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Traffic Noise Analysis Report

143rd Street
Wolf Road to Southwest Highway
Traffic Noise Analysis
Orland Park, Illinois

April 2020
Updated July 2020 with Benefited Receptor Survey Results
File No. 81.0220055.07

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PREPARED FOR:
Village of Orland Park

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1.0 INTRODUCTION

This traffic noise study has been prepared to evaluate traffic noise for the proposed roadway improvements to 143rd Street from west of Wolf Road (Compton Court) to east of Southwest Highway (Main Street). The Village of Orland Park is the lead agency for the project. The noise study area, shown in Figure 1, is in Orland Park, Illinois. An additional lane will be added to 143rd Street in each direction, with a center median, to Wolf Road north and south of 143rd Street, and to Southwest Highway north of 143rd Street. Union Street north of 143rd Street will also be realigned to intersect at the point where 143rd Street and Southwest Highway meet. The proposed study will evaluate existing and future traffic noise conditions, and if appropriate, potential noise abatement measures. The existing land use adjacent to the road is a mixture of commercial, residential, recreational, institutional, and open land.

This report presents the federal and state noise regulations (Section 2), a discussion of noise sensitive receptors (Section 3), field noise monitoring (Section 4), a description of the noise analysis methodology (Section 5), the analysis of the existing and future noise levels (Section 6), the noise abatement analysis (Section 7), the likelihood statement (Section 8), coordination with local officials for undeveloped lands (Section 9), construction noise (Section 10), and the noise analysis conclusion (Section 11).

2.0 NOISE BACKGROUND AND REGULATIONS

2.1 NOISE BACKGROUND

Sound is caused by the vibration of air molecules and its loudness is measured on a logarithmic scale using units of decibels (dB). Sound is composed of a wide range of frequencies; however, the human ear is not uniformly sensitive to all frequencies. Therefore, the "A" weighted scale was devised to correspond with the ear's sensitivity. The A-weighting generally weighs noise levels in the humanly audible range more heavily and screens out noise levels that cannot be heard but are still generated, such as a high frequency dog whistle. The A-weighted unit is used because:

1) It is easily measured.

2) It approximates the human ear's sensitivity to sounds of different frequencies.

3) It matches attitudinal surveys of noise annoyance better than other noise measurements.

4) It has been adopted as the basic unit of environmental noise by many agencies around the world for assessing community noise issues.

The equivalent sound level (L_{eq}) is the steady-state, A-weighted sound level that contains the same amount of acoustic energy as the actual time-varying, A-weighted sound level over a specified period. If the period is 1 hour, the descriptor is the hourly equivalent sound level or L_{eq}(h), which is widely used by state highway agencies as a descriptor of traffic noise. It is generally the equivalent level of sound (in decibels or dB(A)) that represents the level of sound, held constant over a specified period that reflects the same amount of energy as the actual fluctuating noise over that period. L_{eq} is based on the energy average, not a noise level average.

2.2 FEDERAL REGULATIONS

Traffic noise analyses are required for all projects considered a Type I project. Federal regulations[1] define Type I projects as any of the following:

- The construction of a highway on new location,
- The physical alteration of an existing highway where there is either:
  - *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
  - *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)
- The addition of a through-traffic lane(s) (This includes the addition of a through-traffic lane that functions as a HOV lane, High-Occupancy Toll (HOT) lane, bus lane, or truck climbing lane),
- The addition of an auxiliary lane, except for when the auxiliary lane is a turn lane,

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[1] Based on 23 Code of Federal Regulations Part 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise* (adopted 2010).

- The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange,
- Restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane, or,
- The addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot or toll plaza.

This proposed improvement to 143rd Street would be characterized as a Type I noise project, as it includes additional through-lanes and the realignment of Union Road north of 143rd Street.

Federal regulations establish noise abatement criteria (NAC), which are noise levels where noise abatement should be evaluated. Five separate NAC based upon land use are used by the Federal Highway Administration (FHWA) to assess potential noise impacts. A traffic noise impact occurs when noise levels approach, meet, or exceed the NAC listed in Table 1.[2] In determining the applicable noise activity category for the study area, existing and proposed land uses were reviewed. The applicable NAC for all residential noise receptors evaluated is 67 dB(A).

