Appendix J: Noise Technical Report

TRAFFIC NOISE TECHNICAL REPORT

County Line Road Added Travel Lanes

Des. Number: 2002553

Johnson and Marion Counties, Indiana

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EXECUTIVE SUMMARY

This report evaluates the potential noise impacts of the proposed improvements within the County Line Road Added Travel Lanes (Des. 2002553) study area in conformance with corresponding Federal regulations and guidance, and the National Environmental Policy Act (NEPA). The noise analysis presents the existing and future acoustical environment along the project corridor.

Existing noise level measurements were conducted on November 5, 2020 at five representative sites in the project corridor. Sites were selected based on distribution throughout the project corridor. A 20-minute measurement was taken at each site. The measurements were made in accordance with Federal Highway Administration (FHWA) and Indiana Department of Transportation (INDOT) guidelines using a Larson Davis LXT integrating sound level analyzer meeting American National Standards Institute (ANSI) and International Electrotechnical Commission (IEC) Type 1 specifications. Traffic counts were taken concurrently with the noise measurements.

The latest version of the FHWA's Traffic Noise Model, TNM®2.5[1] (TNM), was used to model existing (2020) and design year (2045) worst hourly traffic noise levels within the County Line Road Added Travel Lanes project study area. Three hundred forty-three (343) noise receivers representing 509 receptors were modeled in the Existing, No Build, and Build conditions. The study area includes receivers located within 500 feet from the roadway. Receivers consist of residences, a church, two noise-sensitive commercial land uses, and an assisted living facility, as well as non-sensitive commercial land uses.

Existing exterior peak hour (2020) noise levels range from 45.7 to 64.6 dBA L_{eq}(1h). Residential noise levels ranged from 45.7 to 64.6 dBA L_{eq}(1h).

No noise sensitive receptors are anticipated to be impacted by approaching or exceeding the Noise Abatement Criteria (NAC) as a result of the proposed project. The exterior noise levels under the Build Alternative would range from 50.8 to 67.1 dBA L_{eq}(1h). Noise levels at residential receivers would range from 50.8 to 65.9 dBA L_{eq}(1h).

The change in predicted future noise levels over existing noise levels ranged from 2.2 to 6.7 dBA. Therefore, none of the predicted future noise levels would substantially exceed existing noise levels.

No impacts were identified in the study area; therefore, noise abatement was not evaluated.

[1] M.C. Lau, C.S.Y. Lee, J.L. Rochat, E.R. Boeker, and G.C. Fleming. FHWA Traffic Noise Model® Users Guide (Version 2.5 Addendum). Federal Highway Administration, April 2004

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1.0 INTRODUCTION

The City of Indianapolis is planning to proceed with an added travel lanes project on County Line Road in Marion and Johnson Counties. The project is located on County Line Road approximately 500 feet east of State Route (SR) 37 and 950 feet west of S Meridian Street (SR 135). Project activities will include construction of two additional travel lanes, a new two-way left turn lane, a 10-foot multi-purpose path on the north side, and a 6-foot sidewalk on the south side. The final cross section will be 5 total lanes when constructed.

The County Line Road Added Travel Lanes project study area consists of residential (Category B), institutional (Category C), and non-sensitive commercial (Category F) land uses. The proposed project area is located within Johnson and Marion Counties, Indiana.

The project location is shown on Figure 1.

"Highway Traffic Noise Policy and Guidance," was issued in July 2010 (revised January 2011) by the Federal Highway Administration (FHWA). Pursuant to 23 CFR 772, a Type I project is:

(1) The construction of a highway on new location; or,
(2) The physical alteration of an existing highway where there is either:
    (i) Substantial Horizontal Alteration. A project that halves the distance between the traffic noise source and the closest receptor between the existing condition to the future build condition; or,
    (ii) Substantial Vertical Alteration. A project that removes shielding therefore exposing the line-of-sight between the receptor and the traffic noise source. This is done by either altering the vertical alignment of the highway or by altering the topography between the highway traffic noise source and the receptor; or,
(3) The addition of a through-traffic lane(s). This includes the addition of a through-traffic lane that functions as a (high occupancy vehicle (HOV) lane, High-Occupancy Toll (HOT) lane, bus lane, or truck climbing lane; or,
(4) The addition of an auxiliary lane, except for when the auxiliary lane is a turn lane; or,
(5) The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange; or,
(6) restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane, except for when the auxiliary lane is a turn lane; or,
(7) The addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot or toll plaza.

The proposed County Line Road Added Travel Lanes project will include the addition of through traffic lanes and, therefore, it will be classified as a Type I project.

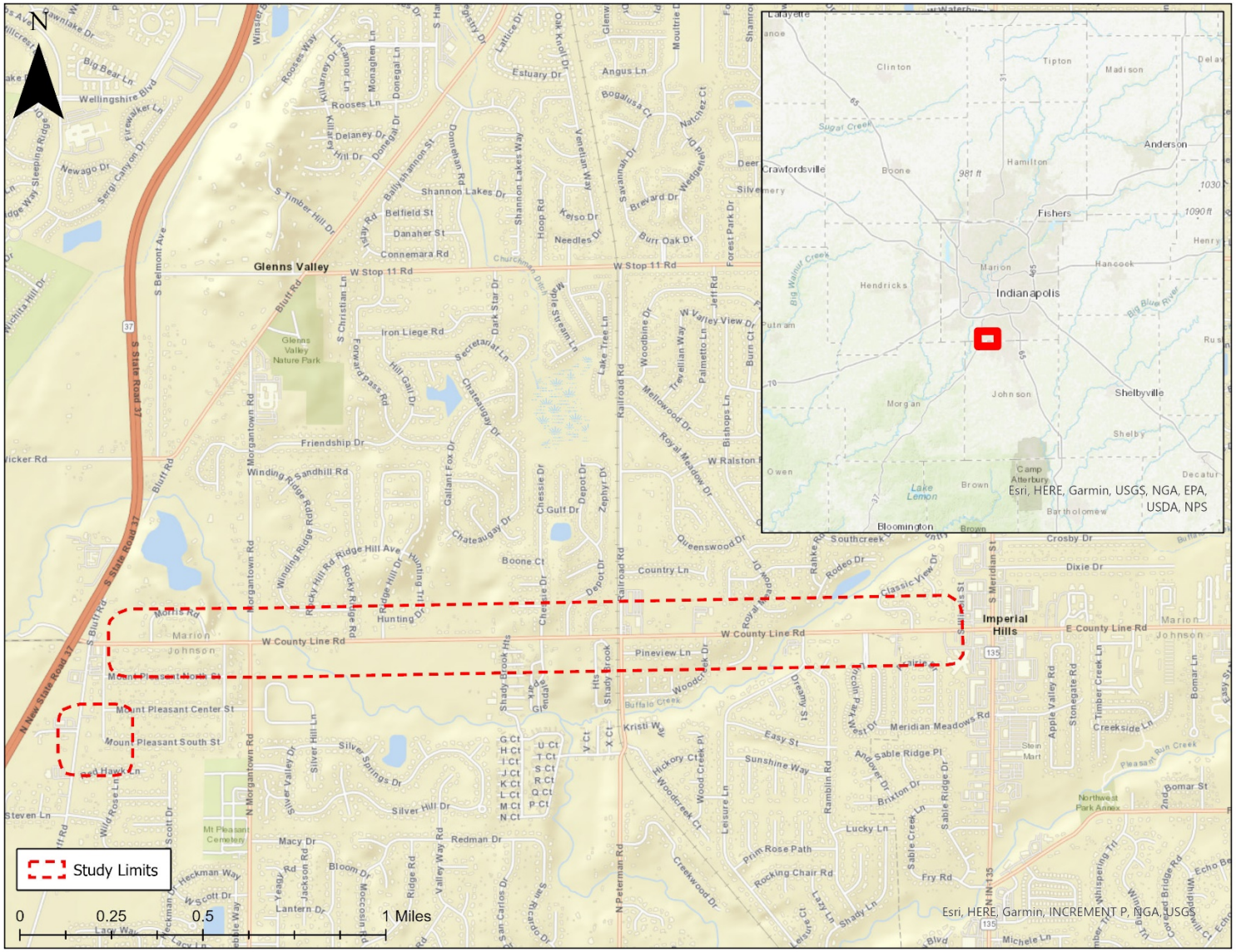


Figure 1. Project Location

2.0 NOISE ANALYSIS OVERVIEW

This report evaluates the potential noise impacts of the proposed improvements identified as part of the preferred alternative for the County Line Road Added Travel Lanes project. The analysis documented within this report, including the determination of noise abatement measures and their potential locations, is in compliance with the FHWA Procedures for Abatement of Highway Traffic Noise and Construction Noise as presented in the Code of Federal Regulations, Title 23 Part 772 (23 CFR 772) and the "Traffic Noise Analysis Procedure 2017" developed by the Indiana Department of Transportation (INDOT 2017). The noise analysis presents the existing and future acoustical environment at various receptors located within the study area.

Basic Noise Information

Noise is defined as unwanted and disruptive sound. Airborne sound occurs by a rapid fluctuation of air pressure above and below atmospheric pressure. The ear is sensitive to this pressure variation and perceives it as sound. The intensity of these pressure variations causes the ear to discern different levels of loudness. These pressure differences are most commonly measured in decibels (dB).

The dB is the unit of measurement for sound. The decibel scale audible to humans spans approximately 140 dB. A level of zero dB corresponds to the lower limit of audibility, while 140 dB produces a sensation more akin to pain than sound. The dB scale is a logarithmic representation of the actual sound pressure variations. Therefore, a 26 percent change in the energy level only changes the sound level one-dB. The human ear would not detect this change except in an acoustical laboratory. A doubling of the energy level would result in a three-dB increase, which would be barely perceptible in the natural environment. A tripling in energy sound level would result in a clearly noticeable change of five-dB in the sound level. A change of ten times the energy level would result in a ten-dB change in the sound level. This would be perceived as a doubling (or halving) of the apparent loudness.

The human ear has a non-linear sensitivity to noise. To account for this in noise measurements, electronic weighting scales are used to define the relative loudness of different frequencies. The "A" weighting scale is widely used in environmental work because it closely resembles the non-linearity of human hearing. Therefore, the unit of measurement for an A-weighted noise level is dBA.

Traffic noise is not constant. It varies as each vehicle passes through a certain location. The time-varying characteristics of environmental noise are analyzed statistically to determine the duration and intensity of noise exposure. In an urban environment, noise is made up of two distinct parts. One is ambient or background noise. Wind noise and distant traffic noise make up the acoustical environment surrounding the project. These sounds are not readily recognized but combine to produce a non-irritating ambient sound level. This background sound level varies throughout the day, being lowest at night and highest during the day. The other component of urban noise is intermittent and louder than the background noise. Nearby transportation noise and local industrial noise are examples of this type of noise. It is for these reasons that environmental noise is analyzed statistically.

The statistical descriptor used for traffic noise is L_{eq}. L_{eq} is the constant, average sound level, which over a period of time contains the same amount of sound energy as the varying levels of the traffic noise. The L_{eq} correlates reasonably well with the effects of noise on people. It is also

easily measurable with integrating sound level meters. The time period for traffic noise is 1-hour. Therefore, the unit of measure for traffic noise is L_{eq}(1h) dBA.

Highway noise sources have been divided into five types of vehicles; automobiles, medium trucks, heavy trucks, buses and motorcycles. Each vehicle type is defined as follows[2]:

- Automobiles – all vehicles with two axles and four tires, includes passenger vehicles and light trucks, less than 10,000 pounds.
- Medium trucks – all vehicles having two axles and six tires, vehicle weight between 10,000 and 26,000 pounds.
- Heavy trucks – all vehicles having three or more axles, vehicle weight greater than 26,000 pounds.
- Buses – all vehicles designed to carry more than nine passengers.
- Motorcycles – all vehicles with two or three tires and an open-air driver/passenger compartment.

Noise levels produced by highway vehicles can be attributed to three major categories:

- Running gear and accessories (tires, drive train, fan and other auxiliary equipment)
- Engine (intake and exhaust noise, radiation from engine casing)
- Aerodynamic and body noise

Tire sound levels increase with vehicle speed but also depend upon road surface, vehicle weight, tread design and wear. Change in any of these can vary noise levels. At lower speeds, especially in trucks and buses, the dominant noise source is the engine and related accessories.

Noise Model and Analysis

FHWA's Procedures for Abatement of Highway Traffic Noise and Construction Noise is presented in the Code of Federal Regulations, Title 23 Part 772 (23 CFR 772). This regulation, plus the *INDOT Traffic Noise Analysis Procedure* (INDOT Noise Policy), set forth the process for performing a traffic noise analysis. The process includes the following:

- Identify existing and proposed land uses in the study area;
- Determine existing noise levels:
    - through modeling, and
    - noise measurements with concurrent classification counts of vehicles passing the noise monitoring site;
- Validate predicted noise levels through comparison between measured and predicted levels;
- Model future design year traffic noise levels which will yield the worst hourly traffic noise on a regular basis (design hour noise levels);
- Identify locations that would be exposed to a noise impact based upon the Noise Abatement Criteria (NAC) as presented in Table 1;
- If traffic noise impacts are identified, evaluate noise abatement for the impacts; and
- Modeling must be performed with an approved version of FHWA's TNM. TNM 2.5 is the current approved version per 2017 INDOT Noise Policy.

[2] G.S. Anderson, C.S.Y. Lee, G.G. Fleming and C. Menge, "FHWA Traffic Noise Model®, Version 1.0 User's Guide", Federal Highway Administration, January 1998, p.60.

INDOT's Noise Policy is the state's policy for implementing 23 CFR 772. The NAC, which is presented in 23 CFR 772, establishes the noise abatement criteria for various land uses. The noise level descriptor used is the equivalent sound level, L_{eq}, defined as the steady state sound level which, in a stated time period (usually one hour), contains the same sound energy as the actual time-varying sound.

Noise abatement measures will be considered when the predicted noise levels approach or exceed those values shown for the appropriate activity category in Table 1, or when the predicted traffic noise levels substantially exceed the existing noise levels. INDOT has defined the approach value to be within 1.0 dBA of the appropriate NAC[3] as shown in Table 1. INDOT has defined an increase in noise levels for which the future noise levels exceed the existing noise by 15.0 dBA as substantial.

TNM is FHWA's "computer program for highway traffic noise prediction and analysis."[4] The following parameters are used in this model to calculate an hourly L_{eq}(1h) at a specific receiver location:

- Distance between roadway and receiver;
- Relative elevations of roadway and receiver;
- Hourly traffic volume in light-duty (two axles, four tires), medium-duty (two axles, six tires), and heavy-duty (three or more axles) vehicles;
- Vehicle speed;
- Ground absorption; and
- Topographic features, including retaining walls and berms.

