOORS

Specifications for Type STL Acoustical Panel Enclosure

1.0 General

Acoustical Panel Enclosures shall be insulated double-wall construction and shall be provided as indicated on drawings by a recognized manufacturer with published standards of construction and technical performance. The manufacturer shall have produced a standard factory-fabricated panel system and components for at least 10 years. Performance of the fabricated and installed system shall conform to all specifications listed herein.

2.0 Materials

2.1 Acoustical Metal Panels

A. All panels and their components shall be pre-fabricated, sectional, all metal-clad, modular and designed for easy and accu rate field assembly. The panels and components shall not be susceptible to damage due to extended exposure to vibration, air temperature or humidity with the passage of time.

B. Panel Construction

1. All panels shall be (2)/(4)/(6) inches thick, as noted on drawings, with a solid galvanized steel Type G90 exterior shell and a perforated/solid galvanized steel type G90 interior shell. The panels shall be connected together by means of a tongue and groove connection and held together rigidly by the use of self-drilling sheet metal screws.

2. The panel shell framing members and internal reinforcements shall be welded, screwed and/or riveted together to form a metal-sheathed panel of sufficient strength for maximum operating loads specified in the structural performance section of these specifications.

3. The solid exterior outer galvanized steel shell thickness shall be 18 ga. minimum and the interior perforated galvanized steel shell shall be 22-ga. minimum thick.

4. Where perforated materials are indicated, all perforations shall be 3/32" dia. holes on 3/16" staggered centers and shall result in an open area of no less than 23 percent.

5. All panel internal and external reinforcing members shall be minimum 18 ga. galvanized steel.

6. Each panel shall be filled with sound-absorbing materials that are inert, mildew-resistant, verminproof, and incombustible.

C. Panel Components and Installation

1. All accessory trim items shall be of 18 ga. minimum galvanized steel and shall be furnished in factory-standard lengths to be field cut to specified dimensions. Location and quantity of sheet metal screws and trim requirements shall be in accordance with the manufacturer's installation details.

2. Base channel shall be installed on a level and structurally sound surface.

3. All external panel connectors, trim items, accessories, base channel/panel interfaces/base channel/floor interfaces, and other sections as noted on the drawings shall be sealed with an acoustical sealant that shall not harden and prevent disassembly in the future.

D. Structural Performance

1. Any special external panel loading conditions including wind, snow and equipment shall be provided for as per specifications.

2. Under the indicated loading conditions, the entire enclosure system shall be self-supporting and/or will be supported as per the specifications. The installer shall furnish and assemble all structural members in strict accordance with drawings and manufacturer's installation details.

3. Under the above loading conditions, the assembled acoustical structure shall not exhibit any panel joint deflection in excess of L/240, where L is the unsupported span length of any panel section in the erected structure.

E. Acoustical Performance

The manufacturer shall provide certified testing data indicating sound absorption and transmission loss characteristics of the panel assembly.

F. Accessory Items

Doors, windows, electrical systems, ventilating systems, accessory components, etc., shall be provided in accordance with drawings.

G. Manufacturer

All materials shall be provided by Kinetics Noise Control, Inc. - Vibron Products Group

Specifications for Type HTL Acoustical Panel Enclosure

1.0 General

Panel enclosure systems shall be insulated double-wall construction and shall be provided as indicated on drawings. Panels, components and accessories shall be provided by a recognized manufacturer with published standards of construction and technical performance. The manufacturer shall have produced a standard factory-fabricated panel system and components for at least 10 years. Performance of the fabricated and installed system shall conform to all specifications listed herein.

2.0 Materials

2.1 Acoustical Metal Panels

A. All panels and their components shall be pre-fabricated, sectional, all-metal clad, modular and designed for easy and accurate field assembly. The panels and components shall not be susceptible to damage due to extended exposure to vibration, air temperature or humidity with the passage of time.

B. Panel Construction

1. All panels shall be (4) / (6) inches thick, as noted on drawings, with a solid galvanized steel type G90 exterior shell, a septum skin and a perforated/solid galvanized steel type G90 interior shell. The panels shall be connected together by means of a tongue and groove connection and held together rigidly by the use of self-drilling sheet metal screws, to be installed on maximum 18" centers on the inside and outside of the enclosure..

2. The panel shells, framing members, and internal reinforcements shall be welded and/or riveted together to form a metal-sheathed panel of sufficient strength for maximum operating loads specified in the structural performance section of these specifications.

3. The outer galvanized steel shell thickness shall be 16 ga. minimum and the inner galvanized steel shell shall be 22-ga. minimum thick.

4. Where perforated materials are indicated, all perforations shall be 3/32" dia. holes on 3/16" staggered centers and shall result in an open area of no less than 23 percent.

5. All panel internal and external reinforcing members shall be minimum 18 ga. galvanized steel.

6. Each panel shall be filled with sound-retardant and absorbing materials that are inert, mildew-resistant, verminproof and incombustible.

