

# Pre-Construction Noise Analysis

for the proposed

## El Sol Storage Center

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October 6, 2021



Prepared for:

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Chicago, Illinois

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## Contents

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Executive Summary .....	1
1. Introduction .....	2
2. Applicable Regulation .....	3
3. Proposed Project and Environs .....	4
4. Pre-Construction Background Noise Measurement Survey.....	5
5. Noise Modeling Methods.....	9
6. Predicted Operational Noise Levels.....	12
7. Construction Noise .....	13
APPENDIX A Youngtown Noise Ordinance .....	A-1
APPENDIX B Photographs of Measurement Locations.....	B-1

## Figures

---

Figure 1-1. General Location of the Project .....	2
Figure 3-1. Layout of Project and Surrounding Area .....	4
Figure 4-1. Examples of Long-Term and Short-Term Noise Measurement Setups .....	5
Figure 4-2. Long-Term Background Noise Levels at LT1 .....	6
Figure 5-1. Sample View of 3D SoundPLAN Noise Model of Project .....	9
Figure 6-1. Predicted Operational Noise Level Contours .....	12
Figure B-1. Photographs of Location LT-1 .....	B-2
Figure B-2. Photographs of Location ST-1.....	B-3
Figure B-3. Photographs of Location ST-2.....	B-4
Figure B-4. Photographs of Location ST-3.....	B-5
Figure B-5. Photographs of Location ST-4.....	B-6

## Tables

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Table 2-1. Youngtown Property Line Noise Level Limits.....	3
Table 4-1. Attended Background Sound Level Measurement Results (10 min, dBA) .....	8
Table 5-1. Noise Emission Factors .....	10
Table 5-2. Noise Source Characteristics of Construction Equipment.....	11
Table 7-1. Predicted Construction Noise Levels ( $L_{eq}(\text{one hour})$ , dBA) .....	13

## **Executive Summary**

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El Sol Energy Storage Center LLC (El Sol Storage), a wholly-owned subsidiary of Invenergy Solar Development North America LLC and an affiliate of Invenergy LLC (Invenergy), is preparing an application for a permit from Youngtown, Arizona to construct and place in utility service the El Sol Energy Storage Center (Facility). The Facility consists of (1) an array of 60 storage containers with racks of batteries inside them and associated cooling systems and small transformers, (2) an associated array of 15 inverters that also have cooling systems and transformers, and (3) one primary step-up transformer located at the Facility substation. The Facility has a storage capacity of 50MW four-hour (200MWh). This report describes the methods and results of a study conducted to assess noise from the Facility and how it has been designed to meet the noise level limit imposed by the Town of Youngtown, Arizona, which is 60 dBA at the property line.

In order to understand the existing noise environment in the vicinity of the Facility, an ambient noise level survey was conducted in April 2021. Noise levels were measured at representative locations at and near the Facility over a 48-hour period. Levels generally range from approximately 35 to 55 dBA. The louder levels (over 50 dBA) were likely caused by aircraft operations from the United States Air Force Base located four miles to the southwest. The most common noise sources in the area are local and distant traffic. Immediately north of the Facility is an industrial operation involving earth moving with heavy equipment, but this was not in operation at the time of the noise survey. Further north is an active mining operation located about one-half mile away, but this was not audible at receptors near the Facility as the view (and sound propagation) it is partially blocked by intervening terrain.

Noise levels from the full and continuous operation of the Facility were predicted using an acoustical model that is based on the measurement of noise emissions from equipment similar to that proposed for the Facility. The model included the physical locations and number of battery storage units and inverters, the location of the Facility's property line, and topography. The model demonstrates that Facility noise emissions will be less than 60 dBA at all locations along the Facility's property line, provided that noise barriers are constructed along portions of the northern and southern property boundaries (approximately 400 feet long and 12 feet tall). Note that the Facility proponent is presently negotiating with adjacent landowners to the north and south for a waiver of the noise limits. If approved this would obviate the need for the noise barriers.

Construction activities are regulated by Youngtown Code of Ordinances 8.16.030, which does not provide objective noise standards, but limits the time that construction can occur without obtaining a variance. Construction is limited to 6:00 am to 7:00 pm from May 1 through September 30; and from 7:00 am to 7:00 pm from October 1 through April 30. Noise levels from the construction of the Facility were predicted for four phases of construction: site preparation, civil work and initial installation, final installation, and commissioning. The duration of construction will be approximately 10 months. In addition to maintaining compliance with the times of allowable construction, it is recommended that the contractor use best management practices to help minimize noise emissions. This includes the use of ambient controlled broadband backup alarms, locating loud stationary equipment behind barriers if necessary, and communicating with the town and residences regarding the dates, times, and duration of construction.



# 1. Introduction

This report describes the results of a pre-construction noise analysis conducted by Hankard Environmental for the proposed El Sol Battery Storage System (Facility or Project) in Youngtown, Arizona. The general location of the Project is shown in Figure 1-1, which is situated on a 14-acre parcel of vacant land approximately ¼ mile to the north of Olive Avenue between the existing El Sol 69 kV substation to the south and a materials processing facility to the north. To the west and east are the residential subdivisions Agua Fria Ranch and Rancho Estates, respectively. The Facility will have a storage capacity of 50 MW.

The noise analysis consisted of measuring existing noise levels in the vicinity of the Project, predicting noise levels from the operation of the Project at the boundary of the Facility for compliance purposes, and predicting noise levels from the construction of the Facility. The analysis was conducted in accordance with the Youngtown Code of Ordinances 8.16.040, *Sound Level Limits*. The following sections of this report describe the noise regulation applicable to the Project, the Project site and the location of property lines and residences, the results of the pre-construction ambient noise study, the methods and data used to predict construction and operational noise emissions and predicted construction and operational noise levels.



Figure 1-1. General Location of the Project



## 2. Applicable Regulation

There are no federal, state, or county noise regulations or ordinances applicable to noise emissions from the operation of the Project. What is applicable is the Town of Youngtown’s Code of Ordinances 8.16.040, *Sound Level Limits*. This ordinance states that it is unlawful to create noise “at either the property line or the area of the property affected by the noise emission” that exceeds the noise level limits listed in Table 2-1. Per the ordinance all noise levels are to be measured using the A-weighting (dBA) scale using a Type 1 sound level meter per American National Standard S1.4-1971. Because the Facility has the potential to operate at night, the lower nighttime limits apply and are controlling. Given this and given the fact that the Residential and Commercial and Mixed Use nighttime limits are both 60 dBA, this is the limit the Project must meet.

