HANKARD ENVIRONMENTAL
ACOUSTICS AND VIBRATION CONSULTING

May 12, 2023

Robert Place
Vice President - Colorado Multifamily
Evergreen
1873 S. Bellaire Street, Suite 1200
Denver, Colorado 80222

Re: Noise Study for Proposed Powers and Grinnell Apartments in Colorado Springs, Colorado

Dear Mr. Place,

Per your request, Hankard Environmental conducted an analysis of noise for the proposed Powers and Grinnell Apartments (Project) in Colorado Springs, Colorado. The study assesses the compatibility of developing residential units at the proposed location given the presence of noise from Colorado Springs Airport and from traffic on Powers and Grinnell Boulevards. The following provides a description of the purpose of the study, applicable noise standards, noise assessment methodology, results of the noise analysis, and conclusions and recommendations.

PURPOSE

The Project is to be located on 16 acres of vacant land at the southeast corner of Powers Boulevard and Grinnell Boulevard, as shown in Figure 1. This parcel is currently zoned Agricultural (A-5) and is adjacent to existing single-family residences to the east. Evergreen is seeking to have the parcel rezoned to Residential Multi-Dwelling District (RM-30) which would allow 30 dwelling units per acre. As a part of the rezoning process, El Paso County requested an assessment of air traffic noise, as the Project is located in the Colorado Springs Airport Overlay District (OD) and the Accident Protection Zone 2 (APZ-2). El Paso County also requested a study to assess the compatibility of the Project with noise from traffic on Powers and Grinnell Boulevards.

APPLICABLE NOISE STANDARDS

Aircraft Noise

The Project is subject to the provisions of El Paso County Land Development Code (LDC) Section 4.3.1, Commercial Airport Overlay District (CAD-O) regarding air traffic noise. Section 4.3.1(E) Allowed and Special Uses summarizes the allowable uses (Table 4-7 of the LDC). The LDC allows multi-family residences (e.g., apartments) within APZ-2 provided they are located outside of the 65 dBA Day-Night (DNL) noise level contour around airport operations. Compliance with this standard is demonstrated herein by showing the Project location in relation to the APZ-2 and Colorado Springs Airport 65 dBA DNL noise level contour. Applicable portions of the LDC are attached to this report.

Roadway Noise

El Paso County LDC Section 8.4.2(B)(2)(b) Environmental Considerations for Noise Hazards for Roadway and Railroad Mitigation requires an assessment of the feasibility of providing noise reduction measures (mitigation) where traffic noise levels are predicted to exceed 67 dBA (equivalent sound level, or L_{eq}) at outdoor use areas such as patios, decks, etc. While not specified, this limit is assumed to be an hourly equivalent noise level ($L_{eq\ 1\text{-}hour}$), which is common practice on highway noise studies and the time period used by the Federal Highway Administration (FHWA) and the Colorado Department of Transportation (CDOT). Applicable portions of the LDC are attached at the end of this report.

As described herein, a software model (FHWA's Traffic Noise Model (TNM)) of noise emissions from Powers Boulevard and Grinnell Boulevard was constructed and used to predict noise levels at the proposed residential dwelling units. The LDC states that "where noise levels exceed or are predicted to exceed 67 dBA Equivalent Sound Level (L_{eq}), any or all of the following mitigation measures (in order of county preference) shall be included in the design:

- Increased building setbacks,
- Modified site orientation for buildings and outdoor areas,
- Landscape buffers or tracts,
- Noise easement,
- Soil berming, or
- Noise barrier.

Increased building setbacks and building orientation were incorporated into the Project. As described below, the initial design of the Project had the units along Powers Boulevard facing the roadway. The present design orients the units roughly perpendicular to Powers Boulevard, which cuts the noise exposure on the balconies almost in half. The buildings were also shifted south away from Powers Boulevard A landscape buffer or tract has always been part of the design, in that the Project is situated south of a tract of land owned by CDOT. With regard to soil berming and noise barriers, these mitigation measures were evaluated and found to be completely ineffective for 3rd floor balconies, given that a barrier must break the line of sight from the source to the receptor. For ground floor units along Grinnell Boulevard, and for ground and 2nd floor units along Powers Boulevard, a barrier could provide some noise reduction. For upper-level units a barrier would not meet the requirements of Section 8.4.2(B)(2)(b)(iii) of the LDC which states:

(iii) Noise Activity Covenant and Disclosure Required

In the event noise mitigation within the area subject to noise levels of 67 dBA L_{eq} would not achieve a noise level reduction of a minimum of 5 dBA L_{eq} without a noise barrier, a Noise Activity Covenant and Disclosure is required to be applied to each lot which will remain in the 67 dBA L_{eq}, either by notation on the plat or by recording a separate document.