TABLE 1. NOISE ABATEMENT CRITERIA - HOURLY WEIGHTED SOUND LEVELS

Activity Category[1]	L_{eq}(h)	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[1]	67	Exterior	Residential.
C[1]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care 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, day care 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[1]	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	---	---	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	---	---	Undeveloped lands that are not permitted.

[1] Includes undeveloped lands permitted for this activity category.

[2] Based on 23 Code of Federal Regulations Part 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise* (adopted 2010).

2.3 IDOT POLICY

Based on the Federal regulations, State Highway Authorities are allowed to establish the noise level determined to ‘approach’ the NAC as well as the increase in noise levels that determines a substantial increase. The Illinois Department of Transportation (IDOT) defines noise impacts as follows:

- Design-year traffic noise levels approach, meet, or exceed the NAC, with ‘approach’ defined as 1 dB(A) (for example, the approach value for the residential NAC of 67 dB(A) would be 66 dB(A)).

- Design-year traffic noise levels are a substantial increase over existing traffic-generated noise levels, defined as an increase of 15 dB(A) or greater.

3.0 NOISE RECEPTOR SELECTION

The land use within the study limits consists of residences, a place of worship, commercial properties, medical offices, schools, recreational areas, and open land. Figure 2 depicts land use based on field reviews and available aerial photography.

Receptor locations were selected based on land use adjacent to the 143rd Street project corridor to represent the land uses with established NAC. For this project, this includes residential areas (land use Activity Category B) and a place of worship, medical offices, recreational areas, and a school (land use Activity Category C) and noise sensitive commercial buildings with an outdoor gathering area (land use Activity Category E). The remaining commercial areas and open lands along the project corridor are characterized as land use Activity Category F or G, which do not have an established NAC.

The traffic noise study evaluates the study area using common noise environments (CNEs). A CNE is a group of receptors within the same activity category that are exposed to similar noise sources and levels. Within each of the CNEs, the closest receptor was selected to represent the CNE, thereby representing the worst-case traffic noise condition (known as the representative receptor). The remaining receptors within the CNEs (known as represented receptors) will have similar traffic noise levels as the representative receptor. CNEs typically are studied within 500 feet from the edge of roadway improvements. The distance of 500 feet is based on FHWA's 2010 performance evaluation of the Traffic Noise Model 2.5 (TNM), the model that will be used to predict existing, no-build, and build noise levels for the proposed project.

Twenty-seven receptors have been selected to represent the study area. Each receptor represents a CNE. According to IDOT policy, when determining traffic noise impacts, primary consideration shall be given to exterior areas where frequent human use occurs for Activity Categories A, B, C and E. Additionally, IDOT policy states that traffic noise impacts for land uses within Activity Category D shall be predicted for interior areas only if no exterior use areas are identified. Receptor locations were identified at outdoor locations of frequent human use for all noise receptors studied. Because exterior areas of frequent human use were identified for all receptors, no interior noise monitoring or prediction occurred.

Table 2 lists the receptor/CNE number, the land use category and associated NAC, the receptor type, and the approximate distance to the proposed edges of pavement. Figure 3 depicts the aerial photography of the study area with the receptors and CNEs depicted. Receptor locations are between 20 feet and 300 feet from the proposed edge of pavement of the nearest major street in the project area.

The vacant and undeveloped areas within the project area, shown as land use Activity Category G in Figure 2, were reviewed to determine if any were permitted for development. Based on the information available from the governing agencies with permitting jurisdiction, there are no existing permits for development within the project limits.

TABLE 2. NOISE RECEPTOR LOCATIONS

Receptor/ CNE No.	Activity Category and NAC	Type	Distance to Nearest Project Area Roadway Proposed Edge of Pavement, ft.
R1	B / 67	MFR	75
R2	B / 67	MFR	75
R3	B / 67	SFR	75
R4	C / 67	School	130
R5	B / 67	SFR	120
R6	B / 67	SFR	65
R7	B / 67	SFR	105
R8	C / 67	Restaurant	95
R9	E / 72	Medical Offices	105
R10	C / 67	Golf Course	50
R11	B / 67	SFR	275
R12	B / 67	MFR	60
R13	B / 67	SFR	20
R14	B / 67	SFR	50
R15	E / 72	Medical Offices	30
R16	E / 72	Office	20
R17	C / 67	School	75
R18	E / 72	Dentist Office	20
R19	B / 67	SFR	110
R20	E / 72	Funeral Home	45
R21	B / 67	SFR	75
R22	E / 72	Restaurant	75
R23	C / 67	Park	40
R24	B / 67	SFR	40
R25	B / 67	SFR	125
R26	B / 67	MFR	300
R27	C / 67	Park	270