The County Line Road Added Travel Lanes project study area consists of residential (NAC Category B), noise-sensitive commercial (NAC Category E), institutional (NAC Category C), and non-sensitive land uses (NAC Category F). The criteria stated in Table 1 will help to determine if the proposed project will produce noise levels that approach or exceed the NAC throughout the corridor.

[3] "Traffic Noise Analysis Procedure", Indiana Department of Transportation, 2017, Page 3 of 11.
[4] "FHWA Traffic Noise Model®, Version 1.0 Users Guide", Report Documentation Page.

Table 1: Noise Abatement Criteria (NAC)
Hourly A-Weighted Sound Level-Decibels (dBA)

Activity Category	Activity Criteria L_{eq}(1h)	Evaluation Location	Activity Description
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67	Exterior	Residential
C	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, daycare centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	N/A	N/A	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	N/A	N/A	Undeveloped lands that are not permitted.

Source: Federal Highway Administration (23 CFR Part 772, Table 1).

3.0 NOISE MEASUREMENTS

Existing noise level measurements were conducted on November 5, 2020 at five representative sites in the project corridor. Sites were selected based on distribution throughout the project corridor. A 20-minute measurement was taken at each site. The measurements were made in accordance with FHWA and INDOT guidelines using a Larson Davis LXT integrating sound level analyzer meeting ANSI and IEC Type 1 specifications. Traffic classification counts were taken concurrently with the noise measurements. The data collected at the five sites is presented in Table 2. The noise measurement sites, FM1 through FM5, are shown on Figure 2 in Appendix A. The field data sheets are presented in Appendix B and the sound level analyzer laboratory calibration certificates are presented in Appendix C of this report.

Table 2: Measured Existing Noise Levels
County Line Road Added Travel Lanes Project
Johnson and Marion Counties, Indiana

Field Site #	Figure #	Site Description	Date	Start Time	Duration	Traffic[2]							Noise Level, dBA L_{eq}(1h)
						Roadway	A[a]	MT[b]	HT[c]	MC[d]	Buses[e]	Speed mph	
FM1	A1	Morris Road, north of County Line Road	11/5/2020	9:30 am	20:00	CLR EB	249	21	6	0	0	34	52.3
						CLR WB	162	18	6	0	0	34	
FM2	A2	Rocky Ridge Road, north of County Line Road	11/5/2020	10:12 am	20:00	CLR EB	261	27	9	0	0	34	61.9
						CLR WB	174	15	9	0	0	34	
FM3	A2	East of Shady Brooks Heights, south of County Line Road	11/5/2020	12:35 pm	20:00	CLR EB	285	30	9	0	0	34	58.2
						CLR WB	297	18	6	0	0	34	
FM4	A3	Grace Baptist Church, north of County Line Road	11/5/2020	11:53 am	20:00	CLR EB	324	39	0	3	3	34	58.5
						CLR WB	348	45	12	0	0	34	
FM5	A4	West of Lincoln Park Boulevard, south of County Line Road	11/5/2020	11:21 am	20:00	CLR EB	384	24	9	0	3	34	56.4
						CLR WB	453	48	6	0	0	34	

1) Vehicle counts classified as follows:
   a. Autos (A) defined as vehicles with 2-axles and 4-tires.
   b. Medium trucks (MT) defined as vehicles with 2-axles and 6-tires.
   c. Heavy trucks (HT) defined as vehicles with 3 or more axles.
   d. Motorcycle (MC) defined as vehicles with two or three-wheeled motorized vehicles.
   e. Buses defined as vehicles carrying more than 9 passengers.
2) Traffic counts are prorated from a 20 minute duration to a 60 minute duration for model validation (L_{eq}(1h))

Source: HNTB Corporation, November 2020

Measured vs. Modeled

TNM was used to validate the predicted noise levels through comparison with the measured and predicted noise levels. During the field measurements the skies were mostly cloudy, the temperatures ranged from 55 to 67 degrees Fahrenheit and the winds were from the south southwest at 8 to 11 miles per hour (mph). The traffic data from these five sites were used in the model. Results for the five field sites modeled were within 3 dBA of the measured levels. Since all of the field measurements were within 3 dBA of the predicted value, the noise model is considered valid.

Table 3: Comparison of Measured and Modeled Noise Levels
County Line Road Added Travel Lanes Project
Johnson and Marion Counties, Indiana

Field Site	Figure #	Noise Level, dBA L_{eq}(1h)		Difference in Noise Level, dBA L_{eq}(1h) (Modeled Minus Measured)
		Measured	Modeled	
FM1	A1	52.3	54.4	-2.1
FM2	A2	61.9	59.4	2.5
FM3	A2	58.2	56.7	1.5
FM4	A3	58.5	60.8	-2.3
FM5	A4	56.4	55.6	0.8

Source: HNTB Corporation, November 2020

4.0 NOISE MODELING

The latest version of TNM was used to model existing (2020) and design year (2045) worst hourly traffic noise levels within the County Line Road Added Travel Lanes study area. Consistent with 2017 INDOT Noise Policy, three hundred forty-three (343) noise receivers representing the 509 receptors within 500 feet of the edge of the outside travel lane of the project were modeled in the Existing, No Build, and Build conditions. Because no impacts were identified at the edge of the 500-foot buffer, the study area was not extended to the maximum of 800 feet.

The results of the computer modeling are presented in Table 4.

The Grace Baptist Church is located at 740 W. County Line Road, on the north side of County Line Road (R204). Through coordination and service schedule, it was estimated that Grace Baptist Church has capacity for approximately 150 regular attendees on Sunday and Wednesday. Based on the occupation of this building approximately 2 days per week for 12 months of the year, the average daily usage was estimated to be 43 people. The following algorithm was used to calculate the appropriate number of receptors per receiver: (43 visitors per day/2.52 average people per household) X (90% of the property within the study area) = 16 receptors. These receptors were modeled at the front of the building.

The Carefree Club is a recreational facility for residents of the Carefree Subdivision located at 1202 Leisure Lane, on the south side of County Line Road (R241). Based on coordination and the number of properties in the north and south sections of the subdivision, the estimated membership size of 535 people was distributed across 7 days per week for 9 months of the year, and the average daily usage was estimated to be 58 people. The following algorithm was used to calculate the appropriate number of receptors per receiver: (58 visitors per day/2.52 average people per household) X (90% of the property within the study area) = 21 receptors. These receptors were distributed across identified exterior land uses on the property.

Greenwood Meadows is a nursing home located on 1200 N State Road 135, on the south side of County Line Road (R292). Based on a resident and staff capacity of approximately 135 people, the equivalent number of receptors were used. These receptors were modeled at an outdoor common area nearest to the traffic noise source (County Line Road).

5.0 IMPACT ASSESSMENT

Existing exterior peak hour (2020) noise levels range from 45.7 to 64.6 dBA L_{eq}(1h). Residential noise levels ranged from 45.7 to 64.6 dBA L_{eq}(1h).

No noise sensitive receptors are anticipated to be impacted by approaching or exceeding the Noise Abatement Criteria (NAC) as a result of the proposed project. The exterior noise levels under the Build Alternative would range from 50.8 to 67.1 dBA L_{eq}(1h). Noise levels at residential receivers would range from 50.8 to 65.9 dBA L_{eq}(1h).

The change in predicted future noise levels over existing noise levels ranged from 2.2 to 6.7 dBA. Therefore, none of the predicted future noise levels would substantially exceed existing noise levels.

While primary consideration is given to exterior areas where frequent human use occurs, for certain NAC Category C land uses where no frequent exterior use activities are identified, the potential for interior impacts are evaluated (NAC Category D). One receiver (R204), Grace Baptist Church, was evaluated under NAC Category D. To accomplish this, a reduction factor based on the building type is applied to the modeled exterior result. For Grace Baptist Church, the building type was considered light frame construction with closed, ordinary sash windows. Based on a 20 dB reduction to the exterior noise levels, R204 would not be impacted under NAC Category D.

Table 4: Build Noise Reduction Factors
County Line Road Added Travel Lanes
Johnson and Marion Counties, Indiana

Building Type	Window Condition	Reduction
All	Open*	10 dB
Light Frame	Ordinary Sash (closed)	20 dB
	Storm Windows	25 dB
Masonry	Single Glazed	25 dB
	Double Glazed	35 dB
Source: FHWA's Highway Traffic Noise Analysis and Abatement: Policy and Guidance		

Table 5: Design Hour Noise Levels, dBA L_{eq}(1h)
County Line Road Added Travel Lanes
Johnson and Marion Counties, Indiana