Given this, the more prudent approach to further mitigation for the Project would be to disclose the potential noise hazard to prospective residents.

RESULTS OF AIRCRAFT NOISE ASSESSMENT

For air traffic noise, the most recent DNL noise contours and APZs for the Colorado Springs Airport (*Commercial Airport Overlay District, Master Plan Update*, July 2013 (gis.coloradosprings.gov)) was overlaid onto mapping with the proposed Project. Note that repeated calls to airport officials requesting verification that this is the latest set of contours have gone unreturned. As shown in Figure 1, the Project is located within the APZ-2 zone, in which El Paso County considers multi-family homes an allowable use. Also from Figure 1, the Project is located outside of the 65 dBA DNL contour and therefore considered compatible with the Commercial Airport Overlay District noise standards.

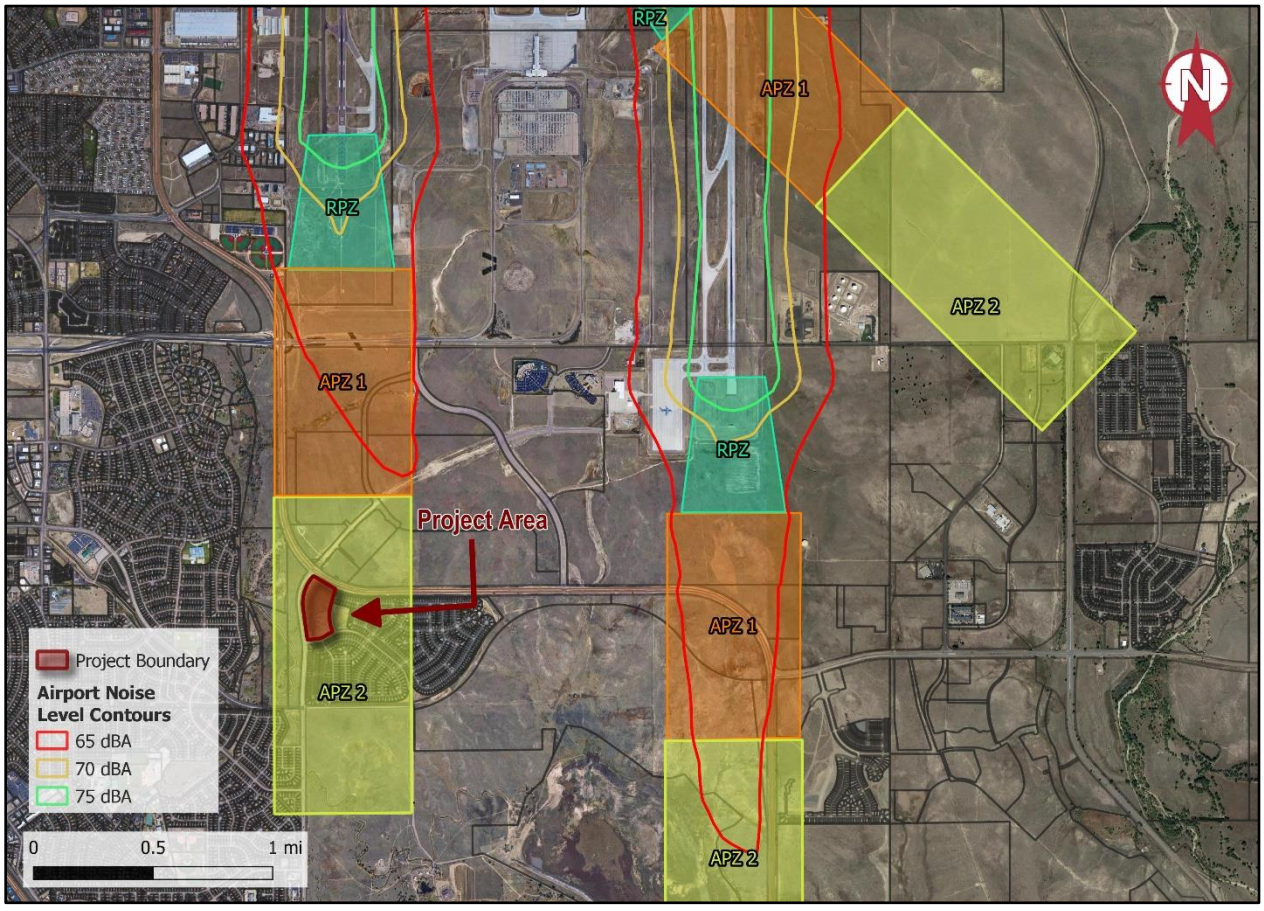


Figure 1 – Location of Project in Relation to Airport Noise Level Contours and APZ-2

RESULTS OF ROADWAY NOISE ASSESSMENT

A model of noise from traffic on Powers and Grinnell Boulevards was created with FHWA's Traffic Noise Model (TNM, v3.1). Using the model, noise levels were predicted at the exterior of

each building in locations representative of the outdoor use areas of the dwelling units (patios and decks). In accordance with the manner in which CDOT conducts roadway noise analyses, noise levels were predicted for both existing (2021) and design-year (2045) traffic and roadway conditions. The model is based on the existing roadway network and the preliminary site plan shown in Figure 3. Traffic volumes for the analysis were derived from the Project-specific traffic study (Traffic Impact Study, DHI-Waterview, Kimley Horn, March 2022). Figure 2 shows an example 3D plan view of the acoustic model. Refer to Attachment B for technical information regarding model input data, measured noise levels, and model validation.