**Table 2-1. Youngtown Property Line Noise Level Limits**

Zone	Time	Noise Standard (dBA)
Residential	10:00 pm to 7:00 am	60
	7:00 am to 10:00 pm	70
Commercial and Mixed Use	10:00 pm to 7:00 am	60
	7:00 am to 10:00 pm	80

Noise is also limited by Youngtown Code of Ordinances 8.16.030, *Enumeration of loud, disturbing, and unnecessary noises – Enumeration not exclusive*. This ordinance specifies that certain types of noise (e.g., blowing horns, yelling, etc.) are not permitted. Regarding construction it limits the hours of construction from 6:00 a.m. to 7:00 p.m. from May 1 through September 30; and from 7:00 a.m. to 7:00 p.m. from October 1 through April 30, unless a variance is obtained. The specific language of this ordinance is as follows:

*Building Operations, Excavation of Streets. The erection (including excavating), demolition, alteration or repair of any building in any residential district or section and the excavation of streets and highways in any residential district or section, other than between the hours of six a.m. and seven p.m. from the first day of May to and including the thirtieth day of September and between the hours of seven a.m. and seven p.m. beginning the first day of October to and including the thirtieth day of April on weekdays, except in case of urgent necessity in the interest of public health and safety and then only with a permit from the building inspector, which permit may be granted for a period not to exceed thirty (30) days while the emergency continues. If the council should determine that the public health and safety will not be impaired by the erection, demolition, alteration or repair of any building or excavation of streets and highways, other than within the hours specified herein, and if they shall further determine that loss or inconvenience would not result to any party in interest, they may grant permission for such work to be done at times other than specified herein, upon application being made at the time the permit for work is awarded or during the progress of the work;*

### 3. Proposed Project and Environs

The Project is located north of Olive Avenue and west of 111<sup>th</sup> Avenue, in the Town of Youngtown, Arizona, as shown in Figure 3-1. Noise-producing elements of the operation of the Project include the cooling systems associated with each battery storage container, the cooling fans and transformers associated with each inverter, and the primary step-up transformer. The Facility has the potential to operate 24 hours per day, as necessary. Land use in the vicinity of the Facility is a mixture of industrial and residential. Land use on directly-adjacent parcels is as follow:

1. North - Materials processing/landfill (business park land with commercial use, but the town has indicated the possibility that this will convert to residential),
2. East - Rancho Estates subdivision (business park land then residential),
3. South - El Sol Substation (public and commercial land with commercial use),
4. West - Agua Fria Ranch subdivision (residential).

Construction of the Project will involve the use of typical construction equipment and will take approximately ten months to complete. Equipment to be employed includes heavy trucks for equipment delivery, light duty trucks, bulldozers, tractors, dump trucks, motor graders, excavators, forklifts, backhoes, skid-steer loaders, cranes, , and truck-mounted auger or drill rigs.

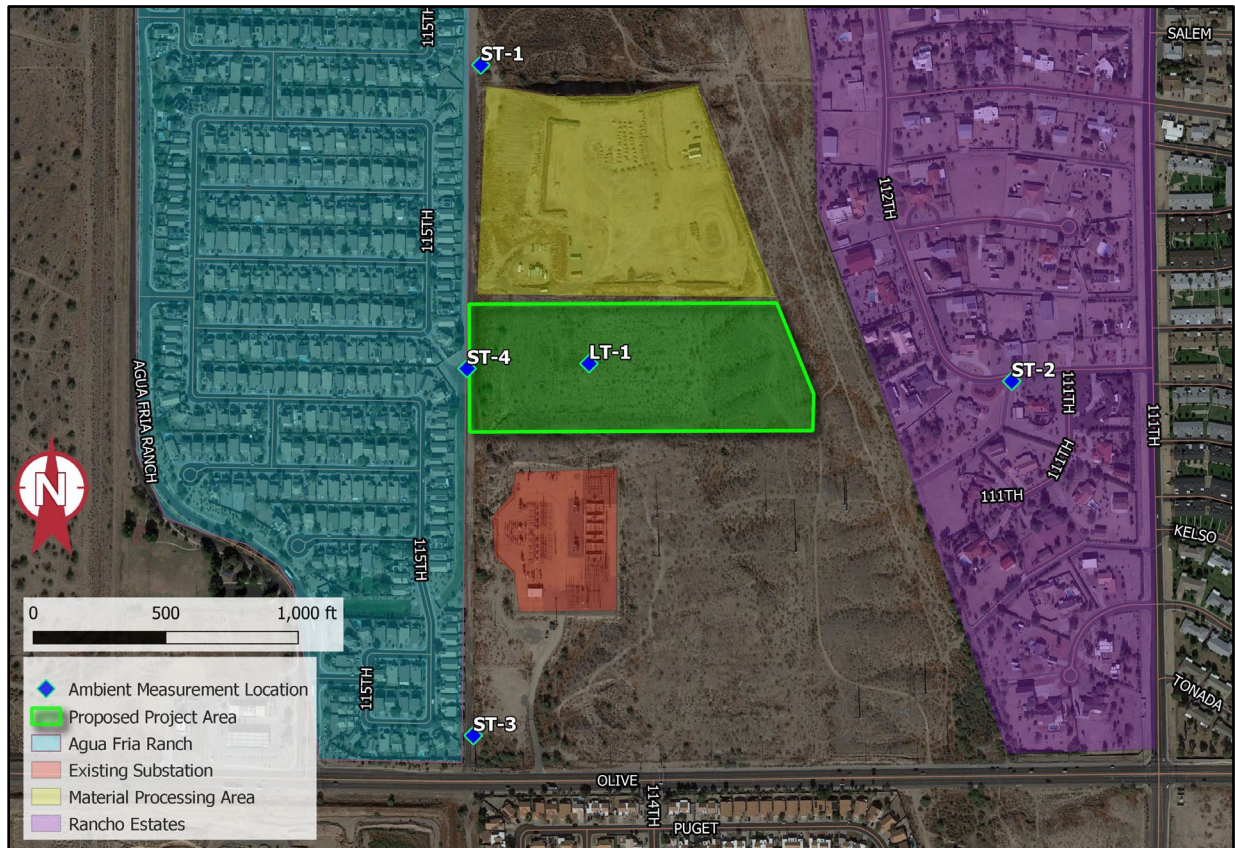


Figure 3-1. Layout of Project and Surrounding Area



## 4. Pre-Construction Background Noise Measurement Survey

A background (ambient) noise level survey was conducted in the Project Area to characterize and document pre-construction noise levels. The survey was conducted between April 18 and 20, 2021 (Sunday through Tuesday). Noise levels were continuously measured for 48 hours at one unattended long-term location (LT-1) on the proposed site, as well as for 10-minute periods at four other attended short-term locations (ST-1 to ST-4) around the proposed site during the daytime and evening to nighttime hours. These measurement locations are shown in Figure 3-1. Note that because the Project can operate 24-hours per day, a focus was made on the nighttime conditions. In addition, a source measurement was taken of the existing transformers at the existing substation just south of the proposed Project. Figure 4-1 provides photographic examples of the long-term and one of the short-term noise measurement setups. Refer to Appendix B for photographs of each specific measurement location.