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) L_{eq}(1h)**	Receptors	Existing L_{eq}(1h)	Future L_{eq}(1h)	Increase (Future - Existing)	Impact
R1	Single-Family Residential	B	67	1	58.6	63.1	4.5	No
R2	Single-Family Residential	B	67	1	54.4	57.7	3.3	No
R3	Single-Family Residential	B	67	1	53.9	57.1	3.2	No
R4	Single-Family Residential	B	67	1	58.3	62.6	4.3	No
R5	Single-Family Residential	B	67	1	58.4	62.6	4.2	No
R6	Single-Family Residential	B	67	1	56.7	59.8	3.1	No
R7	Single-Family Residential	B	67	1	54.1	56.8	2.7	No
R8	Single-Family Residential	B	67	1	58.9	63.1	4.2	No
R9	Single-Family Residential	B	67	1	57.9	62.2	4.3	No
R10	Single-Family Residential	B	67	1	56.7	59.7	3.0	No
R11	Single-Family Residential	B	67	1	54.2	57.1	2.9	No
R12	Single-Family Residential	B	67	1	58.4	62.1	3.7	No
R13	Single-Family Residential	B	67	1	57.8	62.1	4.3	No
R14	Single-Family Residential	B	67	1	56.2	59.4	3.2	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)$**	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R15	Single-Family Residential	B	67	1	57.3	61.7	4.4	No
R16	Single-Family Residential	B	67	1	53.6	56.2	2.6	No
R17	Single-Family Residential	B	67	1	58.4	62.5	4.1	No
R18	Single-Family Residential	B	67	1	56.5	59.8	3.3	No
R19	Single-Family Residential	B	67	1	57.6	62.1	4.5	No
R20	Single-Family Residential	B	67	1	53.1	55.8	2.7	No
R21	Single-Family Residential	B	67	1	58.3	62.3	4.0	No
R22	Single-Family Residential	B	67	1	57.8	62.0	4.2	No
R23	Single-Family Residential	B	67	1	55.3	58.5	3.2	No
R24	Single-Family Residential	B	67	1	57.6	61.3	3.7	No
R25	Single-Family Residential	B	67	1	52.6	56.3	3.7	No
R26	Single-Family Residential	B	67	1	57.2	62.2	5.0	No
R27	Single-Family Residential	B	67	1	52.5	56.6	4.1	No
R28	Single-Family Residential	B	67	1	58.2	63.3	5.1	No
R29	Single-Family Residential	B	67	1	52.5	56.5	4.0	No
R30	Single-Family Residential	B	67	1	59.7	65.7	6.0	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)$**	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R31	Single-Family Residential	B	67	1	53.9	57.6	3.7	No
R32	Single-Family Residential	B	67	1	55.1	59.3	4.2	No
R33	Single-Family Residential	B	67	1	54.4	61.0	6.6	No
R34	Single-Family Residential	B	67	1	49.3	53.6	4.3	No
R35	Single-Family Residential	B	67	1	57.7	62.3	4.6	No
R36	Single-Family Residential	B	67	1	52.6	55.7	3.1	No
R37	Single-Family Residential	B	67	1	55.3	59.4	4.1	No
R38	Single-Family Residential	B	67	1	53.1	56.8	3.7	No
R39	Single-Family Residential	B	67	1	53.9	57.4	3.5	No
R40	Single-Family Residential	B	67	1	53.1	55.9	2.8	No
R41	Single-Family Residential	B	67	1	56.6	60.8	4.2	No
R42	Single-Family Residential	B	67	1	55.4	59.0	3.6	No
R43	Single-Family Residential	B	67	1	51.8	54.7	2.9	No
R44	Single-Family Residential	B	67	1	48.9	54.2	5.3	No
R45	Single-Family Residential	B	67	1	49.5	55.3	5.8	No
R46	Single-Family Residential	B	67	1	49.4	55.6	6.2	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)^{**}$	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R47	Single-Family Residential	B	67	1	55.9	60.6	4.7	No
R48	Single-Family Residential	B	67	1	49.7	56.2	6.5	No
R49	Single-Family Residential	B	67	1	56.0	61.0	5.0	No
R50	Single-Family Residential	B	67	1	56.2	61.1	4.9	No
R51	Single-Family Residential	B	67	1	50.1	56.4	6.3	No
R52	Single-Family Residential	B	67	1	55.2	59.7	4.5	No
R53	Single-Family Residential	B	67	1	55.2	60.2	5.0	No
R54	Single-Family Residential	B	67	1	49.2	55.7	6.5	No
R55	Single-Family Residential	B	67	1	50.1	56.5	6.4	No
R56	Single-Family Residential	B	67	1	55.2	60.4	5.2	No
R57	Single-Family Residential	B	67	1	49.8	56.3	6.5	No
R58	Single-Family Residential	B	67	1	56.3	61.1	4.8	No
R59	Single-Family Residential	B	67	1	58.2	62.0	3.8	No
R60	Single-Family Residential	B	67	1	60.0	65.0	5.0	No
R61	Single-Family Residential	B	67	1	52.3	58.5	6.2	No
R62	Single-Family Residential	B	67	1	49.0	55.5	6.5	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)^{**}$	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R63	Single-Family Residential	B	67	1	47.8	54.3	6.5	No
R64	Single-Family Residential	B	67	1	54.3	59.8	5.5	No
R65	Single-Family Residential	B	67	1	50.5	57.1	6.6	No
R66	Single-Family Residential	B	67	1	59.4	64.2	4.8	No
R67	Single-Family Residential	B	67	1	47.6	54.0	6.4	No
R68	Single-Family Residential	B	67	1	56.7	61.2	4.5	No
R69	Single-Family Residential	B	67	1	58.6	63.3	4.7	No
R70	Single-Family Residential	B	67	1	46.6	53.1	6.5	No
R71	Single-Family Residential	B	67	1	46.7	53.1	6.4	No
R72	Single-Family Residential	B	67	1	57.2	62.0	4.8	No
R73	Single-Family Residential	B	67	1	56.3	61.1	4.8	No
R74	Single-Family Residential	B	67	1	51.1	57.7	6.6	No
R75	Single-Family Residential	B	67	1	47.0	53.3	6.3	No
R76	Single-Family Residential	B	67	1	57.8	62.2	4.4	No
R77	Single-Family Residential	B	67	1	56.3	61.1	4.8	No
R78	Single-Family Residential	B	67	1	56.4	61.4	5.0	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)$**	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R79	Single-Family Residential	B	67	1	54.8	60.2	5.4	No
R80	Single-Family Residential	B	67	1	55.7	60.8	5.1	No
R81	Single-Family Residential	B	67	1	56.3	61.1	4.8	No
R82	Single-Family Residential	B	67	1	55.9	60.3	4.4	No
R83	Single-Family Residential	B	67	1	50.5	57.2	6.7	No
R84	Single-Family Residential	B	67	1	55.8	60.9	5.1	No
R85	Single-Family Residential	B	67	1	55.9	60.6	4.7	No
R86	Single-Family Residential	B	67	1	51.3	56.9	5.6	No
R87	Single-Family Residential	B	67	1	49.2	54.6	5.4	No
R88	Single-Family Residential	B	67	1	55.7	59.9	4.2	No
R89	Single-Family Residential	B	67	1	46.7	51.8	5.1	No
R90	Single-Family Residential	B	67	1	46.3	52.0	5.7	No
R91	Single-Family Residential	B	67	1	47.2	52.2	5.0	No
R92	Single-Family Residential	B	67	1	50.0	54.8	4.8	No
R93	Single-Family Residential	B	67	1	47.3	52.2	4.9	No
R94	Single-Family Residential	B	67	1	52.0	56.7	4.7	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)$**	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R95	Single-Family Residential	B	67	1	48.4	54.9	6.5	No
R96	Single-Family Residential	B	67	1	58.3	63.1	4.8	No
R97	Single-Family Residential	B	67	1	53.0	58.9	5.9	No
R98	Single-Family Residential	B	67	1	57.0	61.7	4.7	No
R99	Single-Family Residential	B	67	1	49.9	54.8	4.9	No
R100	Single-Family Residential	B	67	1	47.0	51.6	4.6	No
R101	Single-Family Residential	B	67	1	52.0	56.3	4.3	No
R102	Single-Family Residential	B	67	1	49.3	54.2	4.9	No
R103	Single-Family Residential	B	67	1	48.9	55.4	6.5	No
R104	Single-Family Residential	B	67	1	47.7	52.3	4.6	No
R105	Single-Family Residential	B	67	1	53.1	59.1	6.0	No
R106	Single-Family Residential	B	67	1	46.2	51.0	4.8	No
R107	Single-Family Residential	B	67	1	52.1	56.7	4.6	No
R108	Single-Family Residential	B	67	1	46.8	51.3	4.5	No
R109	Single-Family Residential	B	67	1	49.3	55.7	6.4	No
R110	Single-Family Residential	B	67	1	47.4	52.2	4.8	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)$**	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R111	Single-Family Residential	B	67	1	49.3	53.9	4.6	No
R112	Single-Family Residential	B	67	1	51.5	56.4	4.9	No
R113	Single-Family Residential	B	67	1	56.8	61.2	4.4	No
R114	Single-Family Residential	B	67	1	49.5	55.8	6.3	No
R115	Single-Family Residential	B	67	1	54.1	59.7	5.6	No
R116	Single-Family Residential	B	67	1	58.5	63.5	5.0	No
R117	Single-Family Residential	B	67	1	51.5	57.8	6.3	No
R118	Single-Family Residential	B	67	1	51.4	56.5	5.1	No
R119	Single-Family Residential	B	67	1	49.3	55.4	6.1	No
R120	Single-Family Residential	B	67	1	52.6	57.8	5.2	No
R121	Single-Family Residential	B	67	1	48.5	53.4	4.9	No
R122	Single-Family Residential	B	67	1	47.9	52.8	4.9	No
R123	Single-Family Residential	B	67	1	55.5	60.4	4.9	No
R124	Single-Family Residential	B	67	1	53.8	58.6	4.8	No
R125	Single-Family Residential	B	67	1	49.4	54.8	5.4	No
R126	Single-Family Residential	B	67	1	50.3	56.3	6.0	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)^{**}$	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R127	Single-Family Residential	B	67	1	48.3	53.5	5.2	No
R128	Single-Family Residential	B	67	1	52.3	58.2	5.9	No
R129	Single-Family Residential	B	67	1	48.8	54.3	5.5	No
R130	Single-Family Residential	B	67	1	54.0	59.0	5.0	No
R131	Single-Family Residential	B	67	1	49.2	55.2	6.0	No
R132	Single-Family Residential	B	67	1	51.6	57.7	6.1	No
R133	Single-Family Residential	B	67	1	55.3	60.4	5.1	No
R134	Single-Family Residential	B	67	1	58.7	63.5	4.8	No
R135	Single-Family Residential	B	67	1	47.3	53.2	5.9	No
R136	Single-Family Residential	B	67	1	50.9	57.0	6.1	No
R137	Single-Family Residential	B	67	1	55.0	60.0	5.0	No
R138	Single-Family Residential	B	67	1	49.7	55.5	5.8	No
R139	Single-Family Residential	B	67	1	58.7	63.8	5.1	No
R140	Single-Family Residential	B	67	1	56.6	60.8	4.2	No
R141	Single-Family Residential	B	67	1	48.6	54.0	5.4	No
R142	Single-Family Residential	B	67	1	59.0	64.0	5.0	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)$**	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R143	Single-Family Residential	B	67	1	55.5	60.8	5.3	No
R144	Single-Family Residential	B	67	1	51.3	57.5	6.2	No
R145	Single-Family Residential	B	67	1	49.0	55.1	6.1	No
R146	Single-Family Residential	B	67	1	54.8	58.8	4.0	No
R147	Single-Family Residential	B	67	1	47.9	53.6	5.7	No
R148	Single-Family Residential	B	67	1	59.7	63.4	3.7	No
R149	Single-Family Residential	B	67	1	48.9	53.5	4.6	No
R150	Single-Family Residential	B	67	1	47.7	53.0	5.3	No
R151	Single-Family Residential	B	67	1	58.1	62.6	4.5	No
R152	Single-Family Residential	B	67	1	54.9	60.3	5.4	No
R153	Single-Family Residential	B	67	1	52.1	57.9	5.8	No
R154	Single-Family Residential	B	67	1	51.5	55.8	4.3	No
R155	Single-Family Residential	B	67	1	49.7	53.7	4.0	No
R156	Single-Family Residential	B	67	1	48.3	53.1	4.8	No
R157	Single-Family Residential	B	67	1	57.1	61.1	4.0	No
R158	Single-Family Residential	B	67	1	54.6	58.7	4.1	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)$**	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R159	Single-Family Residential	B	67	1	57.4	62.2	4.8	No
R160	Single-Family Residential	B	67	1	53.1	58.5	5.4	No
R161	Single-Family Residential	B	67	1	50.9	54.8	3.9	No
R162	Single-Family Residential	B	67	1	51.3	55.1	3.8	No
R163	Single-Family Residential	B	67	1	58.2	62.6	4.4	No
R164	Single-Family Residential	B	67	1	53.7	57.6	3.9	No
R165	Single-Family Residential	B	67	1	58.7	62.2	3.5	No
R166	Single-Family Residential	B	67	1	54.4	57.7	3.3	No
R167	Single-Family Residential	B	67	1	53.4	56.3	2.9	No
R168	Single-Family Residential	B	67	1	56.8	60.4	3.6	No
R169	Single-Family Residential	B	67	1	55.9	59.5	3.6	No
R170	Single-Family Residential	B	67	1	54.5	57.4	2.9	No
R171	Gas Station	F	--	1	64.6	67.1	2.5	No
R172	Convenience Store	F	--	1	62.1	65.9	3.8	No
R173	Single-Family Residential	B	67	1	60.2	63.5	3.3	No
R174	Single-Family Residential	B	67	1	57.1	59.9	2.8	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)^{**}$	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R175	Single-Family Residential	B	67	1	58.9	62.9	4.0	No
R176	Single-Family Residential	B	67	1	52.3	56.1	3.8	No
R177	Self Storage	F	--	1	59.5	64.5	5.0	No
R178	Single-Family Residential	B	67	1	48.9	53.4	4.5	No
R179	Single-Family Residential	B	67	1	58.0	62.1	4.1	No
R180	Single-Family Residential	B	67	1	50.9	55.9	5.0	No
R181	Single-Family Residential	B	67	1	58.2	61.7	3.5	No
R182	Single-Family Residential	B	67	1	49.2	54.4	5.2	No
R183	Single-Family Residential	B	67	1	52.5	58.6	6.1	No
R184	Single-Family Residential	B	67	1	48.3	52.9	4.6	No
R185	Single-Family Residential	B	67	1	48.8	53.9	5.1	No
R186	Single-Family Residential	B	67	1	57.8	62.1	4.3	No
R187	Single-Family Residential	B	67	1	49.4	54.9	5.5	No
R188	Single-Family Residential	B	67	1	59.0	64.2	5.2	No
R189	Single-Family Residential	B	67	1	58.5	62.8	4.3	No
R190	Single-Family Residential	B	67	1	49.9	56.5	6.6	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)^{**}$	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R191	Single-Family Residential	B	67	1	53.6	59.7	6.1	No
R192	Single-Family Residential	B	67	1	58.3	62.7	4.4	No
R193	Single-Family Residential	B	67	1	49.1	54.5	5.4	No
R194	Single-Family Residential	B	67	1	47.4	52.3	4.9	No
R195	Single-Family Residential	B	67	1	49.0	54.4	5.4	No
R196	Single-Family Residential	B	67	1	57.8	62.6	4.8	No
R197	Single-Family Residential	B	67	1	46.0	51.9	5.9	No
R198	Single-Family Residential	B	67	1	57.1	61.6	4.5	No
R199	Single-Family Residential	B	67	1	49.3	54.7	5.4	No
R200	Single-Family Residential	B	67	1	48.9	53.7	4.8	No
R201	Single-Family Residential	B	67	1	60.8	65.9	5.1	No
R202	Single-Family Residential	B	67	1	58.3	62.9	4.6	No
R203	Single-Family Residential	B	67	1	49.6	54.8	5.2	No
R204	Grace Baptist Church	C/D	52	16	52.0	58.4	6.4	No
R205	Single-Family Residential	B	67	1	50.7	55.2	4.5	No
R206	Single-Family Residential	B	67	1	46.9	51.4	4.5	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)$**	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R207	Single-Family Residential	B	67	1	59.7	65.2	5.5	No
R208	Single-Family Residential	B	67	1	58.1	62.3	4.2	No
R209	Single-Family Residential	B	67	1	59.2	63.2	4.0	No
R210	Single-Family Residential	B	67	1	47.5	51.9	4.4	No
R211	Single-Family Residential	B	67	1	46.9	53.2	6.3	No
R212	Single-Family Residential	B	67	1	55.3	60.9	5.6	No
R213	Single-Family Residential	B	67	1	49.8	54.1	4.3	No
R214	Single-Family Residential	B	67	1	59.4	63.6	4.2	No
R215	Single-Family Residential	B	67	1	47.2	53.8	6.6	No
R216	Single-Family Residential	B	67	1	56.9	61.7	4.8	No
R217	Single-Family Residential	B	67	1	49.6	53.9	4.3	No
R218	Single-Family Residential	B	67	1	53.3	59.2	5.9	No
R219	Single-Family Residential	B	67	1	49.4	56.1	6.7	No
R220	Single-Family Residential	B	67	1	46.1	52.3	6.2	No
R221	Single-Family Residential	B	67	1	51.3	55.8	4.5	No
R222	Single-Family Residential	B	67	1	47.6	54.2	6.6	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)$**	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R223	Single-Family Residential	B	67	1	57.5	61.7	4.2	No
R224	Single-Family Residential	B	67	1	47.3	53.6	6.3	No
R225	Single-Family Residential	B	67	1	46.3	52.7	6.4	No
R226	Single-Family Residential	B	67	1	57.0	61.7	4.7	No
R227	Single-Family Residential	B	67	1	47.6	51.9	4.3	No
R228	Single-Family Residential	B	67	1	53.3	59.1	5.8	No
R229	Single-Family Residential	B	67	1	51.8	55.9	4.1	No
R230	Single-Family Residential	B	67	1	55.8	61.0	5.2	No
R231	Single-Family Residential	B	67	1	50.4	56.9	6.5	No
R232	Single-Family Residential	B	67	1	54.9	59.0	4.1	No
R233	Single-Family Residential	B	67	1	52.8	58.8	6.0	No
R234	Single-Family Residential	B	67	1	56.5	61.3	4.8	No
R235	Single-Family Residential	B	67	1	47.0	53.3	6.3	No
R236	Single-Family Residential	B	67	1	53.0	58.8	5.8	No
R237	Single-Family Residential	B	67	1	45.9	52.0	6.1	No
R238	Single-Family Residential	B	67	1	46.9	53.3	6.4	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)$**	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R239	Single-Family Residential	B	67	1	53.8	59.4	5.6	No
R240	Single-Family Residential	B	67	1	46.4	52.7	6.3	No
R241A	Carefree Club	C	67	6	52.8	58.2	5.4	No
R241B	Carefree Club	C	67	5	50.2	55.5	5.3	No
R241C	Carefree Club	C	67	5	49.7	55.4	5.7	No
R241D	Carefree Club	C	67	5	47.3	52.8	5.5	No
R242	Single-Family Residential	B	67	1	55.0	60.1	5.1	No
R243	Single-Family Residential	B	67	1	45.7	51.8	6.1	No
R244	Single-Family Residential	B	67	1	51.8	58.0	6.2	No
R245	Single-Family Residential	B	67	1	47.5	53.9	6.4	No
R246	Single-Family Residential	B	67	1	46.7	53.0	6.3	No
R247	Single-Family Residential	B	67	1	48.9	55.5	6.6	No
R248	Single-Family Residential	B	67	1	55.5	59.7	4.2	No
R249	Single-Family Residential	B	67	1	48.5	54.3	5.8	No
R250	Single-Family Residential	B	67	1	51.0	56.3	5.3	No
R251	Single-Family Residential	B	67	1	47.1	52.7	5.6	No
R252	Single-Family Residential	B	67	1	55.5	59.8	4.3	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)^{**}$	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R253	Single-Family Residential	B	67	1	48.5	54.9	6.4	No
R254	Single-Family Residential	B	67	1	46.3	52.1	5.8	No
R255	Single-Family Residential	B	67	1	55.0	59.7	4.7	No
R256	Single-Family Residential	B	67	1	51.5	56.8	5.3	No
R257	Single-Family Residential	B	67	1	55.2	59.6	4.4	No
R258	Single-Family Residential	B	67	1	57.2	61.8	4.6	No
R259	Single-Family Residential	B	67	1	48.7	54.3	5.6	No
R260	Single-Family Residential	B	67	1	51.1	57.7	6.6	No
R261	Single-Family Residential	B	67	1	47.2	52.6	5.4	No
R262	Single-Family Residential	B	67	1	52.9	59.0	6.1	No
R263	Single-Family Residential	B	67	1	47.4	53.4	6.0	No
R264	Unoccupied	F	--	1	54.9	59.7	4.8	No
R265	Single-Family Residential	B	67	1	46.7	52.8	6.1	No
R266	Single-Family Residential	B	67	1	46.4	51.7	5.3	No
R267	Single-Family Residential	B	67	1	54.2	58.5	4.3	No
R268	Single-Family Residential	B	67	1	46.9	53.1	6.2	No
R269	Single-Family Residential	B	67	1	46.2	52.4	6.2	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)$**	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R270	Unoccupied	F	--	1	50.6	56.2	5.6	No
R271	Single-Family Residential	B	67	1	46.3	52.2	5.9	No
R272	Unoccupied	F	--	1	55.8	60.6	4.8	No
R273	Single-Family Residential	B	67	1	53.7	59.5	5.8	No
R274	Single-Family Residential	B	67	1	56.7	61.5	4.8	No
R275	Single-Family Residential	B	67	1	49.1	54.6	5.5	No
R276	Single-Family Residential	B	67	1	47.6	53.6	6.0	No
R277	Single-Family Residential	B	67	1	49.0	54.4	5.4	No
R278	Single-Family Residential	B	67	1	55.8	60.0	4.2	No
R279	Single-Family Residential	B	67	1	49.2	55.3	6.1	No
R280	Single-Family Residential	B	67	1	48.8	54.3	5.5	No
R281	Single-Family Residential	B	67	1	57.5	62.3	4.8	No
R282	Single-Family Residential	B	67	1	52.9	58.7	5.8	No
R283	Single-Family Residential	B	67	1	46.1	52.1	6.0	No
R284	Single-Family Residential	B	67	1	49.6	55.0	5.4	No
R285	Single-Family Residential	B	67	1	48.2	54.4	6.2	No
R286	Single-Family Residential	B	67	1	50.1	55.3	5.2	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)^{**}$	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R287	Single-Family Residential	B	67	1	53.8	58.9	5.1	No
R288	Single-Family Residential	B	67	1	49.2	55.3	6.1	No
R289	Single-Family Residential	B	67	1	55.3	59.5	4.2	No
R290	Single-Family Residential	B	67	1	46.8	51.2	4.4	No
R291	Single-Family Residential	B	67	1	46.5	52.0	5.5	No
R292	Greenwood Meadows	C	67	135	49.9	54.4	4.5	No
R293	Single-Family Residential	B	67	1	57.5	61.1	3.6	No
R294	Single-Family Residential	B	67	1	47.2	52.7	5.5	No
R295	Single-Family Residential	B	67	1	50.5	55.8	5.3	No
R296	Single-Family Residential	B	67	1	54.8	59.0	4.2	No
R297	Single-Family Residential	B	67	1	49.6	52.3	2.7	No
R298	Single-Family Residential	B	67	1	48.6	52.2	3.6	No
R299	Single-Family Residential	B	67	1	47.7	51.8	4.1	No
R300	Single-Family Residential	B	67	1	47.2	51.6	4.4	No
R301	Single-Family Residential	B	67	1	46.7	50.8	4.1	No
R302	Single-Family Residential	B	67	1	59.2	64.1	4.9	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)$**	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R303	Single-Family Residential	B	67	1	59.5	64.6	5.1	No
R304	Single-Family Residential	B	67	1	60.2	64.5	4.3	No
R305	Single-Family Residential	B	67	1	61.7	65.3	3.6	No
R306	Single-Family Residential	B	67	1	55.4	58.6	3.2	No
R307	Single-Family Residential	B	67	1	56.3	59.4	3.1	No
R308	Single-Family Residential	B	67	1	57.1	59.9	2.8	No
R309	Single-Family Residential	B	67	1	58.3	61.3	3.0	No
R310	Single-Family Residential	B	67	1	58.9	61.3	2.4	No
R311	Single-Family Residential	B	67	1	59.7	62.2	2.5	No
R312	Single-Family Residential	B	67	1	59.3	63.7	4.4	No
R313	Single-Family Residential	B	67	1	59.1	61.6	2.5	No
R314	Single-Family Residential	B	67	1	58.4	60.6	2.2	No
R315	Single-Family Residential	B	67	1	58.5	59.9	1.4	No
R316	Office	E	72	1	57.3	58.6	1.3	No
R317	Single-Family Residential	B	67	1	56.9	57.9	1.0	No
R318	Single-Family Residential	B	67	1	55.8	56.5	0.7	No
R319	Single-Family Residential	B	67	1	51.3	52.2	0.9	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)$**	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R320	Single-Family Residential	B	67	1	51.9	52.7	0.8	No
R321	Single-Family Residential	B	67	1	53.0	53.8	0.8	No
R322	Single-Family Residential	B	67	1	54.7	55.5	0.8	No
R323	Single-Family Residential	B	67	1	55.5	56.3	0.8	No
R324	Single-Family Residential	B	67	1	56.9	57.3	0.4	No
R325	Single-Family Residential	B	67	1	56.3	56.4	0.1	No
R326	Single-Family Residential	B	67	1	59.8	60.5	0.7	No
R327	Single-Family Residential	B	67	1	60.4	61.3	0.9	No
R328	Kennel	E	72	1	61.0	62.1	1.1	No
R329	Single-Family Residential	B	67	1	53.2	54.0	0.8	No
R330	Single-Family Residential	B	67	1	52.4	53.5	1.1	No
R331	Single-Family Residential	B	67	1	55.9	57.0	1.1	No
R332	Single-Family Residential	B	67	1	54.3	55.7	1.4	No
R333	Single-Family Residential	B	67	1	53.4	54.7	1.3	No
R334	Single-Family Residential	B	67	1	53.0	54.3	1.3	No
R335	Single-Family Residential	B	67	1	51.7	53.1	1.4	No
R336	Single-Family Residential	B	67	1	51.0	52.2	1.2	No