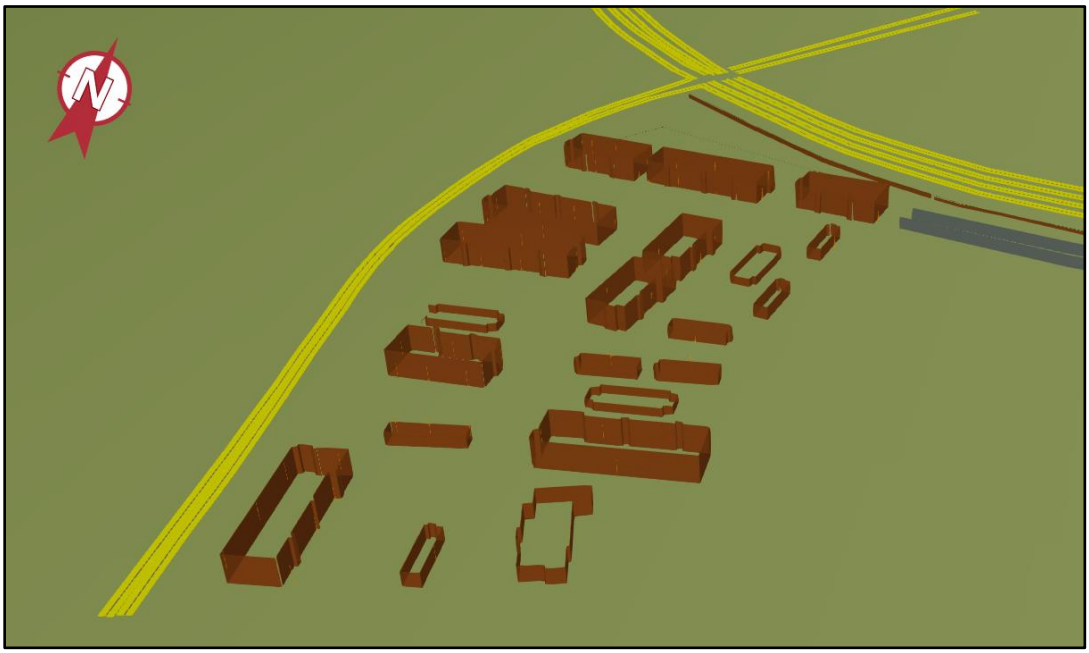


Figure 2 – Plan View of Acoustic Model

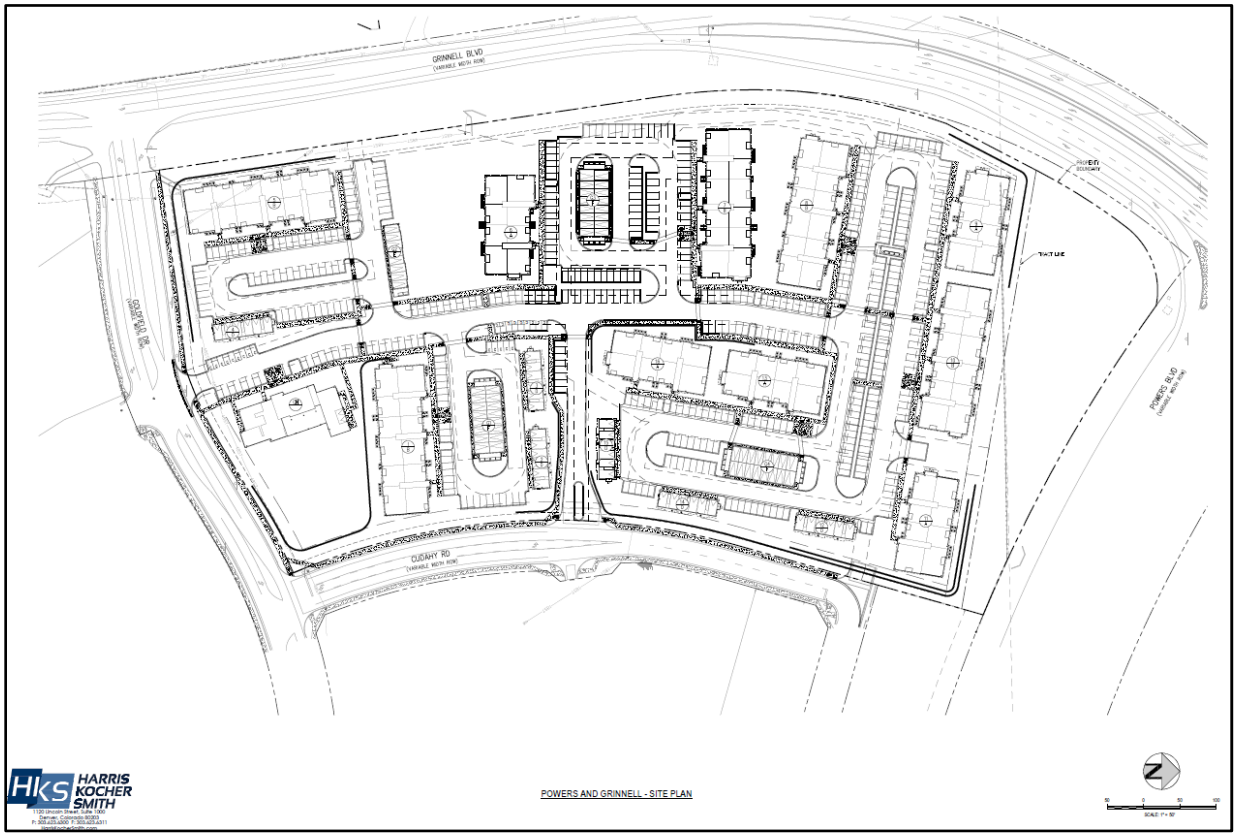


Figure 3 – Preliminary Project Site Plan

Table 1 lists the range of predicted noise levels for the dwelling units facing Powers and Grinnell Boulevards. Predicted noise levels at all receptors are listed in Attachment B. A few observations about the predicted levels are listed below:

1. The loudest levels occur on the 3rd level of the units facing Powers Boulevard. This makes sense, as these locations have direct lines of sight to the road. Some of these units have predicted noise levels in excess of 67 dBA in 2045.
2. Noise levels are predicted to be 67 dBA or less at the ground floor patios along Powers and Grinnell, in both 2021 and 2045, with levels ranging from 42 to 65 dBA.
3. Noise levels are predicted to exceed 67 dBA on upper floors along Powers Boulevard, in both 2021 and 2045, with levels ranging from 44 to 75 dBA.
4. Noise levels on upper floors along Grinnell Boulevard are within the 67 dBA limit in 2021, but will exceed the limit in 2045, with levels ranging from 43 to 68 dBA.
5. In the interior of the Project, where the outer buildings shield noise from reaching the inner buildings, predicted levels range from approximately 34 to 64 dBA in 2045.
6. An 8-foot-tall barrier was modeled to determine if at least 5 dBA of noise reduction could be achieved for ground floor patios and second floor balconies along Powers Boulevard. Refer to Table 1 for the efficacy of this. A barrier would be ineffective at upper levels.

Table 1 – Summary of Predicted Noise Levels (dBA, one-hour L_{eq})

Receptor		2021	2045	8' Tall Barrier Reduction
Along Powers	Ground Floor Patio	42 to 61	46 to 65	Approximately 5 dB
Along Powers	2nd Floor Deck	44 to 70	48 to 72	Approximately 10 dB
Along Powers	3rd Floor Deck	46 to 73	50 to 75	Approximately 0 dB
Along Grinnell	Ground Floor Patio	38 to 62	40 to 67	Approximately 10 dB
Along Grinnell	2nd Floor Deck	43 to 63	45 to 68	0 dB
Along Grinnell	3rd Floor Deck	48 to 63	50 to 68	0 dB
Interior Buildings		34 to 60	41 to 64	---
Pool		39	44	---

CONCLUSIONS AND RECOMMENDATIONS

Regarding aircraft noise, the proposed Project is located within the Colorado Springs Airport APZ-2 zone. El Paso County regulations allow for residential development within the APZ-2 zone. The Project is located outside of the 65 dBA DNL contour generated by aircraft operations at Colorado Springs Airport. Both El Paso County regulations and Colorado Springs Airport guidelines allow residential development outside the 65 dBA DNL noise contour.

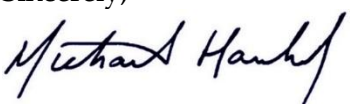
Regarding roadway noise, El Paso County's Land Development Code states that at outdoor use areas, such as patios and decks, a variety of noise mitigation should be considered for inclusion in the design of a project where noise levels are predicted to exceed 67 dBA. Feasible measures were included in the design of this Project to reduce noise, including increased setback distances from Powers Boulevard, orienting the buildings such that the buildings themselves act as a barrier, and decks that are recessed into the building further reducing lines of sight to Powers Boulevard. With these measures in place there are still patios and balconies at certain units facing Powers and Grinnell Boulevards where traffic noise levels are predicted to exceed 67 dBA in the design-year (2045), primarily those on the 2nd and 3rd stories on the sides of buildings facing Powers and Grinnell Boulevards.

Another common noise mitigation strategy is to construct a barrier, such as a solid fence, between the roads and outdoor use areas. This is the county's least preferred mitigation method. Per the county's LDC, to be considered a feasible option a proposed barrier must provide at least 5 to 10 dBA of noise reduction. For a barrier of reasonable size, such as 8 feet tall, this would not be the case for the 3rd story balconies where no noise reduction would be achieved. Some ground floor patios and 2nd story balconies could effectively be screened by such a barrier, but it is not a feasible solution for 3rd story balconies.

Alternatively, the LDC allows for disclosing the potential noise hazard by applying a Noise Activity Covenant Disclosure applied to the lot (parcel). In this case it might also be prudent to advise prospective rental tenants for units facing Powers and Grinnell Boulevards of the presence of traffic noise. Furthermore, the traffic volumes projected for 2045 may or may not be realized, and if they are the Level of Service will be D or less, which results in slowing of traffic and a decrease in noise levels.

Thank you for commissioning Hankard Environmental to conduct this analysis.