7. Where indicated on drawings, septum panels shall consist of a solid 16 ga. minimum galvanized outer skin, a septum skin and a 22 ga. minimum galvanized inner skin.

C. Panel Components and Installation

1. All accessory trim items shall be of 18 ga. minimum galvanized steel and shall be furnished in factory-standard lengths to be field cut to specified dimensions. Locations and quantity of sheet metal screws and trim requirements shall be in accordance with the manufacturer's installation details.

2. Base channel shall be installed on a level and true steel or concrete surface.

3. All external panel connectors, trim items, accessories, base channel/panel interfaces/base channel/floor interfaces, and other sections as noted on the drawings shall be sealed with an acoustical sealant that shall not harden and prevent disassembly in the future.

D. Structural Performance

1. Any special external panel loading conditions including wind, snow and equipment shall be provided for as per specifications.

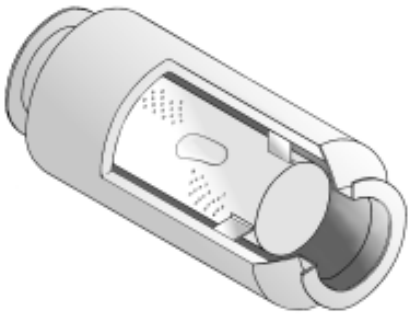
2. Under the indicated loading conditions, the entire enclosure system shall be self-supporting and/or will be supported as per the specifications. The installer shall furnish and assemble all structural members in strict accordance with drawings and manufacturer's installation details.

3. Under the above loading conditions, the assembled acoustical structure shall not exhibit any panel joint deflection in excess of L/240, where L is the unsupported span length of any panel section in the erected structure.

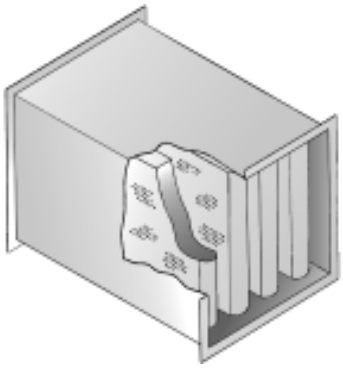
E. Acoustical Performance

The manufacturer shall provide certified independent test data indicating sound absorption and transmission loss characteristics of the panel assembly.

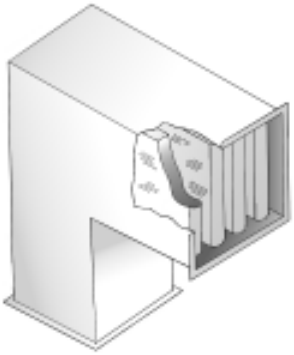
Other Kinetics Noise Control Products



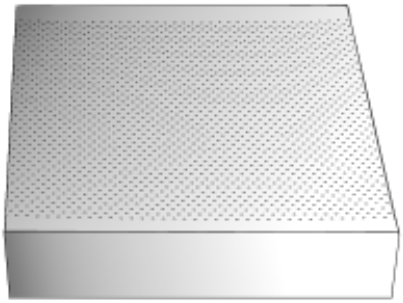
CIRCULAR SILENCERS



RECTANGULAR SILENCERS

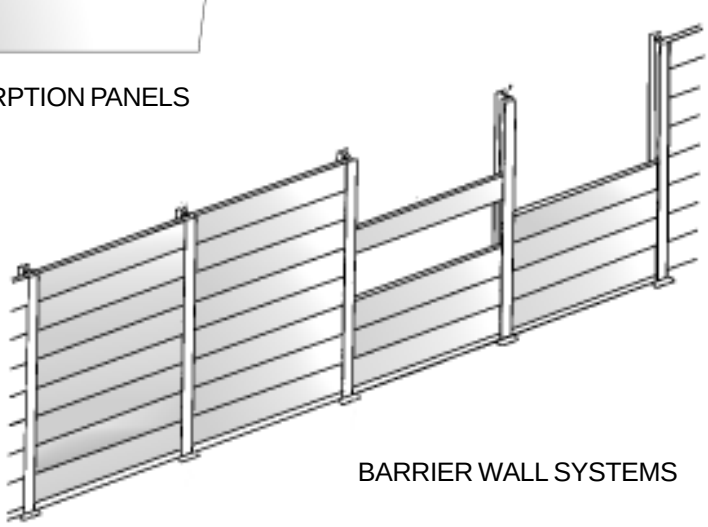


ELBOW SILENCERS



KNP ABSORPTION PANELS

MUFFLERS



BARRIER WALL SYSTEMS

United States
6300 Irelan Place
P.O. Box 655
Dublin, Ohio 43017
Phone: 614 889-0480
Fax: 614 889-0540

Canada
1720 Meyerside Drive
Mississauga, Ontario
L5T 1A3
Phone: 905-670-4922
Fax: 905-670-1698

www.kineticsnoise.com

Summary: Application Appendix C: Noise Report electronically filed by Teresa Orahood on behalf of Oregon Clean Energy, LLC