Figure 4-1. Examples of Long-Term and Short-Term Noise Measurement Setups

Sources of existing noise commonly observed in the area were natural sounds such as birds calling, wind noise, and rustling vegetation from wind. Other sources of noise included local and distant traffic, general aviation propeller aircraft, jet aircraft from the United States Air Force (USAF) base (~4 miles to the southwest), that from residences (e.g., maintenance, talking, dogs barking, and home cooling systems), and distant train horns (~2.5 miles to the northeast). While wind conditions were not constantly monitored, it was noted over the two days that wind speeds were 0 to 6 miles per hour from the north on the first day and then from the south on the second day. Sky conditions were noted as clear during the entire survey and no precipitation occurred.



### Unattended Ambient Noise Measurement

LT-1 was located near the center of the proposed site, which is elevated above the surrounding areas except to the north. Nighttime noise levels ranged from 35 to 55 dBA ( $L_{eq}$ ) with the levels greater than 50 dBA likely caused by the operation of jets at the USAF base, which was noted when conducting the attended short-term measurements. The more constant noises in the area that were observed included birds calling and traffic. The existing substation transformers were not audible from this location but are described in more detail later in this report. A plot of the measured levels is provided in Figure 4-2.

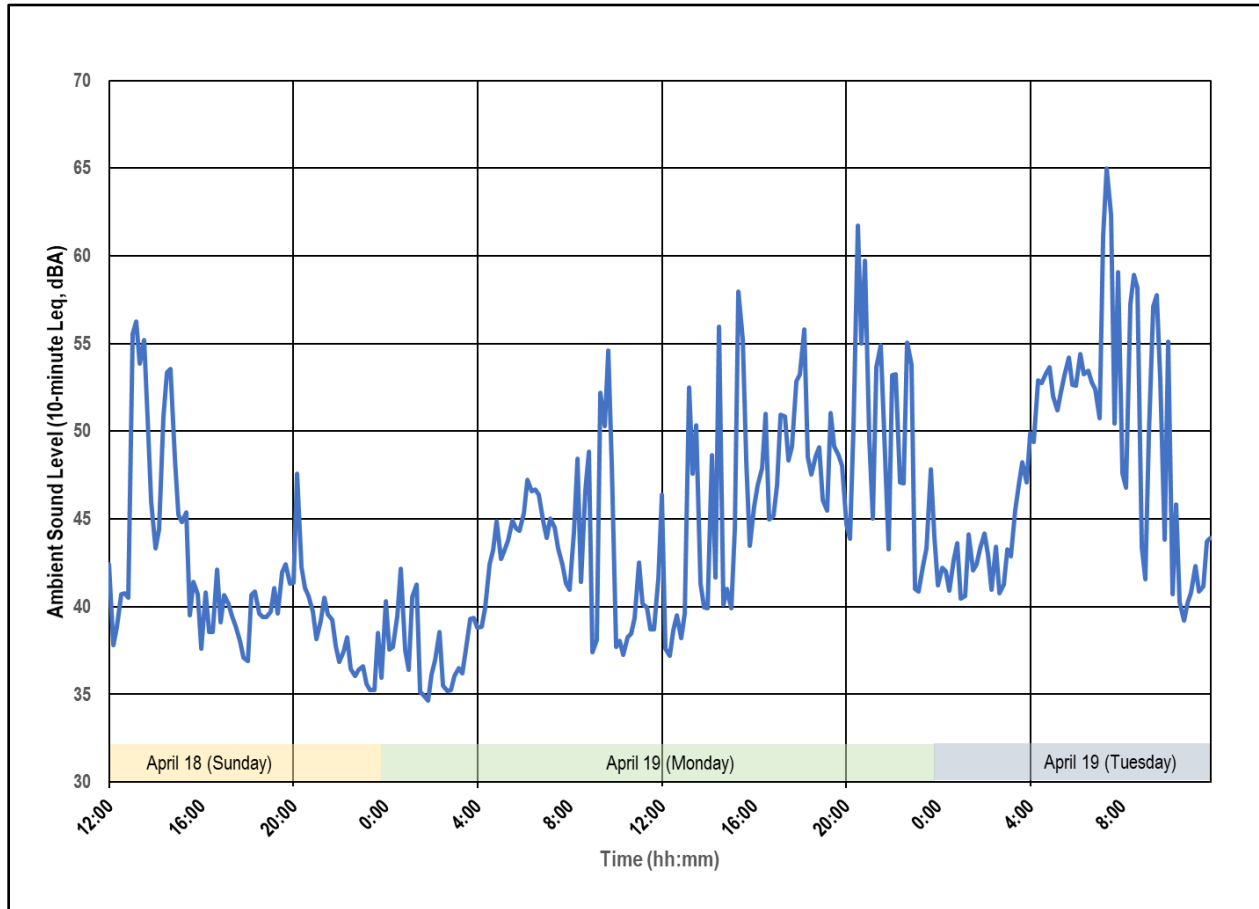


Figure 4-2. Long-Term Background Noise Levels at LT1

### **Attended Ambient Noise Measurements**

**ST-1** was located along the access road to the north of the existing industrial facility and east of the Agua Fria Ranch residential subdivision. Nighttime noise levels ranged from 39 to 49 dBA ( $L_{eq}$ ) and 38 dBA ( $L_{90}$ ), which suggests there were intermittent sounds present with a lower  $L_{90}$  value. Nighttime noise levels included that from distant traffic, depending on the wind direction, and residential cooling systems. Note that during the daytime, open pit mining operations were active to the northeast about 1,200 feet away. Finally, no noise sources were ever active at the industrial facility immediately north of the Project area.

**ST-2** was located on W. Hatcher Road within the Rancho Estates subdivision about 750 feet from the Project's eastern property line. Nighttime noise levels ranged from 50 to 59 dBA ( $L_{eq}$ ) and 40 to 41 dBA ( $L_{90}$ ), which suggests there were intermittent sounds present with a lower  $L_{90}$  value. It was noted the area was 38 to 42 dBA during quieter times with less traffic which is consistent with the  $L_{90}$  levels. Nighttime noise levels included noise from distant traffic and local traffic, some slight cricket noise, distant train horns, propeller-driven general aviation aircraft, and that from USAF jets which were the dominant source for one night.

**ST-3** was located at the southern portion of the access road near Olive Avenue and is representative of residences located closer to the southern border of the Project. Nighttime noise levels ranged from 54 to 55 dBA ( $L_{eq}$ ) and 44 to 46 dBA ( $L_{90}$ ), which suggests there were intermittent sounds, such as local traffic, present with a lower  $L_{90}$  value. It was noted the area was 40 dBA during quieter times with less traffic. Nighttime noise levels included noise from local traffic, distant traffic when none present on Olive Avenue, occasional dogs barking, and that from USAF jets which were the dominant source for one night.