Receiver ID	Land Use	Activity Category*	Noise Abatement Criteria (NAC) $L_{eq}(1h)^{**}$	Receptors	Existing $L_{eq}(1h)$	Future $L_{eq}(1h)$	Increase (Future - Existing)	Impact
R337	Single-Family Residential	B	67	1	52.4	53.9	1.5	No
R338	Single-Family Residential	B	67	1	51.8	53.3	1.5	No
R339	Single-Family Residential	B	67	1	50.9	52.4	1.5	No
R340	Single-Family Residential	B	67	1	50.3	51.5	1.2	No

***** NAC Category F results are disclosed for informational purposes only
** The approach criteria for impact determination is within 1 dBA of the NAC

6.0 NOISE ABATEMENT MEASURES

No locations were identified as impacted; therefore, evaluation of noise abatement measures is not required.

7.0 UNDEVELOPED LANDS

The distances to the 66 dBA $L_{eq}(1h)$ noise level contour, which vary along the study area, were developed to assist local planning authorities with jurisdiction over the remaining undeveloped lands within the study area to prevent development of incompatible land use. Large undeveloped lands without permitted/anticipated future development along the project corridor were modeled at 50-feet (from the nearest edge of pavement), 100 feet, and then 100-foot intervals. Given the similarities in local topography and traffic volumes utilized in the analysis, one study area group, Study Area A, was identified and is considered representative of the project corridor. Study Area A was evaluated on the south side of County Line Road. Highlighted cells indicate an approximate distance from the roadway noise source where noise levels are predicted to be lower than the residential NAC. The data in Table 6 below provides information to aid local officials with jurisdiction over properties in proximity to the project.

Table 6: Study Areas
County Line Road Added Travel Lanes
Johnson and Marion Counties, Indiana

Study Area	50 feet (dBA L_{eq})	100 feet (dBA L_{eq})	200 feet (dBAL_{eq})	300 feet (dBA L_{eq})	400 feet (dBA L_{eq})	500 feet (dBA L_{eq})
A	67.2	62.2	58.2	55.0	52.3	50.3

As Shown in Table 5, the estimated distances to the 66 dB(A) Leq(1h) noise level contour are between 50 and 100 feet from the proposed edge of pavement. It is recommended that any future development proposed around the project be modeled with accurate survey data to avoid creating incompatible land uses adjacent to the project.

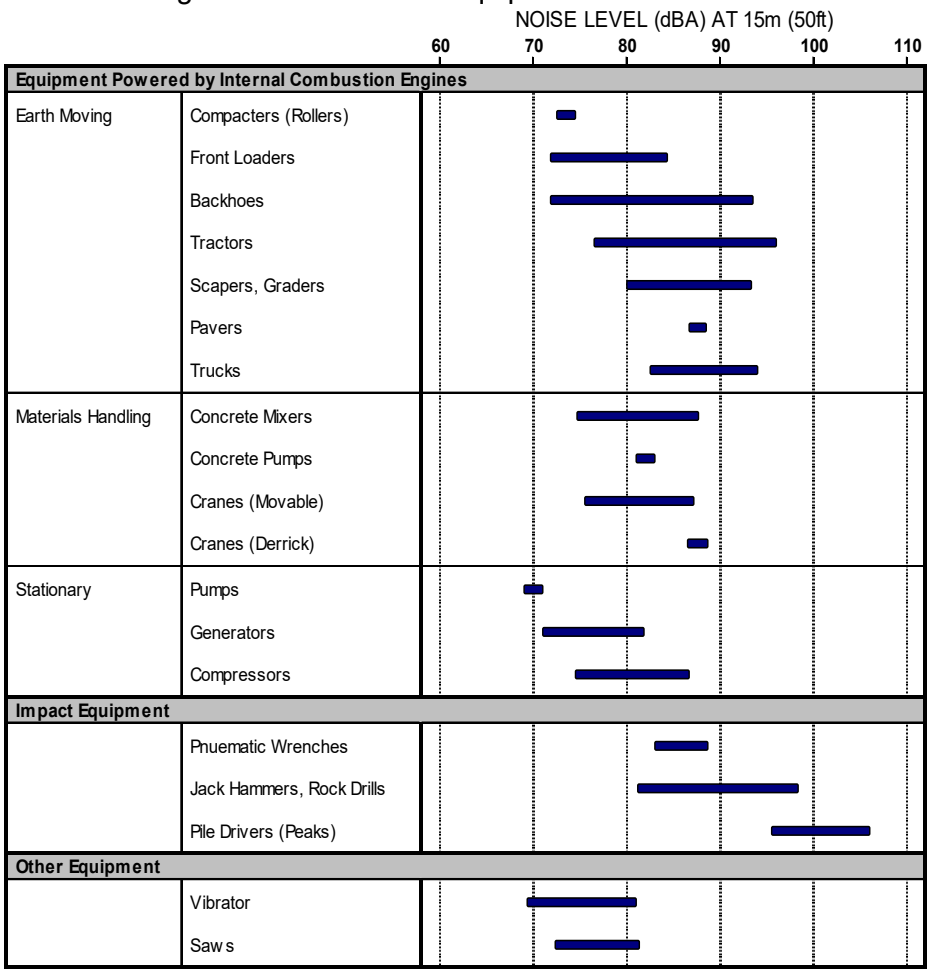
At the conclusion of this noise report, the study will be provided to the respective planning departments in Johnson County, as well as the cities of Indianapolis and Greenwood.

8.0 CONSTRUCTION NOISE

In addition to noise from traffic, construction activities themselves can produce increased noise of a temporary nature. INDOT will be sensitive to local needs and may make adjustments to work practices in order to reduce inconvenience to the public.

The major construction elements of this project are expected to be demolition, hauling, grading, paving, and bridge construction. Construction of the proposed improvements will result in a temporary increase in the ambient noise level within the study area. General construction noise impacts for passerby and those individuals living or working near the project can be expected particularly from demolition, earth moving, pile driving, and paving operations. Equipment associated with construction generally includes backhoes, graders, pavers, concrete trucks, compressors, and other miscellaneous heavy equipment. Figure 2 lists some typical peak operating noise levels at a distance of 15 m (50 feet), grouping construction equipment according to mobility and operating characteristics. Considering the relatively short-term nature of construction noise, impacts are not expected to be substantial. The transmission loss characteristics of nearby structures are believed to be sufficient to moderate the effects of intrusive construction noise.

Figure 2: Construction Equipment Sound Levels



SOURCE: U.S. Report to the President and Congress on Noise, February, 1972.

9.0 CONCLUSION

Existing exterior peak hour (2020) noise levels range from 45.7 to 64.6 dBA L_{eq}(1h). Residential noise levels ranged from 45.7 to 64.6 dBA L_{eq}(1h).

No noise sensitive receptors are anticipated to be impacted by approaching or exceeding the Noise Abatement Criteria (NAC) as a result of the proposed project. The exterior noise levels under the Build Alternative would range from 50.8 to 67.1 dBA L_{eq}(1h). Noise levels at residential receivers would range from 50.8 to 65.9 dBA L_{eq}(1h).

The change in predicted future noise levels over existing noise levels ranged from 2.2 to 6.7 dBA. Therefore, none of the predicted future noise levels would substantially exceed existing noise levels.

Based on the studies completed to date, no locations are anticipated to be impacted by exceeding the NAC or a substantial increase from existing noise levels. Therefore, noise abatement was not evaluated.

10.0 REFERENCES

Anderson, G. S., C.S.Y. Lee, G.G. Fleming and C. Menge, “FHWA Traffic Noise Model®, Version 1.0 User’s Guide”, Federal Highway Administration, January 1998, p. 60.

“Traffic Forecast and Analysis Memo, County Line Road Added Travel Lanes”, HNTB, January 15, 2021

Lau, Michael C., Cynthia S. Y. Lee, Gregg G. Judith L. Rochat, Eric R. Boeker, and Gregg C. Fleming. FHWA Traffic Noise Model® Users Guide (Version 2.5 Addendum). Federal Highway Administration, April 2004.