Sincerely,



Michael Hankard, Full Member of INCE and ASA
Principal Acoustical Consultant

ATTACHMENT A

Applicable Sections of the El Paso County Land Use Development Code

ATTACHMENT B
Noise Modeling Details

The following describes the data and methods used to predict traffic noise levels on this Project.

Model: FHWA's Traffic Noise Model (TNM), version 3.1. General model settings included "lawn" as the default ground type, 68 degrees Fahrenheit, and 50% relative humidity.

Roadway Locations: The location of Powers and Grinnell Boulevards was obtained using aerial photography and elevations were estimated based on contours provided by the Project. According to the Project's traffic study there is potential for future improvements to both roads, but no specifics are known at this point. Therefore, all future widening was assumed to occur about the centerlines of the roads, such that the model assumes that future traffic is in the same location as existing traffic.

Traffic Volumes: Traffic volumes for the analysis were derived from the Project-specific traffic study (Traffic Impact Study, DHI-Waterview, Kimley Horn, March 2022). Specifically, existing conditions (2021) peak-hour traffic volumes on Powers Boulevard and Grinnell Boulevard were estimated from the data in that report's Figure 5, Key Intersection 1, weekday morning. Medium and heavy truck percentages were taken from CDOT Online Transportation Information System (Route 021A, 4.0% medium trucks, 2.3% heavy trucks). The future 2045 peak-hour volumes are highest in the morning versus the evening, the morning Level of Service (LOS) is F, which results in stop-and-go traffic. LOS of C or D is considered the loudest hour, because a relatively high volume of traffic is flowing at posted speeds. Despite this, for this Project the morning traffic volumes were used to calculate the loudest hour noise levels, as they were lower than evening volumes for eastbound Powers which is the closest road segment. Table 2 summarizes the traffic data used in the TNM analysis.

Traffic Speeds: The posted speed on Powers Boulevard is 65 mph eastbound and 60 mph westbound. The limit on Grinnell Boulevard is 40 mph. During the measurements it was observed that actual speeds in the area are lower than this due to the signalized intersection. Based on observations the speeds used in the model were 55 mph for the right lane of Powers and 60 mph for the left in both directions of travel, and 35 mph for Grinnell Boulevard.

Receptors: The location of each receptor point included in the model is shown in Figure 5, below. Points were located to represent specific dwelling units in each building located along Powers and Grinnell Boulevards. Only one point was modeled to represent each building on the interior of the site, and one for the pool. Predictions at dwelling unit locations were made at each point for three different elevations (5 feet above ground to represent patios, 15 feet above ground to represent 2nd floor balconies, and 25 feet above the ground to represent 3rd floor balconies).

Terrain: The Project is located lower in elevation than Powers Boulevard, more so to the east. The edge of the Powers Boulevard shoulder was modeled as a terrain line as shown in Figure 2.

Barriers: Each of the proposed buildings was modeled as a barrier in TNM. The height of the buildings and floors was taken from Project plans. The 2nd and 3rd floor decks were modeled as being inset slightly into the sides of the buildings consistent with the design of the Project.

Table 2 – Traffic Volumes Used in Noise Analysis

Roadway	Year	Autos	Med. Trucks	Hvy. Trucks	Buses	Motorcycles
Powers:						
Eastbound E of intersection	**2021**	839	13	2	2	9
HV total count = 91(47)	**2045**	1347	21	3	3	14
HV % = 2.4(1.6)		97	1.5	0.25	0.25	1
Eastbound W of intersection	**2021**	1146	18	3	3	12
HV total count = 91(47)	**2045**	1714	27	4	4	18
HV % = 2.4(1.6)		97	1.5	0.25	0.25	1
Westbound E of intersection	**2021**	926	14	2	2	10
HV total count = 61(43)	**2045**	1405	22	4	4	14
HV % = 2.2(2.1)		97	1.5	0.25	0.25	1
Westbound W of intersection	**2021**	1205	19	3	3	12
HV total count = 61(43)	**2045**	2377	37	6	6	25
HV % = 2.2(2.1)		97	1.5	0.25	0.25	1
Grinnell:						
Northbound N of intersection	**2021**	361	6	1	1	4
HV total count = 38(16)	**2045**	1330	21	3	3	14
HV % = 1.8(1.7)		97	1.5	0.25	0.25	1
Northbound S of intersection	**2021**	531	8	1	1	5
HV total count = 38(16)	**2045**	2016	31	5	5	21
HV % = 1.8(1.7)		97	1.5	0.25	0.25	1
Southbound N of intersection	**2021**	109	2	0	0	1
HV total count = 10(11)	**2045**	825	13	2	2	9
HV % = 3.6(1.6)		97	1.5	0.25	0.25	1
Southbound S of intersection	**2021**	307	5	1	1	3
HV total count = 10(11)	**2045**	906	14	2	2	9
HV % = 3.6(1.6)		97	1.5	0.25	0.25	1