**ST-4** was located on the access road in-between ST-1 and ST-3 on the western side of the Project boundary to represent the nearest residential areas to the Project. Nighttime noise levels ranged from 38 to 44 dBA ( $L_{eq}$ ) and 36 to 41 dBA ( $L_{90}$ ), which suggests intermittent sounds were not as significant here as the other sites and is likely due to being further away from local traffic. Nighttime noise levels included noise from distant traffic on US 60 to the north or Olive Avenue to the south, residential cooling systems, and some crickets. No USAF jets were operating in the area during either nighttime measurement at this location.

### **Existing Substation Noise Measurement**

There is an existing substation with two step-up transformers adjacent to the southern Project boundary. This source was measured at a few locations and is estimated to be equivalent to approximately 35 dBA at 400 feet. This is a typical and expected noise level from step-up transformers of this size. These levels could increase by 3 to 5 dBA when cooling fans come online during warmer weather.

**Table 4-1. Attended Background Sound Level Measurement Results (10 min, dBA)**

Period	Date	Location	L <sub>eq</sub>	L <sub>min</sub>	L <sub>max</sub>	L <sub>90</sub>	Wind (mph)	Audible Noises
Day 1	Sunday, April 18, 2021	ST-1	42	34	63	36	0-5 N	Birds, Distant Traffic, Train Horn
		ST-2	44	36	58	38	0-5 N	Birds, Wind, Local/Distant Traffic,
		ST-3	56	41	73	46	0-6 N	Traffic on Olive Ave, Birds, Wind
		ST-4	48	34	66	36	0-4 N	Birds, Wind, Aircraft, Dogs
Day 2	Monday, April 19, 2021	ST-1	47	39	66	41	0-3 ENE	Mining to NE, Birds, Distant Traffic
		ST-2	42	37	55	38	0-4 E	Local/Distant Traffic, Birds
		ST-3	57	40	66	48	0-3 ENE	Traffic on Olive Ave
		ST-4	41	36	56	38	0-3 ENE	Distant traffic, Distant mining, Birds
Night 1	Sunday, April 18, 2021	ST-1	39	36	52	38	0-1 N	Distant Traffic, Crickets (minor)
		ST-2	50	38	69	40	0-2 N	Local/Distant Traffic, Birds, Train Horn
		ST-3	55	40	69	46	0-1 N	Traffic on Olive Ave, Dogs
		ST-4	38	35	61	36	0-1 N	Distant Traffic, Crickets, Talking
Night 2	Monday, April 19, 2021	ST-1	49	37	84	38	0-2 S	Traffic on Olive Ave, A/C
		ST-2	59	39	78	41	0-1 SW	Traffic on Olive Ave, USAF Aircraft
		ST-3	54	38	64	44	0-2 S	Traffic on Olive Ave, USAF Aircraft
		ST-4	44	39	59	41	0-3 S	Traffic on Olive Ave, A/C



## 5. Noise Modeling Methods

Noise levels from the proposed Project were predicted using the International Organization for Standardization (ISO) Standard 9613-2:1996, *Attenuation of Sound During Propagation Outdoors - Part 2: General method of calculation*. The calculations were made using the SoundPLAN v8.2 software program. There are a number of parameters in the ISO 9613-2:1996 method, including the locations of the noise sources and receivers, noise source spectral characteristics, terrain and ground type, and atmospheric conditions. The ISO 9613-2:1996 method assumes optimal acoustic propagation in all directions, specifically that a “well-developed, moderate ground-based temperature inversion” is present or, equivalently, that all receptors are downwind of all noise sources at all times. The sections below describe the modeling assumptions. A sample view of the noise model is provided in Figure 5-1 which shows the battery storage containers, inverters (yellow), wall mounted air conditioning (AC) units (red), and step-up transformer at the substation (green).

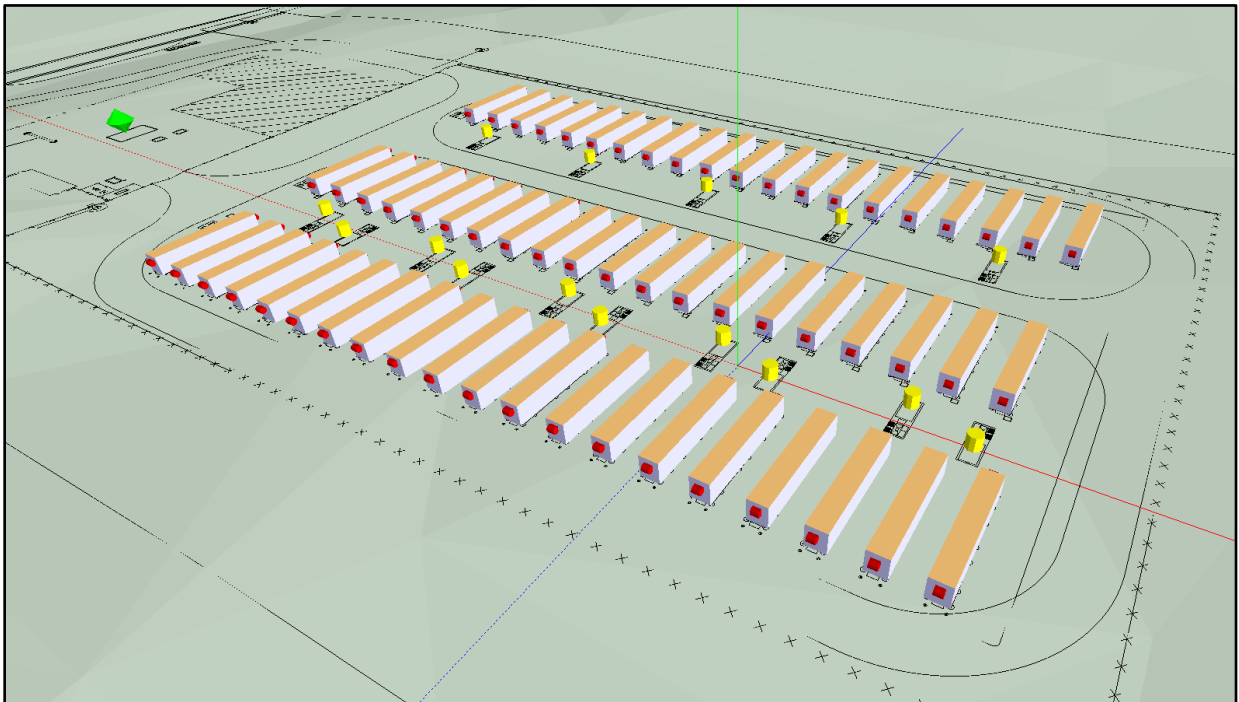


Figure 5-1. Sample View of 3D SoundPLAN Noise Model of Project

### Atmospheric Conditions

The air temperature, relative humidity, and atmospheric pressure were set to 10°C, 70%, and 1 atmosphere, respectively. Per ISO 9613-2:1996, these values result in the least amount of atmospheric sound absorption and the highest levels of sound reaching the receivers.