“Traffic Noise Analysis Procedure”, Indiana Department of Transportation’s, 2017. http://www.in.gov/indot/files/2017%20INDOT%20Noise%20Policy.pdf

APPENDIX A
Modeling and Measurement Locations

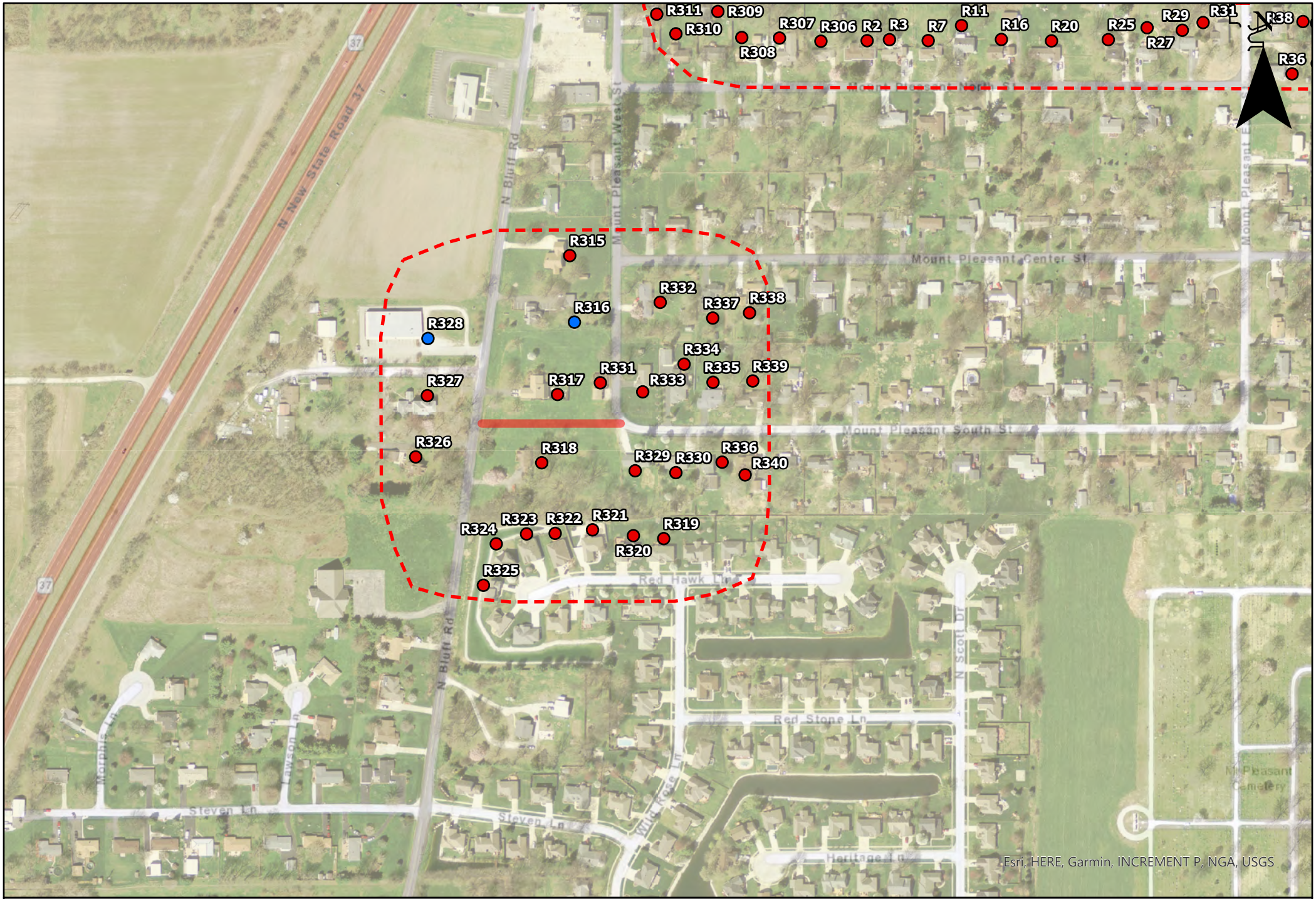


Figure A1: Modeling and Measurement Locations

County Line Road Added Travel Lanes, Des. 2002553

0 125 250 500 Feet

- Field Measurement
- Category B
- Category E
- Sidewalk/Multi-Purpose Path
- Pavement
- Study Limits
- Proposed Connector