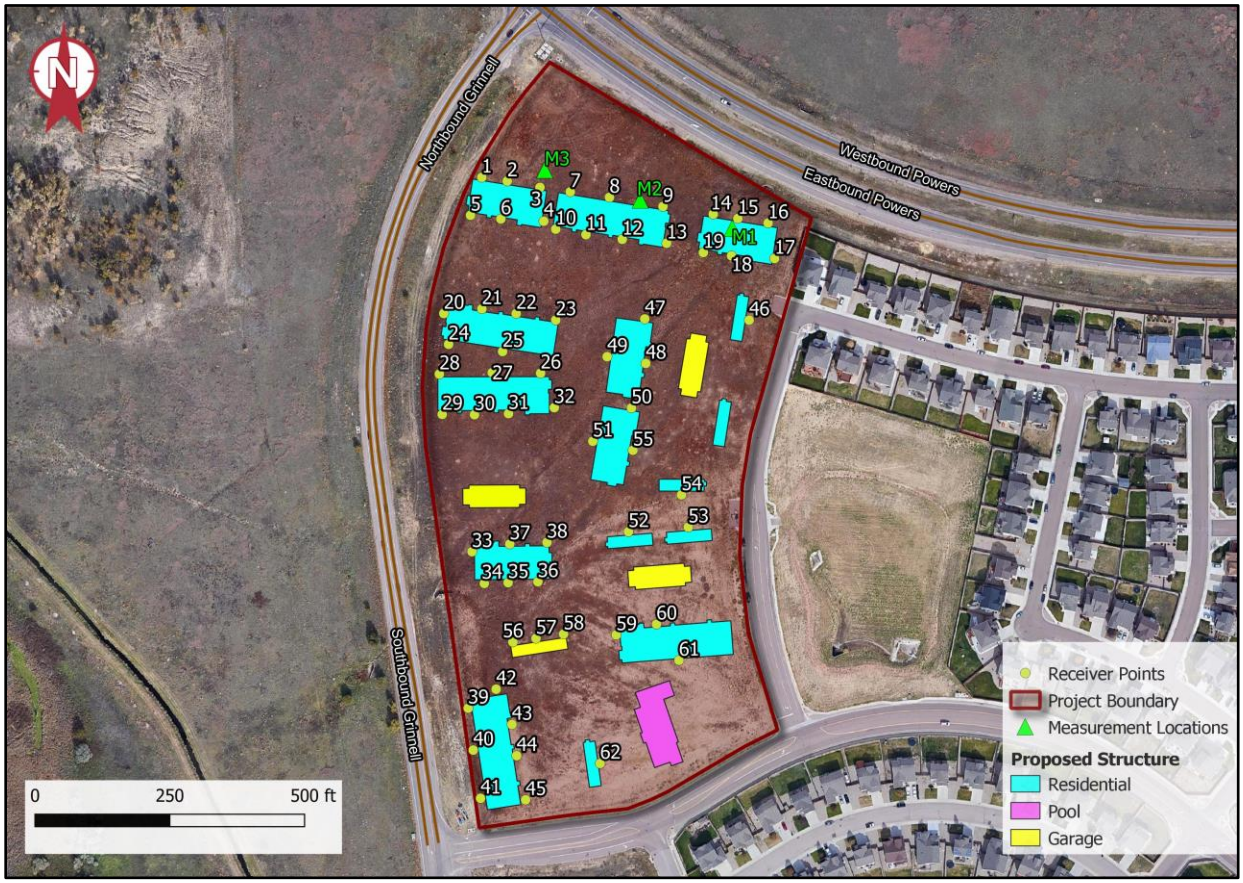


Figure 5 – Preliminary Project Site Plan

Noise Level Measurements: Noise level measurements were taken at three locations south of Powers Boulevard at distances representative of the closest buildings to Powers Boulevard, as shown in Figure 5. A sound level meter was placed on a tripod at each location and run continuously for approximately 30 minutes recording the overall noise level (L_{eq}). Pictures of one measurement setup is shown in Figure 6. Noise levels were measured using a Larson Davis Model LxT sound level meter with associated preamplifiers and a ½ inch free-field precision microphone, which meets ANSI Type 1 specifications. All measurement and field calibration equipment were certified by a traceable laboratory within the 18 months prior to the measurement. Calibration certificates and records are available upon request. The microphone was covered with a hydrophobically treated 7-inch diameter, 80-pores-per-inch density windscreen (ACO Pacific Model WS7-80T). Table 3 shows the measured noise levels.

Figure 6 – Photo of Noise Measurement Equipment

Table 3 – Measurement Results (dBA, L_{eq})

Measurement Location		Measured
Along Powers	M1	57.2
Along Powers	M2	57.6
Along Powers	M3	58.1

Noise Level Results: Table 4, below, lists the predicted noise levels at each location for 2021 and 2045.

Table 4 – Predicted Noise Levels (dBA, L_{eq})

Receptor	2021 L_{eq} dBA			2045 L_{eq} dBA		