### Terrain and Ground Effect

The ground elevations of the site and immediate surrounding area were provided by the Project with the elevation of the more distant terrain taken from the USGS 3D Elevation Program 1/3

Arc Second. The acoustical effect of the ground was modeled using the ISO 9613-2:1996 General Method. This method requires the selection of ground factors for the ground near the source, near the receiver, and in between. A ground factor of 0.0 represents a completely reflective surface such as pavement, which would result in a higher level of sound reaching a receiver. A ground factor of 1.0 represents absorptive ground such as thick grass or fresh snow, resulting in a lower level of sound reaching the receiver. For this Project, a ground factor of 0.5 was used to represent the surrounding area which is a mixture of soft dirt, rocks, with some vegetation and grass. Diffractions were enabled in the model to represent the effect of the battery containers blocking noise in some directions. Also, the coolers on the battery boxes are located on one end of the units, and these ends were assumed to face toward the inside of the site.

### Noise Level Prediction Type

There are two typical prediction types. The first is point predictions, in which levels are predicted at discrete points such as a house or other noise-sensitive receptor. The other type of predictions are noise level contours, which are essentially a series of point predictions in which a line is drawn along those points with the same value. Selecting the prediction type is dependent on the applicable noise regulation which defines a noise level limit and a location to meet said limit. In this case, the Project needs to meet noise limits at the adjacent property lines, and thus noise level contours were the selected noise level prediction type. In accordance with ISO 9613-2:1996, the height above the ground for each receptor was set to five feet.

### Operational Noise Sources

Noise producing elements of the Project include the cooling units associated with each of the 60 battery storage containers (includes 15 potential future units), the two AC units per container, 15 inverters, and the primary step-up transformer located at the Project substation. The sound power levels of each container cooling unit are shown in Table 5-1 and are based on supplier data and measurements conducted by Hankard Environmental. The inverter sound power levels shown in Table 5-1 are based on the TMEIC 4,200 kW solar inverter, which were also measured by Hankard Environmental at an existing solar facility. The noise source representing each container and inverter were modeled at a height of six feet above the ground. The substation for this Project is comprised of one 58 MVA step-up transformer to be located on site to the west of the battery storage area. The sound power levels for the transformer shown in Table 5-1 were estimated using the procedures outlined in the “Electric Power Plant Environmental Noise Guide” from the Edison Electric Institute (EEI, 1984). The step-up transformer was modeled at a height of 10 feet above the ground.

**Table 5-1. Noise Emission Factors**

Equipment	Octave-Band Sound Power Level (dB)									Overall Sound Power Level (dBA)
	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1,000 Hz	2,000 Hz	4,000 Hz	8,000 Hz	
Step-up Transformer 58 MVA	91	97	99	94	94	88	83	78	71	95
BESS Container Cooling	92	89	84	81	83	84	77	72	68	87
BESS Inverters TMEIC 4,200kW	105	98	95	94	95	88	83	78	76	95

### Construction Noise Sources

Noise levels were predicted using the Federal Highway Administration’s (FHWA) Roadway Construction Noise Model (RCNM) v1.1 for four phases of construction: (1) Site Preparation (mobilization, clearing/grubbing, grading), (2) Civil Work and Initial Equipment Installation (excavation/backfill, install foundations including drilled piers, install cable, install firewater loop, install some equipment - GSU, steel, bus, control house, other transformers), (3) Final Equipment Installation (install containers, batteries, transformers, control house, breakers, bus/steel, cabling, wrap up construction, and (4) Commissioning (site clean-up, complete access road build out, landscape, punch list/close out). Table 5-2 lists the equipment associated with each phase, as well as the number of units to be employed, the sound pressure level of each unit at a distance of 50 feet, and the percentage of time that each piece of equipment is expected to be used at full capacity (usage factor). Construction noise source levels were generally based on measurements of construction equipment made by Hankard Environmental on previous projects. The usage factors were taken from the RCNM. All construction noise sources were modeled at 10 feet above the ground.

**Table 5-2. Noise Source Characteristics of Construction Equipment**

Construction Phase	Equipment (quantity)	Usage Factor (%)	Sound Pressure Level @ 50 ft (dBA)
1 Site Preparation	Bulldozer (1)	40	81.7
	Excavator (2)	40	80.7
	Moto-grader (2)	40	85.0
	Backhoe/Loader (1)	40	79.1
	Dump Truck (1)	40	76.5
	Tractor (2)	40	84.0
2 Civil Work and Initial Equipment Installation	Auger Drill Rig (2)	20	84.4
	Dump Truck (1)	40	76.5
	Excavator (2)	40	80.7
	Crane (2)	16	80.6
	Gradall Forklift (2)	40	83.4
3 Final Equipment Installation	Gradall Forklift (2)	40	83.4
	Man Lift (2)	20	74.7
	Crane (2)	16	80.6
4 Commissioning	Pickup Truck (2)	40	75.0
	Flatbed Truck (1)	40	74.3
	Excavator (2)	40	80.7
	Moto-grader(2)	40	85.0



## 6. Predicted Operational Noise Levels

Using the model of noise emissions described in Section 5, noise levels from the full and continuous operation of the proposed Project were predicted along the Facility boundary. Figure 6-1 shows the location of the 60 dBA noise level contour for the operation of the Facility along with northern (10 ft x 410 ft) and southern (12 ft x 410 ft) noise barriers. The area between the Facility and the contour has a predicted level greater than 60 dBA, and the area outside of the contour has a predicted level of less than 60 dBA. As can be seen the 60 dBA contour does not extend off site with the noise barriers included, indicating compliance with the Youngtown noise limit.

Without the modeled noise barriers, the predicted noise levels are as high as 62 dBA along the northern property line and 64 dBA along the southern property line. Note that the Project proponent is presently negotiating with adjacent landowners to the north and south for a waiver of the noise limits. If approved this would obviate the need for the noise barriers.