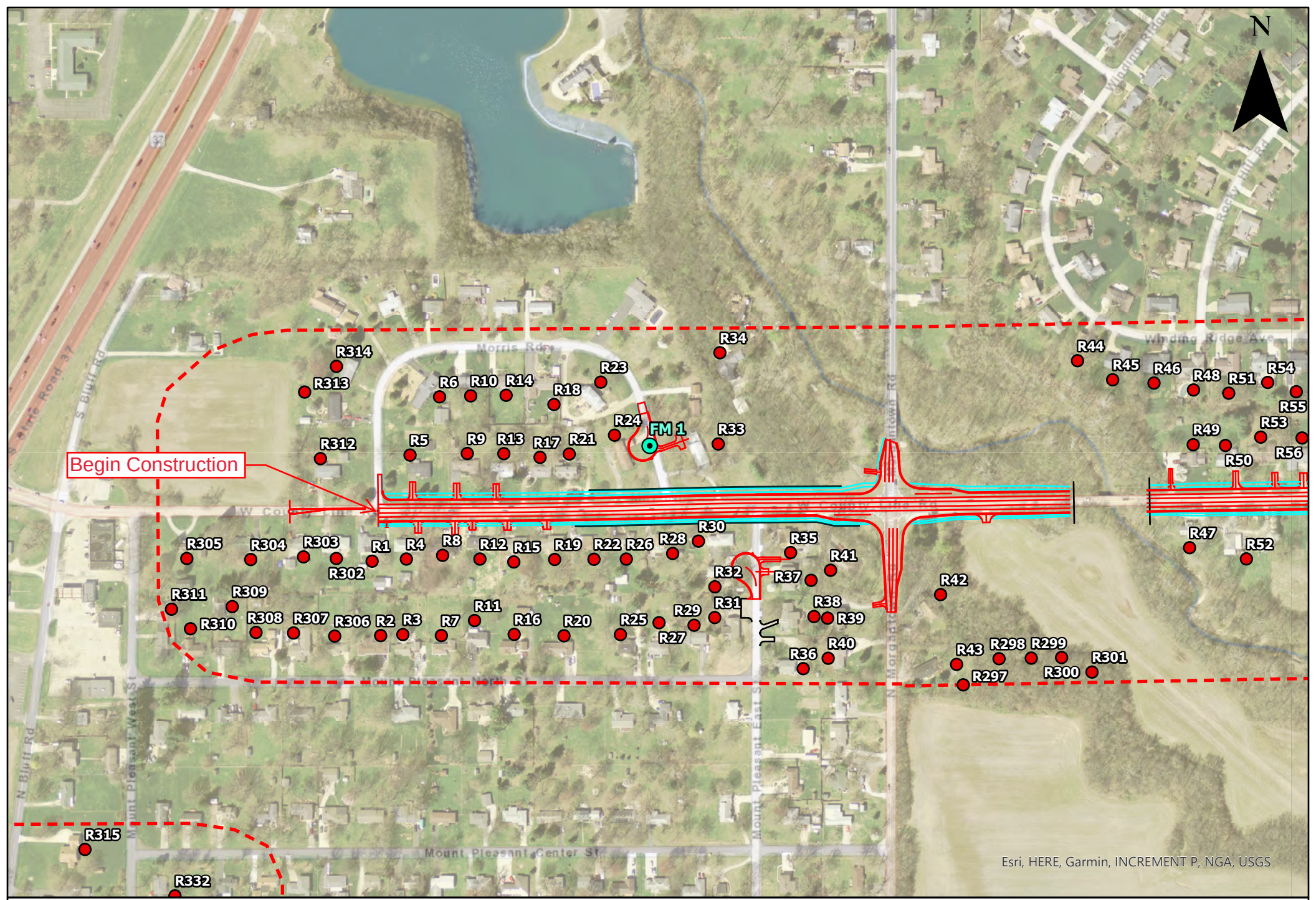


Figure A2: Modeling and Measurement Locations

County Line Road Added Travel Lanes, Des. 2002553

0 125 250 500 Feet

Field Measurement

Category B

Sidewalk/Multi-Purpose Path

Pavement

Study Limits

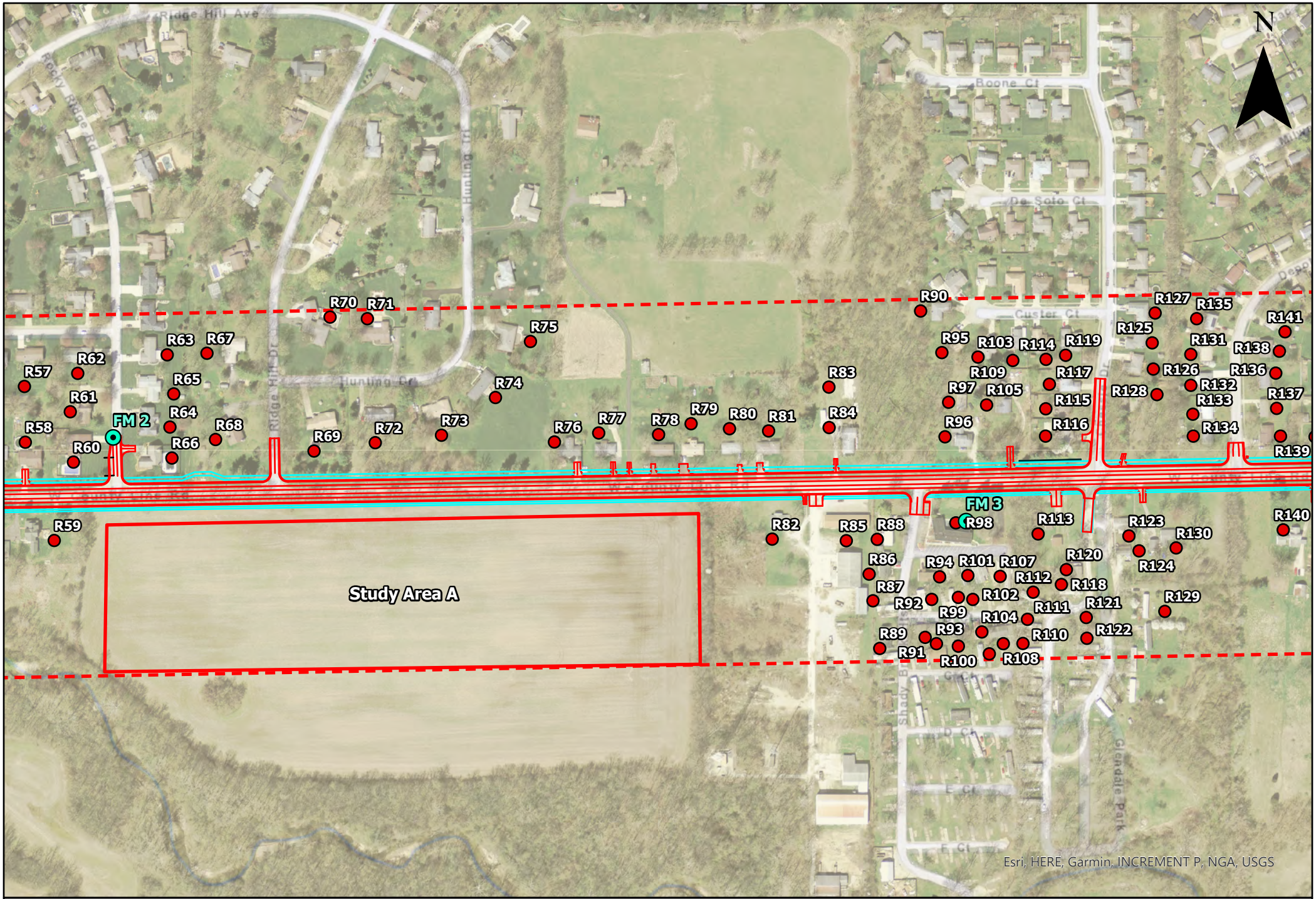


Figure A3: Modeling and Measurement Locations

County Line Road Added Travel Lanes, Des. 2002553

0 125 250 500 Feet

Field Measurement

Category B

Sidewalk/Multi-Purpose Path

Pavement

Study Limits

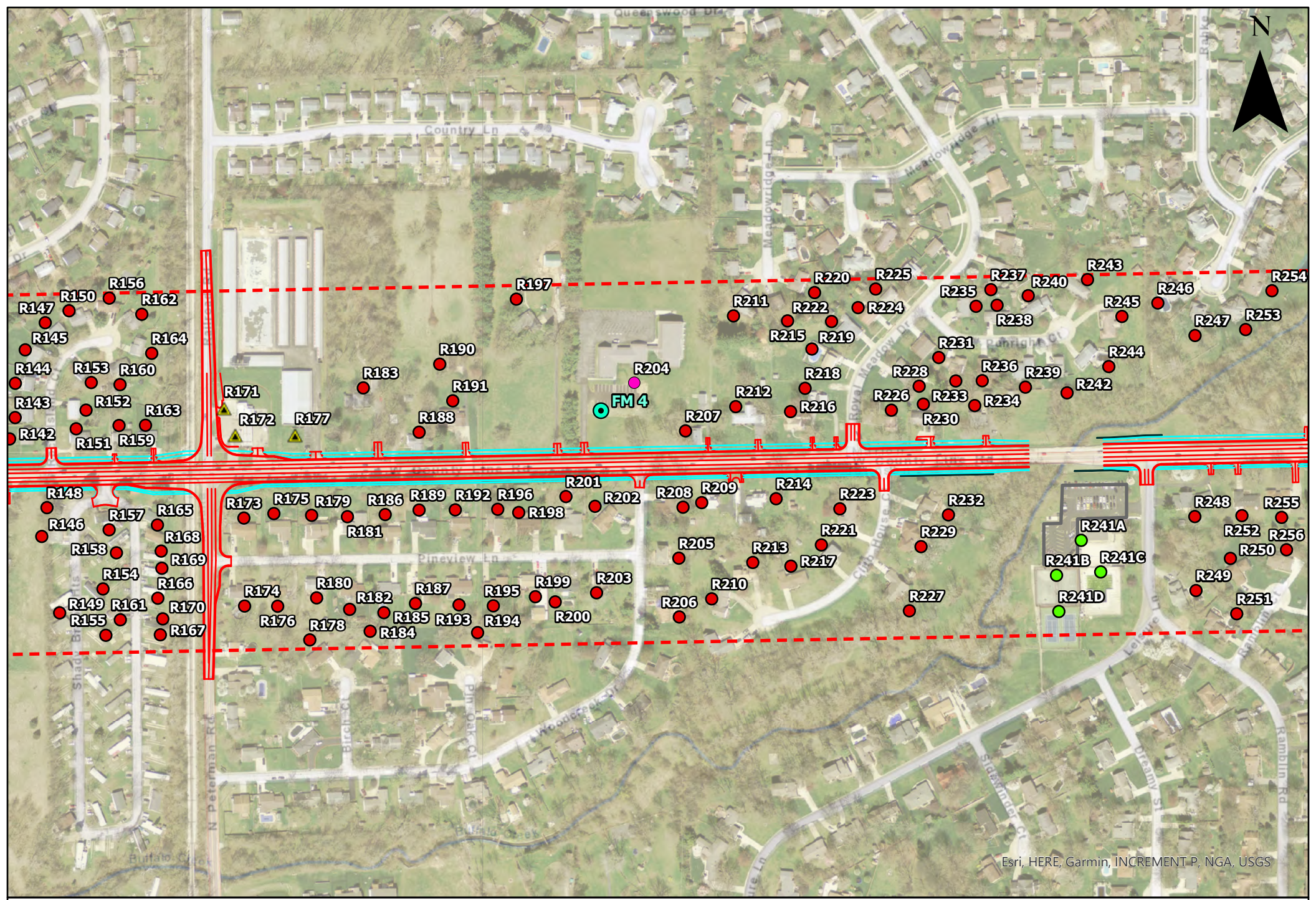


Figure A4: Modeling and Measurement Locations

County Line Road Added Travel Lanes, Des. 2002553

0 125 250 500 Feet

Field Measurement
Category B
Category C
Category D
Category F

Sidewalk/Multi-Purpose Path
Pavement
Study Limits

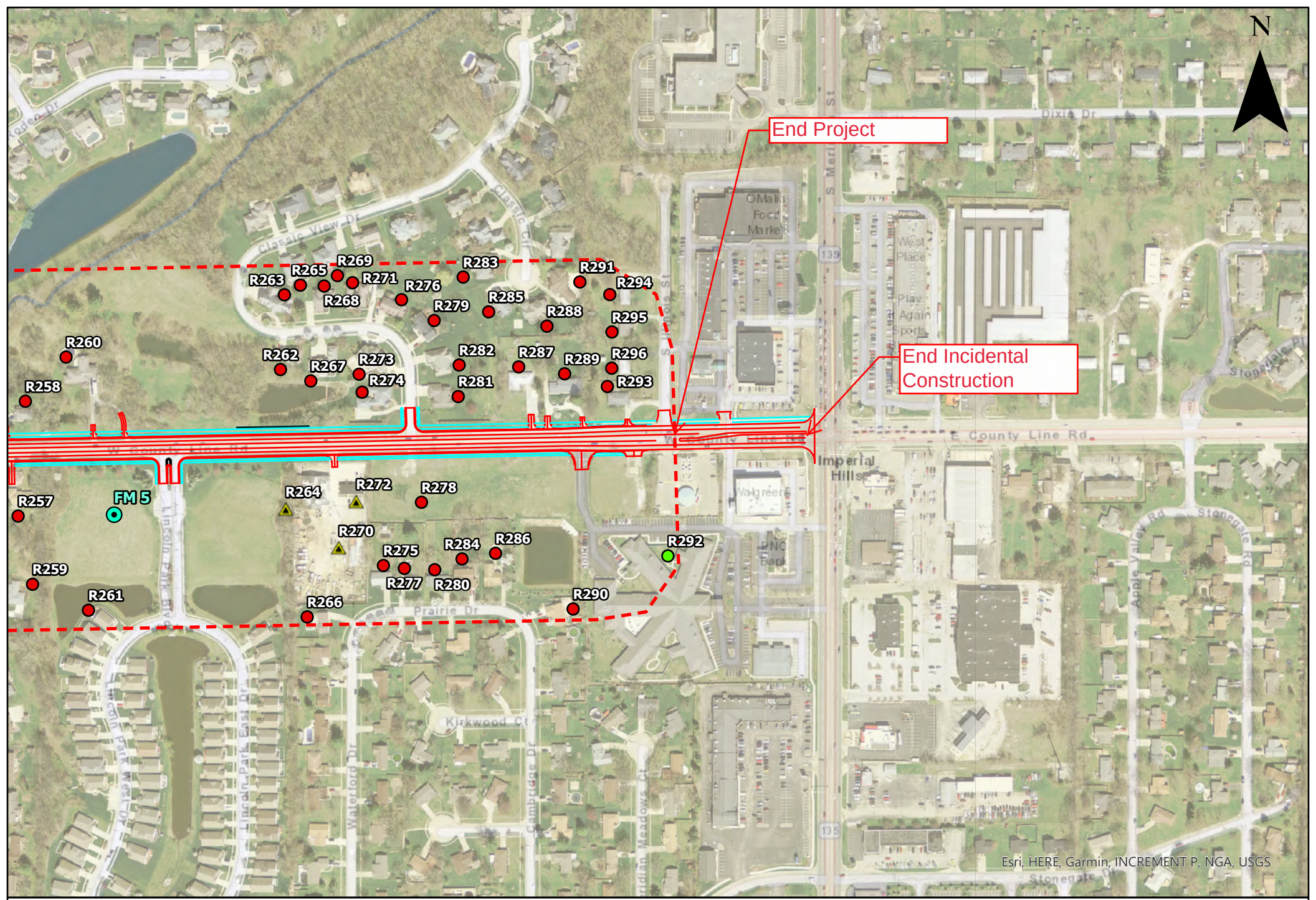


Figure A5: Modeling and Measurement Locations

County Line Road Added Travel Lanes, Des. 2002553

0 125 250 500 Feet

Field Measurement
Category B
Category C
Category F
Sidewalk/Multi-Purpose Path
Pavement
Study Limits

APPENDIX B
Field Measurement Data Sheets

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: Countyline Rd JOB #: 77592 BY: C.T. / L.L.

SITE: FM #1 DATE: 11/5/2020 TIME: 9:30 AM - 9:50 AM

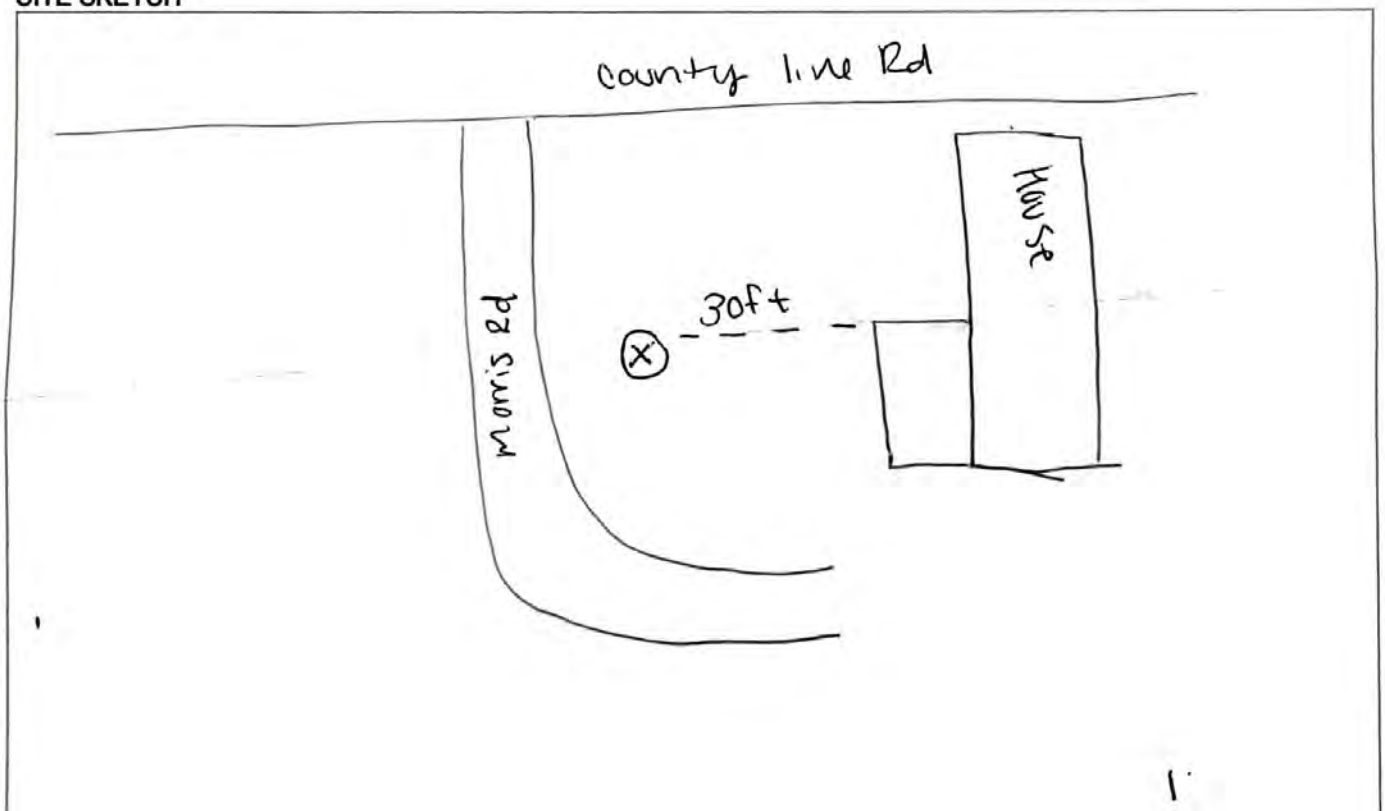
CALIBRATION: -0.05 dB.

RESPONSE: FAST / SLOW WEIGHTING: A / C / LIN.

TRAFFIC DATA		
ROAD (Name/Dir)	Countyline EB	Countyline WB
AUTOS	83	54
MED TRKS	7	6
HVY TRKS	2	2
BUS	0	0
MOTORCYCLE	0	0
SPEED	34	34

EQUIPMENT	
INSTRUMENT	SLM
SLM MANUFACTURER	Larson Davis
SLM MODEL	Lxt DS 860
SLM	S/N 6055
PREAMPLIFIER –	S/N 32190
MICROPHONE –	S/N 155543
CALIBRATOR –	S/N 16684

SITE SKETCH



MEASUREMENT DATA	Duration 20 min	Leq 52.3	

WEATHER DATA	WIND SPEED (MPH)	DIR.	TEMP.	HUMIDITY	CLOUD COVER
BACKGROUND NOISE	8 mph	South	55	68%	Cloudy
MAJOR SOURCES					
UNUSUAL EVENTS					
OTHER NOTES					

Lxt_data.011
DSCN9954.MOV

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: FM02 JOB #: 77592 BY: C.T. / L.L

SITE: County Line Rd DATE: 11/5/2020 TIME: 10:12am - 10:32am

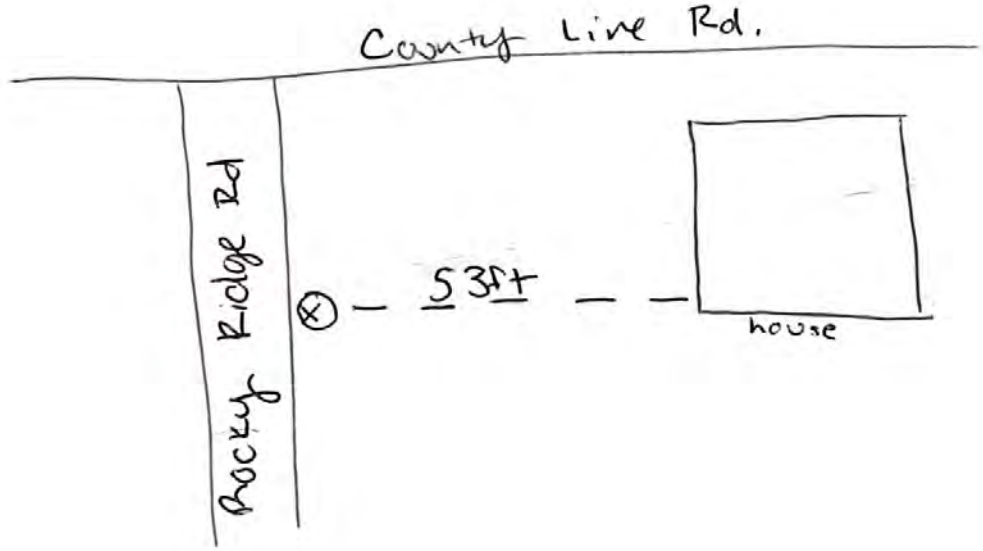
CALIBRATION: +0.13 dB.

RESPONSE: FAST / SLOW WEIGHTING: A / C / LIN.

TRAFFIC DATA		
ROAD (Name/Dir)	County Line EB	County Line WB
AUTOS	87	58
MED TRKS	9	5
HVY TRKS	3	3
BUS	0	0
MOTORCYCLE	0	0
SPEED	34	34

EQUIPMENT	
INSTRUMENT	SLM
SLM MANUFACTURER	Larson Davis
SLM MODEL	LxT DS 360
SLM	S/N 6055
PREAMPLIFIER –	S/N 32190
MICROPHONE –	S/N 135545
CALIBRATOR –	S/N 16664

SITE SKETCH



IIII

MEASUREMENT DATA	Duration 20 min	Leq 61.9	

WEATHER DATA	WIND SPEED (MPH)	DIR.	TEMP.	HUMIDITY	CLOUD COVER
BACKGROUND NOISE	~~SSW~~ 8	SSW	57	63	cloudy
MAJOR SOURCES					
UNUSUAL EVENTS					
OTHER NOTES					

LxT_Data.012
DSCN9955.MOV

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: County Line Rd JOB #: 77592 BY: C.T., L.L.

SITE: EM03 DATE: ~~11-5-2020~~ 11-5-2020 TIME: 11:35pm - 12:55pm

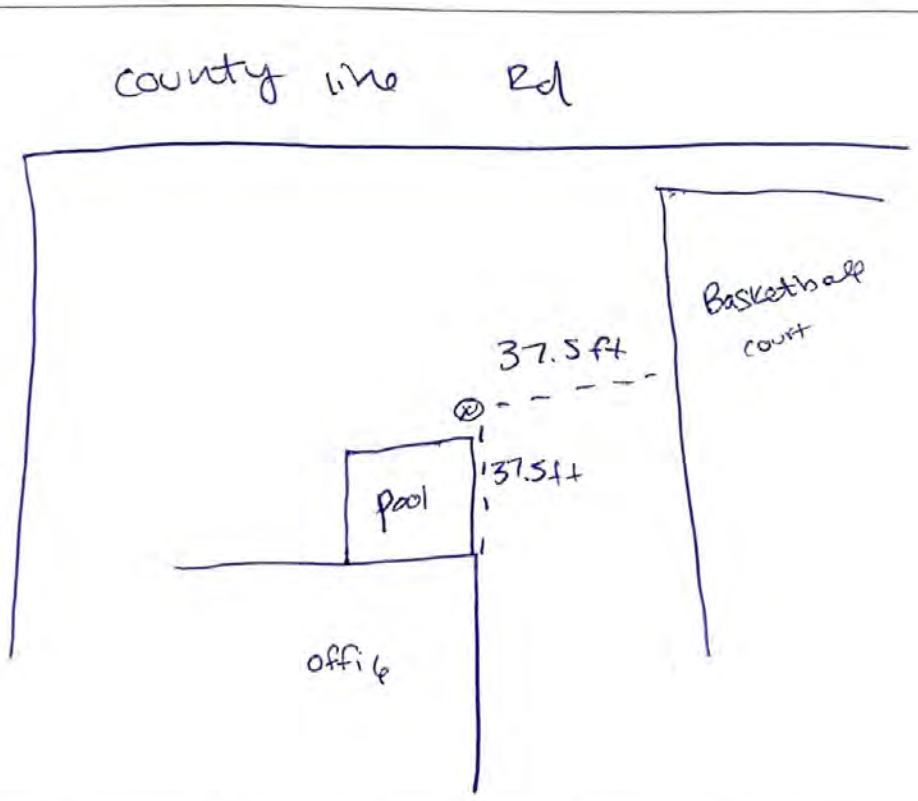
CALIBRATION: -0.23 dB.