	1st Floor	2nd Floor	3rd Floor	1st Floor	2nd Floor	3rd Floor
1	59	65	67	65	70	72
2	58	63	67	64	69	72
3	57	62	66	64	68	72
4	47	49	53	54	57	63
5	60	61	60	65	67	66
6	54	56	56	59	61	61
7	57	61	66	63	68	72
8	56	60	66	63	69	73
9	55	59	66	62	70	73
10	49	52	52	54	57	57
11	48	50	51	53	55	56
12	46	48	49	51	53	54
13	49	52	58	58	64	67
14	56	60	70	62	72	74
15	56	61	71	61	72	75
16	55	62	72	60	72	75
17	55	65	68	59	69	72
18	42	44	45	46	48	50
19	43	45	47	47	50	52
20	61	63	63	66	68	68
21	55	59	60	60	63	64
22	53	56	58	58	61	62
23	51	55	58	56	59	61
24	58	59	58	64	65	64
25	49	52	52	55	57	57
26	47	49	50	53	55	56
27	51	53	53	56	58	59
28	61	62	62	66	67	66
29	59	59	59	64	65	64
30	54	56	56	60	62	62
31	51	53	54	56	59	59
32	37	39	41	43	46	50
33	58	60	59	64	65	65

Receptor	2021 L_{eq} dBA			2045 L_{eq} dBA		
	1st Floor	2nd Floor	3rd Floor	1st Floor	2nd Floor	3rd Floor
34	56	57	57	61	62	62
35	53	55	55	59	61	61
36	51	53	53	56	59	59
37	49	51	54	54	57	59
38	47	49	51	52	54	56
39	62	61	60	67	67	66
40	62	61	60	67	66	65
41	61	60	59	66	66	64
42	56	58	58	61	63	63
43	33	37	44	36	39	46
44	34	35	40	36	38	42
45	33	39	44	35	41	46
46	52	60	64	55	63	67
47	50	53	60	55	58	64
48	44	49	58	48	52	60
49	44	46	48	50	52	53
50	39	54	58	41	56	60
51	46	48	49	51	53	54
52	48	51	53	52	56	58
53	51	56	57	54	58	60
54	42	45	58	46	49	61
55	46	52	58	48	54	60
56	55	58	58	61	63	63
57	51	54	56	57	59	61
58	49	53	55	55	58	59
59	46	48	49	51	54	56
60	49	54	55	52	56	58
61	39	41	43	44	46	48
62	34	38	50	37	41	54