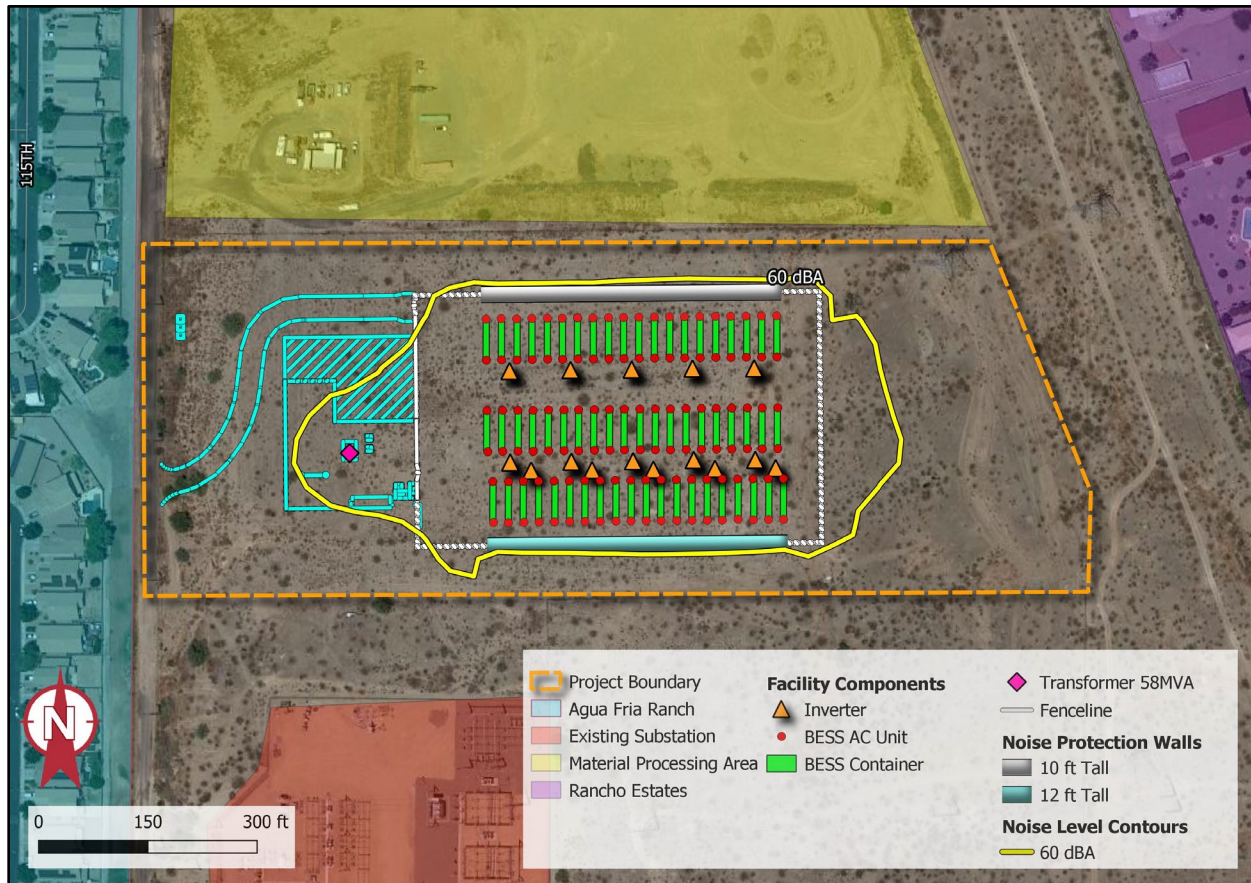


Figure 6-1. Predicted Operational Noise Level Contours

## 7. Construction Noise

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Construction activities are limited by Youngtown Code of Ordinances 8.16.030, which does not provide an objective noise standard for construction noise, but rather limits the time that construction can occur without obtaining a variance. Construction activities are limited to the hours from 6:00 am to 7:00 pm from May 1 through September 30; and from 7:00 am to 7:00 pm from October 1 through April 30.

The construction noise analysis was conducted using the Federal Highway Administration's Roadway Construction Noise Model (RCNM) v1.1. This computer software program includes construction noise source sound pressure levels and equipment usage factors. Noise levels from the construction of the Facility were predicted at representative distances ranging from 200 to 1,500 feet for each of four primary phases of construction. These phases include: (1) Site Preparation (mobilization, clearing/grubbing, grading), (2) Civil Work and Initial Equipment Installation (excavation/backfill, install foundations including drilled piers, install cable, install firewater loop, install some equipment - GSU, steel, bus, control house, other transformers), (3) Final Equipment Installation (install containers, batteries, transformers, control house, breakers, bus/steel, cabling, wrap up construction, and (4) Commissioning (site clean-up, complete access road build out, landscape, punch list/close out) The total duration of construction is approximately 10 months.

The predicted noise levels (one-hour  $L_{eq}$ ) at four representative distances from each phase of construction are listed in Table 7-1. These values assume that all of the equipment for each phase of work is fully operating for the duration of each hour noted in Table 5-2.

In addition to maintaining compliance with the times of allowable construction, it is also recommended that the contractor use best management practices to help minimize complaints from the surrounding neighborhoods. This includes the use of ambient controlled broadband backup alarms, locating any loud generators or equipment behind berms, and communicating with the town and residences regarding the dates, times, and duration of construction activities.

**Table 7-1. Predicted Construction Noise Levels ( $L_{eq}$ (one hour), dBA)**

Construction Phase	Distance from Construction (ft)			
	200	500	1,000	1,500
1 – Site Preparation	77	69	63	59
2 – Civil Work and Initial Installation	75	67	61	58
3 – Final Installation	71	64	58	54
4 – Commissioning	74	66	60	56

# **APPENDIX A**

## **Youngtown Noise Ordinance**

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## Chapter 8.16 - NOISE

### 8.16.010 - Unreasonably loud and disturbing noises prohibited.

Subject to the provisions of this chapter the creating of any unreasonably loud, disturbing and unnecessary noises within the limits of the town is prohibited.

### 8.16.020 - Noises detrimental to the life and health or public peace and welfare prohibited.

Noise of such character, intensity or duration as to be detrimental to the life or health of any individual or in disturbance of the public peace and welfare is prohibited.

### 8.16.030 - Enumeration of loud, disturbing and unnecessary noises—Enumeration not exclusive.

The following acts, among others, are declared to be loud, disturbing and unnecessary noises and noises in violation of this chapter, but this enumeration shall not be deemed to be exclusive, namely:

- A. Blowing Horns or Signal Devices. The sounding or blowing of any horn or signal device on any automobile, truck, bus, motorcycle or other vehicle while not in motion, except as a danger signal if another vehicle is approaching, apparently out of control, or if in motion only as a danger signal after or as brakes are being applied and deceleration of the vehicle is intended; the creation by means of any such signal device of any unreasonably loud or harsh sound; and sounding of such devices for any unnecessary and unreasonable period of time;
- B. Radios, Phonographs, Etc. The playing of any radio, phonograph or any musical instrument in such a manner or with such volume as to annoy or disturb the quiet, comfort or repose of persons in any office, hospital or in any dwelling, hotel or other type of residence, or of any persons in the vicinity;
- C. Yelling, Shouting, Etc., on Streets. Yelling, shouting, hooting, whistling or singing on the public streets so as to annoy or disturb the quiet, comfort or repose of persons in any hospital, dwelling, hotel or other type of residence, or of persons in the vicinity;
- D. Pets. The keeping of any animal, bird or fowl which, by causing frequent or long continued noise, shall disturb the comfort or repose of any person in the vicinity;
- E. Use of Vehicle. The use of any automobile, truck, bus, motorcycle or other vehicle so out of repair, so loaded or in such manner as to create loud and unnecessary grating, grinding, rattling or other noise;
- F. Exhaust Discharge. To discharge into the open air the exhaust of any steam engine, stationary internal combustion engine, motor vehicle or motorboat engine, except through a muffler or other device which will effectively prevent loud or explosive noises therefrom;
- G. Building Operations, Excavation of Streets. The erection (including excavating), demolition, alteration or repair of any building in any residential district or section and the excavation of streets and highways in any residential district or section, other than between the hours of six a.m. and seven p.m. from the first day of May to and including the thirtieth day of September and between the hours of seven a.m. and seven p.m. beginning the first day of October to and including the thirtieth day of April on weekdays, except in case of urgent necessity in the interest of public health and safety and then only with a permit from the building inspector, which permit may be granted for a period not to exceed thirty (30) days while the emergency continues. If the council should determine that the public health and safety will not be impaired by the erection, demolition, alteration or repair of any building or excavation of streets and highways, other than within the hours specified herein, and if they shall further determine that loss or inconvenience would not result to any party in interest, they may grant permission for such work to be done at times other than specified herein, upon application being made at the time the permit for work is awarded or during the progress of the work;

- H. Noises Near Hospitals, Churches, Etc. The creation of any excessive noise on any street adjacent to any institution of learning, church or court while the same is in session, or adjacent to any hospital, which unreasonably interferes with the workings or session thereof;
- I. Loading and Unloading Operations. The creation of loud and excessive noise in connection with loading or unloading any vehicle or the opening and destruction of bales, boxes, crates and containers;
- J. Noises to Attract Attention. The use of any drum, loudspeaker or other instrument or device for the purpose of attracting attention by creation of noise to any performance show or sale or display of merchandise;
- K. Loud-Speakers or Amplifiers on Vehicles. The use of mechanical loud-speakers or amplifiers on automobiles, trucks, busses or other moving or standing vehicles for advertising or other purposes.

8.16.040 - Sound level limits.

- A. Definitions. Unless the context otherwise requires, the following words, terms, and phrases shall have the meanings ascribed to them in this section. Any terminology used in this section shall be interpreted in conformance with definitions used by the American National Standards Institute (ANSI) or its successor body, as applicable.

"A band level" means the total sound level of all noise as measured with a sound level meter using a-weighting network. the unit is the dB(A).

"Decibel" or dB(A) Means a sound pressure that is twenty (20) times the logarithm to the base 10 of the ratio of the pressure of sound to the reference pressure,  $2 \times 10^{-5}$  Newton/Meter<sup>2</sup>.

"Impulse noise" means a noise of short duration, usually less than one second, with an abrupt onset and rapid decay.

"Sound level" or noise level, in decibels, means the sound measured with the A - weighting and slow response by a sound level meter.

"Sound level meter" means an instrument including a microphone, an amplifier, an output meter, and frequency weighting networks for the measurement of sound levels which satisfies the pertinent requirements in American Standard Specifications for sound level meters S1.4-1971 or the most recent revision thereof.

- B. Measurement Criteria. For the purpose of enforcement of this section, noise level shall be measured on the A-weighted scale with a sound level meter satisfying at least the applicable requirement for type 1 sound-level meters as defined in American National Standard S1.4-1971 or the most recent revisions thereof. The meter shall be set for slow response speed, except that for impulse noises or rapidly varying sound levels, fast response speed may be used. prior to measurement, the meter shall be verified, and adjusted to  $\pm 0.3$  decibel by means of an acoustical calibrator.

**C. Allowable Noise Levels.**

- 1. It is unlawful for any person to create any noise which would cause the noise level measured at either the property line or the area of the property affected by the noise emission to exceed the following community noise standards:

Zone	Time	Noise Standard dB(A)
Residential	10:00 p.m.—7:00 a.m.	60
	7:00 a.m.—10:00 p.m.	70
Commercial and mixed use	10:00 p.m.—7:00 a.m.	60
	7:00 a.m.—10:00 p.m.	80

2. If the measurement location is on a boundary between two zoning districts, the lower noise standard shall apply.
- D. Special use permit.
1. Sounds emanating from any event or activity for which a special use permit has been issued by the town shall be governed by the terms of the special use permit. It is unlawful to generate loud or excessive noise in excess of any noise limitations in the special use permit.
  2. The town council may consider noise in deciding whether to grant or deny a special use permit and retains all authority to approve with conditions, or deny, special use permits as otherwise provided in this Code and town regulation.

#### 8.16.050 - Exemptions.

None of the terms or prohibitions of this chapter shall apply to or be enforced against:

- A. Any vehicle of the town while engaged upon necessary public business;
- B. Excavations or repairs of bridges, streets or highways by or on behalf of the town, at night, when the public welfare and convenience renders it impossible to perform such work during the day;
- C. Emergency vehicles on emergency trips;
- D. Building ventilation and routine property maintenance activities;
- E. Public and school property used for officially-sanctioned government activities;
- F. Town events and functions;
- G. Events with approved special use permits; and
- H. Noises from airport and vehicular transportation other than blowing horns or signal devices while vehicles are not in motion and exhaust discharge, loading, unloading or other use of vehicles as prohibited in Section 8.16.030 A., E., F., and I.

## **APPENDIX B**

# **Photographs of Measurement Locations**

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Figure B-1. Photographs of Location LT-1