SFR denotes Single Family Residential
MFR denotes Multi-Family Residential
* Within 500 feet of secondary improvement

4.0 FIELD NOISE MEASUREMENTS

Actual noise level measurements (noise monitoring) provide a "snapshot" of existing site conditions. The traffic volumes and conditions during the actual noise level measurements need to be considered when evaluating if field measurements are typical for the area. The following methodology was used to collect noise level measurements.

Traffic noise levels measured during noise monitoring events are representative of the traffic characteristics (volume, speed and composition) for the period measured. This may or may not be the peak-hour noise condition at the location being measured. In addition, the noise levels also are influenced by other noise sources in the area other than the traffic noise and the characteristics of the location, such as shielding afforded by existing berms or structures. Consequently, comparison of the noise levels between locations should consider the variations in site characteristics in addition to varying traffic conditions. Noise monitoring was conducted at eight representative receptor locations – R6, R7, R9, R13, R18, R19, R21 and R23. The noise monitoring results were compared with TNM results for existing conditions to validate the noise model.

4.1 TRAFFIC VOLUMES

Traffic volumes along roadways adjacent to receptors were counted during field monitoring where traffic was present. The number of cars and trucks were recorded separately along with any other noise sources observed during monitoring. The traffic volumes were counted as a total for each direction during the noise monitoring periods. The traffic volumes counted were extrapolated to hourly volumes for use in noise model validation. This procedure is accepted by the FHWA as a representative noise monitoring method, detailed in IDOT's "Highway Traffic Noise Assessment Manual" (IDOT HTNA Manual) Section 3.5.2.

4.2 TIME AND DAY FOR MEASUREMENTS

Typically, noise monitoring is conducted during free-flow traffic conditions. Noise monitoring was conducted at all locations on April 17, 2017 between the hours of 9:30 am to 1 pm. This follows the noise monitoring methodology to define existing noise levels as described in FHWA's "Noise Measurement Handbook" (FHWA June 2018).

4.3 WEATHER CONDITIONS

Weather conditions have some effect on noise measurement readings. Noise measurements cannot be taken if wind speed exceeds 11 mph. A wind screen was used at all times during the monitoring to reduce wind noise. The conditions during the monitoring are summarized as follows:

WEATHER CONDITIONS DURING THE NOISE MONITORING

Condition	Required	Actual*
Pavement	Dry	Dry
Humidity	Less than 90%	20 - 35%
Temperature	14 to 112 degrees F	62 - 69 degrees F
Wind Speed	Less than 11 mph	Calm to 10 mph

* NWS Data

The weather conditions during the noise monitoring were within the recommended ranges for all parameters listed.

4.4 INSTRUMENTATION

A Brüel & Kjær Type 2250L sound level meter was used for monitoring the actual noise level. The L_{eq} was recorded using the "A" weighted scale. L_{eq} is the equivalent level of sound (in decibels or dB(A)) held constant over a specified period that has the same amount of energy as the actual fluctuating noise over that time period. The instrument was calibrated prior to each use. The instrument was set up approximately five (5) feet from the ground and the measurement was conducted for 10 minutes. The noise meter was placed in an outdoor location where human activity typically occurs or in a location representative of that location.

4.5 FIELD NOISE MONITORING RESULTS

Table 3 compares the noise monitoring results for the eight monitored locations to the TNM modeled existing noise levels. Noise monitored levels ranged from 54 dB(A) to 68 dB(A). The difference between modeled and monitored noise levels indicates that the TNM model accurately represents the project area and its characteristics. Sections 5 and 6 describe the TNM modeling methodology and results. Monitored noise levels are within 3 dB(A) of the modeled noise levels using the traffic volumes observed during the monitoring period, which validates the TNM model. The impact analysis and abatement evaluation will be conducted using the build traffic noise model results.

TABLE 3. NOISE MONITORING RESULTS, L_{eq}

Receptor	Noise Level Monitored, dB(A)	Modeled Existing Noise Level, dB(A)*	Difference Between Modeled and Monitored, dB(A)
R6	62	59	-3
R7	61	61	0
R9	54	53	-1
R13	66	66	0
R18	68	68	0
R19	55	56	1
R21	54	53	-1
R23	61	60	-1

*Modeling methodology and results are presented in Section 5 and Section 6, respectively.