RESPONSE: FAST / SLOW WEIGHTING: A / C / LIN.

TRAFFIC DATA		
ROAD (Name/Dir)	County Line EB	County Line WB
AUTOS	95	99
MED TRKS	10	6
HVY TRKS	3	2
BUS	0	0
MOTORCYCLE	0	0
SPEED	34	34

EQUIPMENT	
INSTRUMENT	SLM
SLM MANUFACTURER	Larson Davis
SLM MODEL	~~LxT~~ DS 360
SLM	SIN 6055
PREAMPLIFIER –	S/N 32196
MICROPHONE –	S/N B 5545
CALIBRATOR –	S/N 16684

SITE SKETCH



MEASUREMENT DATA	Duration 20	Leq 58.2	

WEATHER DATA	WIND SPEED (MPH)	DIR.	TEMP.	HUMIDITY	CLOUD COVER
BACKGROUND NOISE	10	SSW	66	45%	

MAJOR SOURCES

UNUSUAL EVENTS

OTHER NOTES

Lxt_Data.015

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: County Line Rd. JOB #: 77592 BY: C.T. / L.L.

SITE: FM04 DATE: 11/5/2020 TIME: 11:53 am - 12:13 pm

CALIBRATION: +0.12 dB.

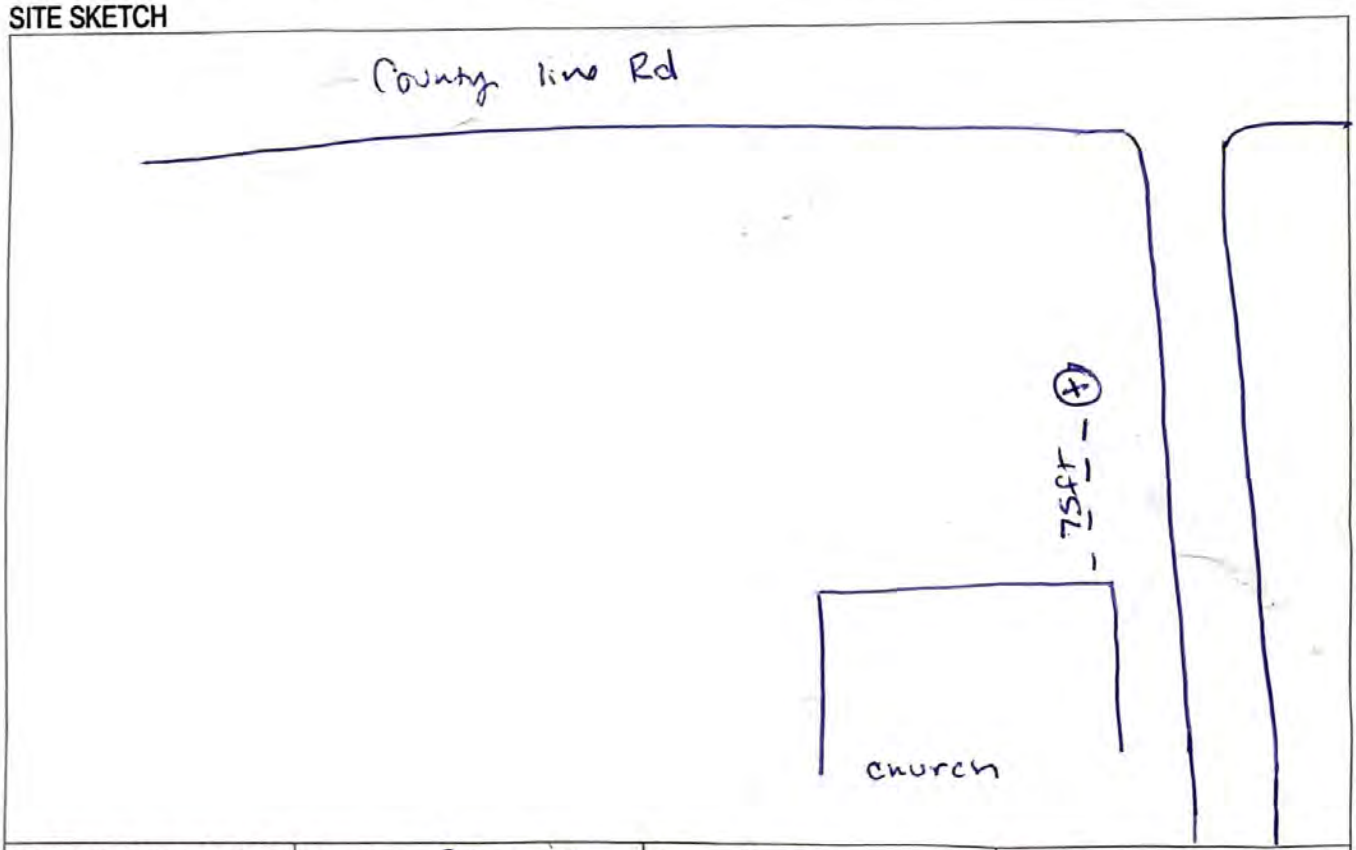
RESPONSE: FAST / SLOW

WEIGHTING: A / C / LIN.

TRAFFIC DATA		
ROAD (Name/Dir)	County Line EB	County Line WB
AUTOS	108	116
MED TRKS	13	15
HVY TRKS	0	4
BUS	1	0
MOTORCYCLE	1	0
SPEED	34	34

EQUIPMENT	
INSTRUMENT	SLM
SLM MANUFACTURER	Larson Davis
SLM MODEL	LXT DS 360
SLM	S/N 6055
PREAMPLIFIER –	S/N 32190
MICROPHONE –	S/N 35545
CALIBRATOR –	S/N 16684

SITE SKETCH



MEASUREMENT DATA	Duration 20min	Leq 58.3	

WEATHER DATA	WIND SPEED (MPH)	DIR.	TEMP.	HUMIDITY	CLOUD COVER
BACKGROUND NOISE	11	SSW	63	50	50%

MAJOR SOURCES

UNUSUAL EVENTS

OTHER NOTES

LXT_data.CKT

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: FMOS JOB #: 77592 BY: C.T. / L.L.

SITE: County line Rd DATE: 11/5/2020 TIME: 11:2lam - 11:4lam

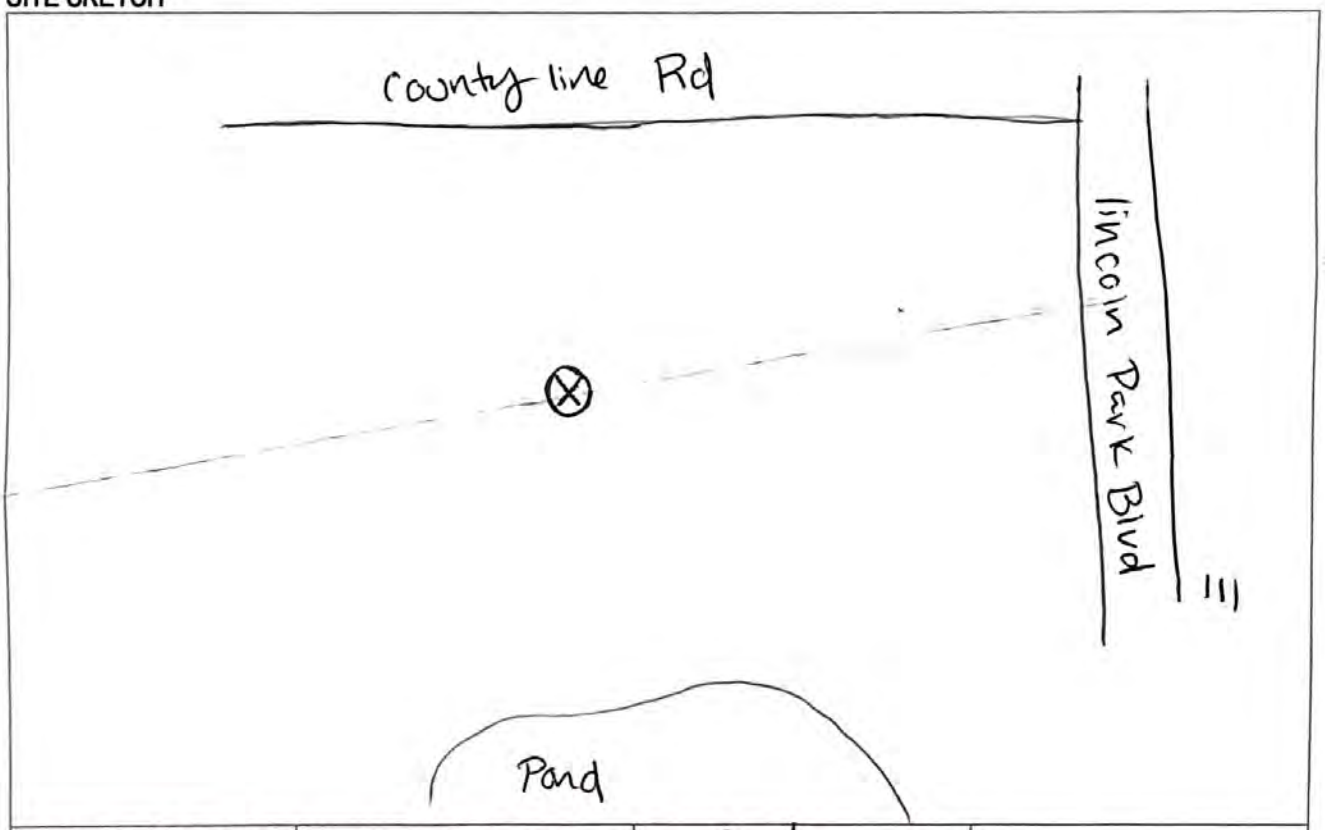
CALIBRATION: -0.06 dB.

RESPONSE: FAST / SLOW WEIGHTING: A / C / LIN.

TRAFFIC DATA		
ROAD (Name/Dir)	County Line EB	County Line WB
AUTOS	128	151
MED TRKS	8	16
HVY TRKS	3	2
BUS	0	0
MOTORCYCLE	1	0
SPEED	34	34

EQUIPMENT	
INSTRUMENT	SLM
SLM MANUFACTURER	Larson Davis
SLM MODEL	Lxt+60SS
SLM	S/N 6055
PREAMPLIFIER –	S/N 32190
MICROPHONE –	S/N :3554S
CALIBRATOR –	S/N 16684

SITE SKETCH



MEASUREMENT DATA	Duration 20 min	Leq 56.4	

WEATHER DATA	WIND SPEED (MPH)	DIR.	TEMP.	HUMIDITY	CLOUD COVER
BACKGROUND NOISE	10	SSW	61	55	mostly cloudy

MAJOR SOURCES

UNUSUAL EVENTS

OTHER NOTES

Start at 8min in

Appendix C
Certificates of Calibration

THE MODAL SHOP
AN MTS COMPANY

10310 Aerohub Boulevard
Cincinnati, OH 45215
Ph: 513.351.9919
Fax: 513.458.2172
www.modalshop.com

~Certificate of Calibration~

Manufacturer: PCB
Model Number: 377B02
Serial Number: 313907
Asset ID:
Description: Free-Field Microphone

Customer: TMS Rental
Address:

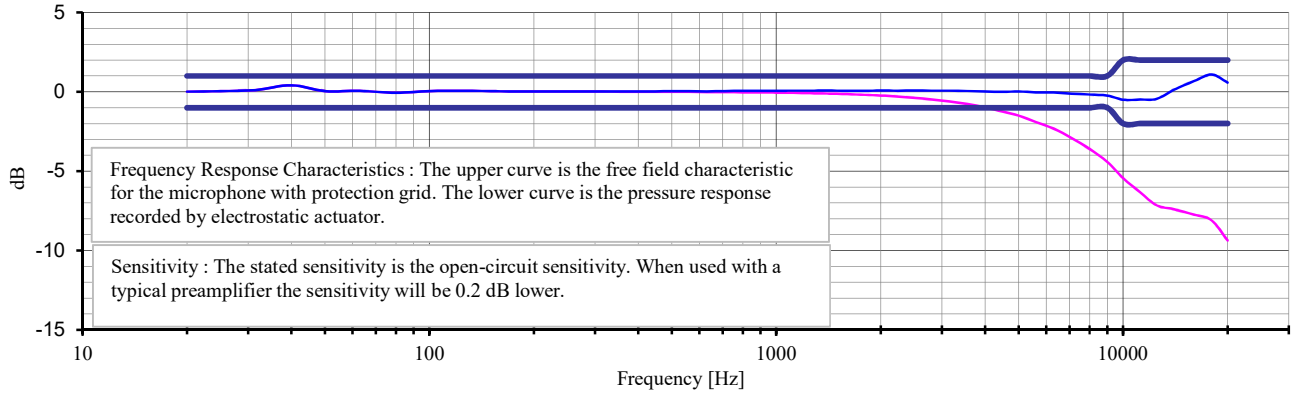
Cal Date / Cal ID: Oct 02, 2020 09:38:42
Due Date:

Sensitivity:	**250 Hz**	**1 kHz**	
	-24.32	-24.37	dB re. 1V/Pa
	60.84	60.46	mV/Pa

Temperature:	72 (22)	°F (°C)
Humidity:	39	%
Ambient Pressure:	1000	mbar

Reference Sens: In Tolerance
Freq. Response: In Tolerance

Polarization Voltage: 0 VDC



Traceability: The calibration is traceable through NIST Project A2007.
Notes: Calibration results relate only to the items calibrated.
This certificate may not be reproduced, except in full, without written permission.
This calibration is performed in compliance with ISO 9001, ISO 17025 and ANSI Z540.
Measurement uncertainty (250 Hz sensitivity calibration) at 95% confidence level: 0.30 dB
Calibrated per procedure PRD-P204.

User Note: As Found / As Left: In Tolerance.