Figure B-2. Photographs of Location ST-1



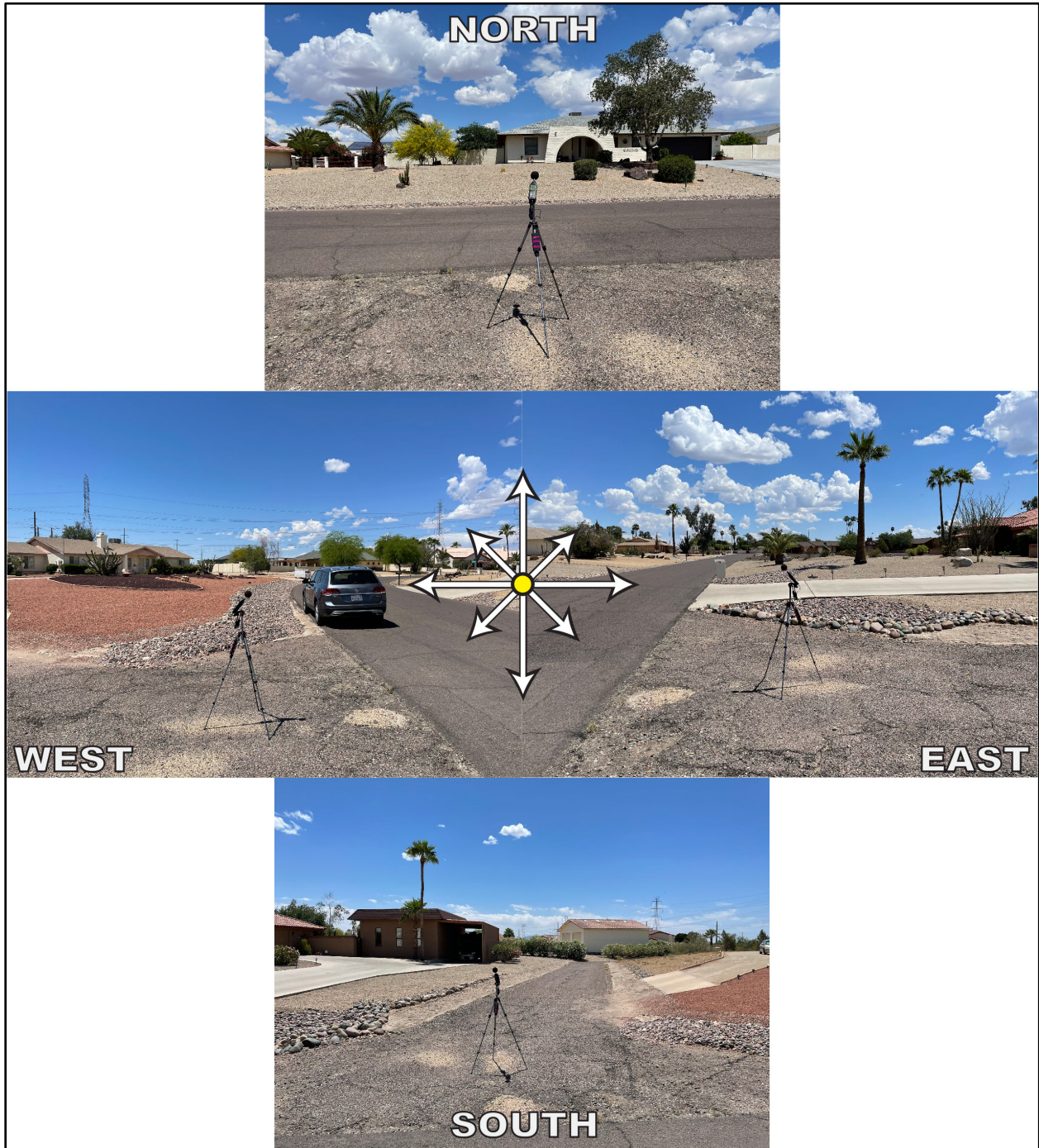


Figure B-3. Photographs of Location ST-2



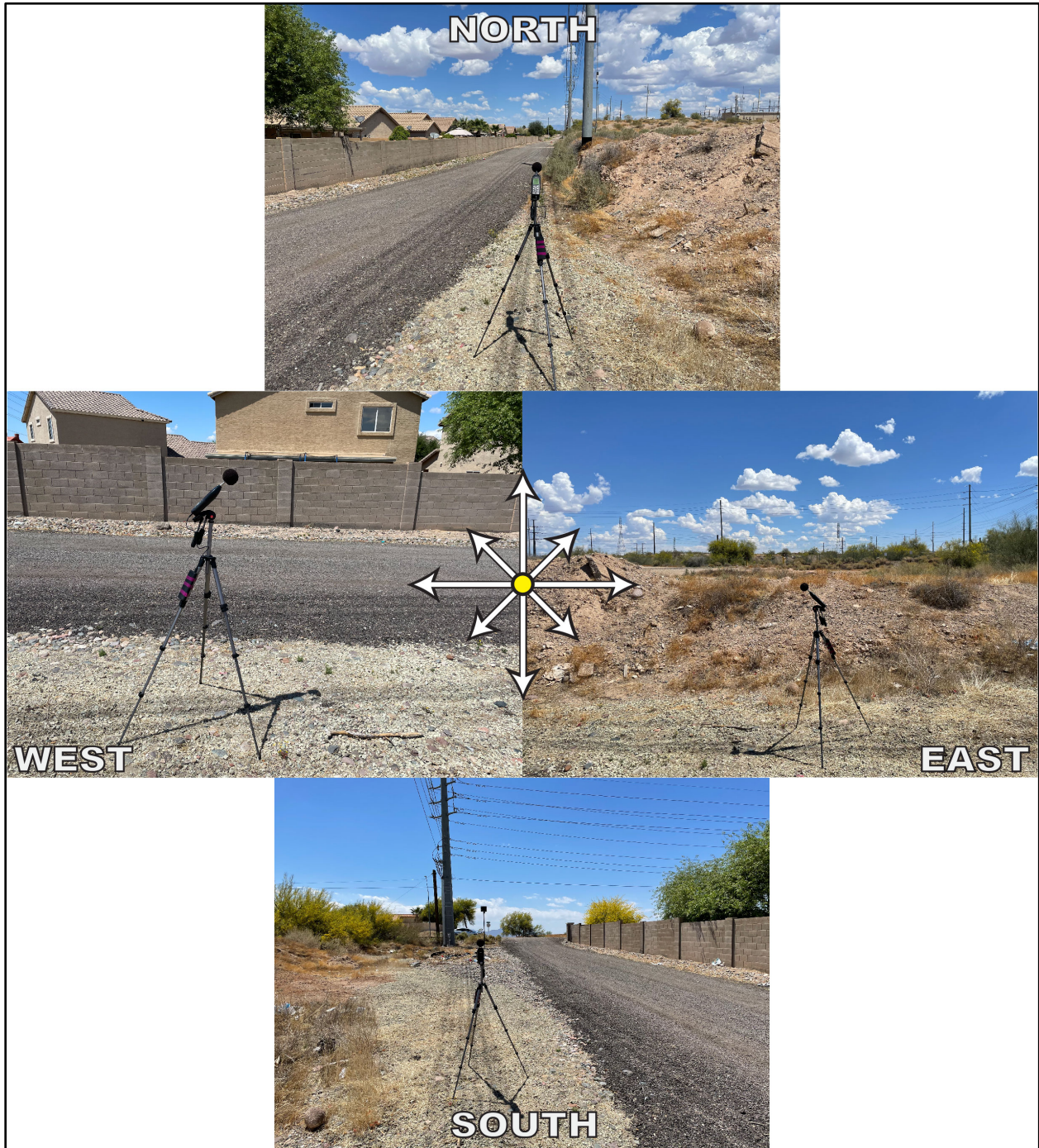


Figure B-4. Photographs of Location ST-3





Figure B-5. Photographs of Location ST-4