5.0 NOISE ANALYSIS METHODOLOGY

Modeling traffic noise levels at receptors within the project limits was conducted utilizing the FHWA-approved TNM. Prediction of noise levels is one step in assessing potential noise impacts and abatement strategies. Traffic noise levels for the receptor sites were predicted using existing (2020) and future (2050) traffic volumes.

Inputs into TNM include traffic volume, traffic mix (cars, heavy trucks, and medium trucks), traffic controls, receptor distance, elevation, and average speeds during free-flowing traffic conditions. Information sources used in the analysis are briefly described in the following subsections.

5.1 TRAFFIC VOLUMES

Peak hourly volumes for the years 2020 and 2050 for the roadways involved in the 143rd Street Project were provided by the project team. The PM peak hour represents the worst-case peak hour volume for both the existing and future conditions.

5.2 TRAFFIC COMPOSITION

Three types of vehicles (cars, medium trucks, and heavy trucks) were input into TNM. Truck composition for the roadways was estimated based on the truck percentages provided. The percentage of automobiles within the project area is estimated to range from 98 percent to 99 percent, with medium and heavy trucks combined accounting for between 1 percent and 2 percent. Heavy trucks account for 50 percent of the total truck traffic, with medium trucks accounting for the remainder.

5.3 RECEPTOR DISTANCE/ELEVATION

Table 2 includes the distances of the receptors from the nearest proposed edge of pavement. The selected representative receptors include residences, recreational areas, a school, restaurants, offices, and a funeral home. The distance and elevation of each receptor relevant to 143rd Street directly affects the predicted traffic noise level. These distances vary from 20 feet at Receptors R13, R16, and R18 to 300 feet at Receptor R26. The specific location of each receptor is based upon identifying the location where outdoor activity occurs.

5.4 SPEED CONDITIONS

The existing posted speed limit for the individual roadways was used for the noise analysis and has been input into the model.

6.0 TNM RESULTS

Existing (2020), No-Build (2050), and Build (2050) traffic noise levels were predicted for the 27 receptor sites utilizing TNM. Table 4 presents the existing (2020) and projected (2050) noise levels for the 27 receptor sites, as well as the anticipated difference in noise levels for these two time periods.

The existing 2020 noise levels range from 51 dB(A) at R11 and R27 to 70 dB(A) at R16. The projected No-Build 2050 traffic noise levels range from 52 dB(A) at R27 to 72 dB(A) at R16. Generally, receptor noise levels either remain the same or increase by up to 2 dB(A) from the existing scenario to the 2050 No-Build scenario. Any increase in traffic noise levels is due to an increase in traffic volumes.

The projected Build 2050 traffic noise levels range from 52 dB(A) at R27 to 72 dB(A) at R16. The projected Build 2050 noise levels either remain the same or increase from the existing scenario to the build scenario by between 1 dB(A) and 5 dB(A). None of the receptors have an increase in noise of 15 dB(A) or greater.

Under the proposed 2050 Build scenario there are six receptor locations that exceed the FHWA NAC and are traffic noise impacts, warranting a noise abatement analysis (R1, R10, R13, R14, R15, and R16). None of the impacted receptors are considered impacted due to a substantial increase (15 dB(A) increase or greater) in traffic noise levels.

TABLE 4. NOISE IMPACT SUMMARY – TNM MODELING RESULTS

Receptor / CNE Number	Activity Category / NAC (dB(A))	Distance to Nearest Project Area Roadway Proposed Edge of Pavement, ft.	Existing 2020 Noise Level, dB(A)	No-Build 2050 Noise Level, dB(A)	Build 2050 Noise Level, dB(A)	Increase in Build Noise Levels over Existing Noise Levels, dB(A)
R1	B / 67	75	65	66	**68**	3
R2	B / 67	75	63	63	63	0
R3	B / 67	75	62	63	63	1
R4	C / 67	130	60	61	61	1
R5	B / 67	120	61	62	62	1
R6	B / 67	65	57	59	62	5
R7	B / 67	105	59	61	63	4
R8	C / 67	95	60	62	64	4
R9	E / 72	105	55	57	59	4
R10	C / 67	50	64	66	**68**	4
R11	B / 67	275	51	53	53	2
R12	B / 67	60	61	63	62	1
R13	B / 67	20	67	69	**68**	1
R14	B / 67	50	64	65	**67**	3
R15	E / 72	30	69	71	**71**	2
R16	E / 72	20	70	72	**72**	2
R17	C / 67	75	61	63	65	4
R18	E / 72	20	68	69	69	1
R19	B / 67	110	58	60	61	3
R20	E / 72	45	62	64	66	4
R21	B / 67	75	54	56	58	4
R22	E / 72	75	62	63	65	3