Frequency Response with reference to level at 250 Hz

Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)
20	0.01	**630**	0.03	**4500**	0.00		
25	0.04	**800**	0.06	**5000**	0.02		
31.5	0.11	**1000**	0.07	**5600**	-0.03		
40	0.41	**1120**	0.07	**6300**	-0.04		
50	0.04	**1250**	0.07	**7100**	-0.12		
63	0.06	**1400**	0.08	**8000**	-0.17		
80	-0.06	**1600**	0.07	**9000**	-0.24		
100	0.05	**1800**	0.07	**10000**	-0.50		
125	0.07	**2000**	0.08	**11200**	-0.49		
160	0.03	**2240**	0.07	**12500**	-0.44		
200	0.03	**2500**	0.08	**14000**	0.13		
250	0.02	**2800**	0.07	**16000**	0.67		
315	0.02	**3150**	0.07	**18000**	1.09		
400	0.02	**3550**	0.05	**20000**	0.58		
500	0.04	**4000**	0.03				

Technician: Ed Devlin

Approval: Edward A. Devlin

Reference Equipment Used:

Manuf.	*Model*	*Serial*	*Cal. Date*	*Due Date*
GRAS	40AG	58094	2/19/2020	2/19/2021

ACCREDITED
Calibration Lab
CALIBRATION CERT 2649.01

Certificate of Calibration and Conformance

This document certifies that the instrument referenced below meets published specifications per Procedure PRD-P263; ANSI S1.4-1983 (R 2006) Type 1; S1.4A-1985; S1.43-1997 Type 1; S1.11-2004 Octave Band Class 0; S1.25-1991; IEC 61672-2002 Class 1; 60651-2001 Type 1; 60804-2000 Type 1; 61260-2001 Class 0; 61252-2002.

Manufacturer:	Larson Davis	Temperature:	77.9	°F
Model Number:	LxT		25.50	°C
Serial Number:	6170	Rel. Humidity:	44.3	%
Customer:	TMS Rental	Pressure:	992.1	mbars
Description:	LxT Sound Level Meter		992.1	hPa

Note:

Upon receipt for testing, this instrument was found to be:

Within the stated tolerance of the manufacturer's specification.

Calibration Date: 29-Sep-20 Calibration Due:

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due
Stanford Research Systems	DS360	123270	5/5/2021
Larson Davis	2239	109	7/2/2021

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. Calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of The Modal Shop.

Technician: Ed Devlin Signature:

THE MODAL SHOP
AN MTS COMPANY

10310 Aerohub Blvd.
Cincinnati, OH. 45215
Phone: (513) 351-9919
(800) 860-4867
www.modalshop.com

Calibration Certificate

Certificate Number 2020003029

Customer:
The Modal Shop
3149 East Kemper Road
Cincinnati, OH 45241, United States

Model Number	CAL200	***Procedure Number***	D0001.8386		
Serial Number	17758	***Technician***	Scott Montgomery		
Test Results	**Pass**	***Calibration Date***	5 Mar 2020		
Initial Condition	As Manufactured	***Calibration Due***			
		Temperature	24	°C	± 0.3 °C
Description	Larson Davis CAL200 Acoustic Calibrator	***Humidity***	30	%RH	± 3 %RH
		Static Pressure	101.3	kPa	± 1 kPa

Evaluation Method The data is aquired by the insert voltage calibration method using the reference microphone's open circuit sensitivity. Data reported in dB re 20 µPa.

Compliance Standards Compliant to Manufacturer Specifications per D0001.8190 and the following standards:
IEC 60942:2017 ANSI S1.40-2006

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Agilent 34401A DMM	08/15/2019	08/15/2020	001021
Larson Davis Model 2900 Real Time Analyzer	04/02/2019	04/02/2020	001051
Microphone Calibration System	03/03/2020	03/03/2021	005446
1/2" Preamplifier	09/17/2019	09/17/2020	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/06/2019	08/06/2020	006507
1/2 inch Microphone - RI - 200V	05/21/2019	05/21/2020	006510
Pressure Transducer	06/24/2019	06/24/2020	007310

Output Level

Nominal Level [dB]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
114	101.3	114.00	113.80	114.20	0.14	Pass
94	101.3	94.00	93.80	94.20	0.15	Pass

-- End of measurement results--

Frequency

Nominal Level [dB]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
114	101.3	1,000.14	990.00	1,010.00	0.20	Pass
94	101.3	1,000.15	990.00	1,010.00	0.20	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N)

Nominal Level [dB]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
114	101.3	0.43	0.00	2.00	0.25 ‡	Pass
94	101.3	0.45	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Level Change Over Pressure

Tested at: 114 dB, 23 °C, 31 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
108.0	108.1	-0.02	-0.30	0.30	0.04 ‡	Pass
101.3	101.3	0.00	-0.30	0.30	0.04 ‡	Pass
92.0	91.9	0.03	-0.30	0.30	0.04 ‡	Pass
83.0	83.3	0.03	-0.30	0.30	0.04 ‡	Pass
74.0	73.8	0.02	-0.30	0.30	0.04 ‡	Pass
65.0	65.2	-0.03	-0.30	0.30	0.04 ‡	Pass

-- End of measurement results--

Frequency Change Over Pressure

Tested at: 114 dB, 23 °C, 31 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
108.0	108.1	0.00	-10.00	10.00	0.20 ‡	Pass
101.3	101.3	0.00	-10.00	10.00	0.20 ‡	Pass
92.0	91.9	0.00	-10.00	10.00	0.20 ‡	Pass
83.0	83.3	-0.01	-10.00	10.00	0.20 ‡	Pass
74.0	73.8	-0.01	-10.00	10.00	0.20 ‡	Pass
65.0	65.2	-0.01	-10.00	10.00	0.20 ‡	Pass

-- End of measurement results--

Certificate Number 2020003029

Total Harmonic Distortion + Noise (THD+N) Over Pressure

Tested at: 114 dB, 23 °C, 31 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
108.0	108.1	0.44	0.00	2.00	0.25 ‡	Pass
101.3	101.3	0.43	0.00	2.00	0.25 ‡	Pass
92.0	91.9	0.40	0.00	2.00	0.25 ‡	Pass
83.0	83.3	0.38	0.00	2.00	0.25 ‡	Pass
74.0	73.8	0.36	0.00	2.00	0.25 ‡	Pass
65.0	65.2	0.35	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Signatory: Scott Montgomery

LARSON DAVIS - A PCB PIEZOTRONICS DIV.
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

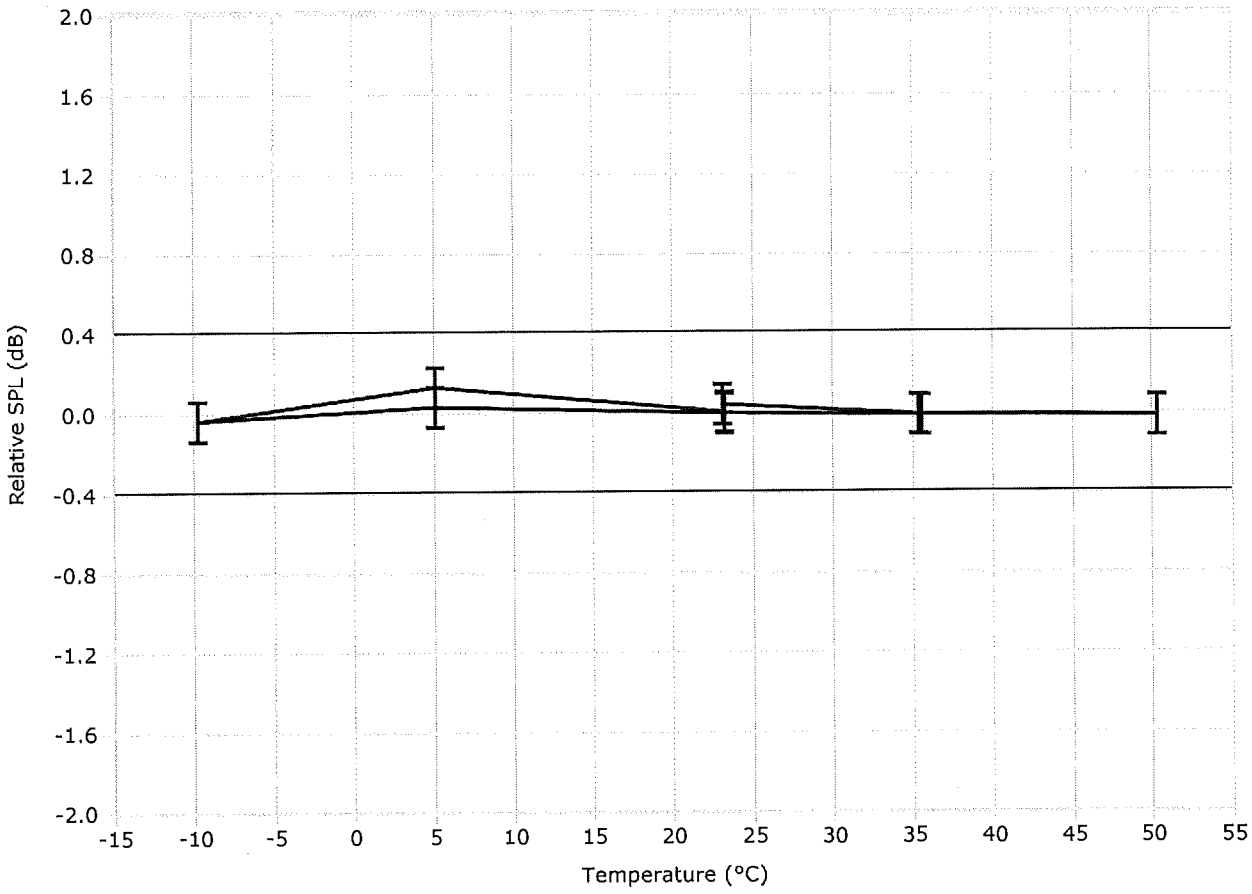
LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Model CAL200 Relative SPL vs. Temperature

Larson Davis Model CAL200 Serial Number: 17758

Model CAL200 Relative SPL vs. Temperature at 50% RH.
A 2559 Mic (SN: 3008) with a PRM902 Preamp (SN: 5789), station 23 was used to check the levels.

Test Date: 03 Feb 2020 7:56:54 AM



0.1dB expanded uncertainty at ~95% confidence level (k=2)

Sequence File: CAL200.SEQ

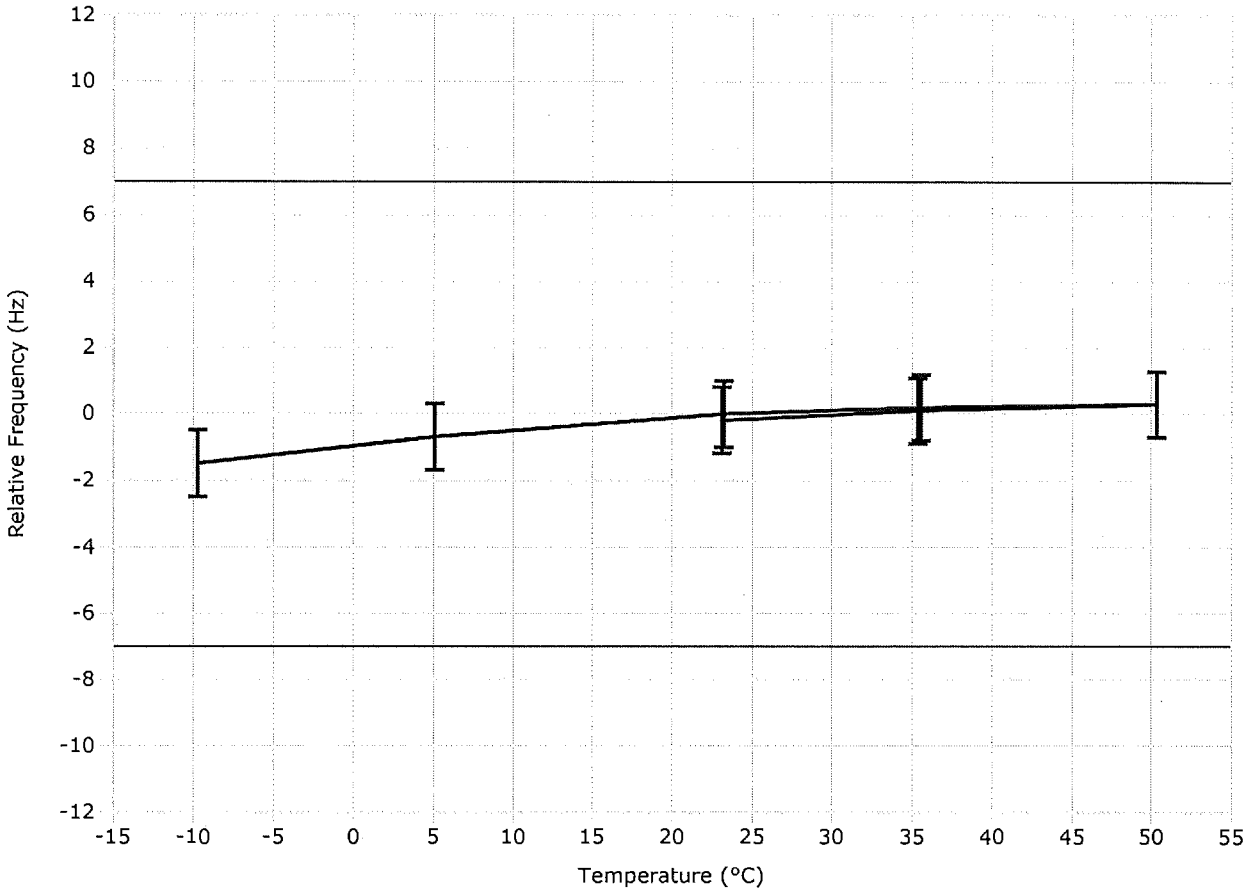
Test Location: Larson Davis, a division of PCB Piezotronics, Inc.
1681 West 820 North, Provo, Utah 84601
Tel: 716 684-0001 www.LarsonDavis.com

Model CAL200 Relative Frequency vs. Temperature

Larson Davis Model CAL200 Serial Number: 17758

Model CAL200 Relative Frequency vs. Temperature at 50% RH.
A 2559 Mic (SN: 3008) with a PRM902 Preamp (SN: 5789), station 23 was used to check the levels.

Test Date: 03 Feb 2020 7:56:54 AM



1.0 Hz expanded uncertainty at ~95% confidence level (k=2)

Sequence File: CAL200.SEQ

Test Location: Larson Davis, a division of PCB Piezotronics, Inc.
1681 West 820 North, Provo, Utah 84601
Tel: 716 684-0001 www.LarsonDavis.com

From: Bales, Ronald
To: Christine Meador; Miller, Brandon
Cc: Richard Connolly; Adin McCann; Chris Schultz
Subject: Des. 2002553 - Noise Report
Date: Friday, November 19, 2021 8:29:21 AM

INDOT Environmental Services Division (ESD) has reviewed the noise analysis for the above-referenced project and found it to be technically sufficient. As you are aware, INDOT no longer comments on recommendations provided in noise studies for local agency projects. However, it is our assessment that the study has been completed in accordance with federal guidelines and state policy. Thank you.

Ron Bales
INDOT-Environmental Services Division
Office: (317) 515-7908
Email: rbales@indot.in.gov