Receptor / CNE Number	Activity Category / NAC (dB(A))	Distance to Nearest Project Area Roadway Proposed Edge of Pavement, ft.	Existing 2020 Noise Level, dB(A)	No-Build 2050 Noise Level, dB(A)	Build 2050 Noise Level, dB(A)	Increase in Build Noise Levels over Existing Noise Levels, dB(A)
R23	C / 67	40	62	63	65	3
R24	B / 67	40	63	64	65	2
R25	B / 67	125	56	57	58	2
R26	B / 67	300	53	54	55	2
R27	C / 67	270	51	52	52	1

Bold and highlighted data indicates the noise levels approach, meet, or exceed the NAC in future build condition

7.0 ABATEMENT ANALYSIS

7.1 ABATEMENT ALTERNATIVES

Traffic noise abatement measures were considered for the six impacted receptors that approach, meet, or exceed the appropriate FHWA NAC and/or have a substantial increase in noise impact, as shown in Table 4. The most feasible approach to abating noise impacts in this area would be to construct a noise barrier. A noise barrier may be a noise wall, an earth berm, or a combination of both. Noise barriers placed adjacent to the roadway will attenuate traffic-related noise and are the most practical measure for this project. An effective noise barrier must be tall enough to break the line-of-sight between the receptor and source and typically extends beyond the last receptor four times the distance between the receptor and noise barrier. Noise barriers have a zone of effectiveness, or shadow zone, which is generally within 200 feet of the noise barrier; therefore, less noise reduction is achieved as the distance between the receptor and the noise barrier increases.

TNM was used to perform the noise barrier feasibility and reasonableness evaluation for the impacted receptors. When determining if an abatement measure is feasible and reasonable, the noise reductions achieved, number of residences benefited, total cost, and total cost per residence benefited are considered.

7.2 FEASIBILITY AND REASONABLENESS

An analysis of noise abatement measures (noise barriers) was conducted in conformance with FHWA requirements contained in Title 23 *Code of Federal Regulations* Part 772, and IDOT policy (Chapter 26 of the IDOT Bureau of Design and Environmental Manual) for the impacted receptors. In order for a noise abatement measure to be recommended for construction, it must meet both the feasibility and reasonableness criteria, described below.

Feasibility

The feasibility evaluation is a combination of acoustical and engineering factors considered in the evaluation of a noise abatement measure. The acoustical portion of the IDOT policy, as required by FHWA regulations, considers noise abatement to be feasible if it achieves at least a 5 dB(A) traffic noise reduction at two impacted receptors. Factors including but not limited to safety, barrier height, topography, drainage, utilities, maintenance, and access issues also are considered.

Reasonableness

As per the FHWA regulations, a noise abatement measure is determined to be reasonable when all three of the following reasonableness criteria are met:

- achievement of IDOT's noise reduction design goal
- cost effectiveness of the highway traffic noise abatement measure and,
- consideration of the viewpoints of the benefited receptors (property owners and residents) if all other criteria are achieved.

A noise abatement measure is considered cost-effective to construct if the noise wall construction cost per benefited receptor is less than the allowable cost per benefited receptor. A benefited receptor is any receptor that is afforded at least a 5 dB(A) traffic noise reduction from the proposed noise abatement measure. The FHWA regulations allow each State Highway Authority to establish cost criteria for determining cost effectiveness.

IDOT policy[3] establishes that the actual cost per benefited receptor be based on a noise wall cost of $30 per square foot, which includes engineering, materials, and construction. The base value allowable cost is $30,000 per benefited receptor, which can be increased based on three factors as summarized below:

- the absolute noise level of the benefited receptors in the design year build scenario before noise abatement
- the incremental increase in noise level between the existing noise level at the benefited receptor and the predicted build noise level before noise abatement and,
- the date of development compared to the construction date of the highway. These factors are considered for all benefited receptors.

ABSOLUTE NOISE LEVEL CONSIDERATION

Predicted Build Noise Level Before Noise Abatement	Dollars Added to Base Value Cost per Benefited Receptor
Less than 70 dB(A)	$0
70 to 74 dB(A)	$1,000
75 to 79 dB(A)	$2,500
80 dB(A) or greater	$5,000

Source: IDOT Highway Traffic Noise Assessment Manual

INCREASE IN NOISE LEVEL CONSIDERATION

Incremental Increase in Noise Level Between the Existing Noise Level and the Predicted Build Noise Level Before Noise Abatement	Dollars Added to Base Value Cost per Benefited Receptor
Less than 5 dB(A)	$0
5 to 9 dB(A)	$1,000
10 to 14 dB(A)	$2,500
15 dB(A) or greater	$5,000

Source: IDOT Highway Traffic Noise Assessment Manual

[3] Chapter 26 of the IDOT Bureau of Design and Environment Manual

NEW ALIGNMENT / CONSTRUCTION DATE CONSIDERATION

Project is on new alignment OR the receptor existed prior to the original construction of the highway	Dollars Added to Base Value Cost per Benefited Receptor
No for both	$0
Yes for either	$5,000

Note: No single optional reasonableness factor shall be used to determine that a noise abatement measure is unreasonable.
Source: IDOT Highway Traffic Noise Assessment Manual

The IDOT noise reduction design goal is to achieve an 8 dB(A) traffic noise reduction for at least one benefited receptor. If a noise abatement measure is feasible, achieves the cost-effective criterion, and achieves the IDOT noise reduction design goal, then the viewpoints of benefited receptors are solicited on the construction of the noise wall.

7.3 NOISE WALL ANALYSIS

TNM was used to perform the noise wall feasibility and reasonableness analyses for the potential noise barriers. When determining if an abatement measure was feasible and reasonable, the noise reductions achieved, number of residences benefited, total cost, and total cost per residence benefited are considered.

Five potential noise walls were evaluated for the six impacted receptors. This includes a shared noise wall for receptors R13 and R14, due to their close proximity. Noise walls were generally modeled along the proposed right-of-way (ROW).

One noise wall (B1) was found to be feasible, meaning it could achieve at least a 5 dB(A) reduction at two or more impacted receptors. The remaining noise walls were found to not be acoustically feasible, either because there is only a single impacted receptor present (B2, B4, and B5), or because gaps in the barriers to maintain driveway access limit the wall's effectiveness (B3).

The feasible noise wall B1 would meet the first criterion of reasonableness, as it achieves the IDOT noise reduction design goal of at least an 8 dB(A) traffic noise reduction at one or more benefited receptors.

The feasible noise wall B1 that also achieves the noise reduction design goal was then evaluated for cost-effectiveness. Table 5 summarizes the results of the adjusted allowable cost per benefited receptor determination. Each benefited receptor received a base allowable barrier cost of $30,000, which could be increased based upon absolute noise level considerations, increase in noise level considerations, and new alignment/construction data considerations. The range of these cost adjustment considerations per barrier is summarized as "Adjustment Factor Range" in Table 5. Table 6 summarizes the results of the noise abatement evaluation.

TABLE 5. ADJUSTED ALLOWABLE COST PER BENEFITED RECEPTOR SUMMARY

Barrier Name	CNE(s) Benefited	Benefited Receptors	Adjustment Range	Adjusted Allowable Cost Per Benefited Receptor
B1	R1	8	$0	$30,000
B2	R10	Does not meet Feasibility Criteria of 2 Impacted Receptors Receiving at least a 5 dB(A) Reduction		
B3	R13/R14	Does not meet Feasibility Criteria of 2 Impacted Receptors Receiving at least a 5 dB(A) Reduction		
B4	R15	Does not meet Feasibility Criteria of 2 Impacted Receptors Receiving at least a 5 dB(A) Reduction		
B5	R16	Does not meet Feasibility Criteria of 2 Impacted Receptors Receiving at least a 5 dB(A) Reduction		

Note: No values are provided in the table for barriers that are not reasonable or feasible.

TABLE 6. NOISE WALL COST REASONABLENESS EVALUATION

Barrier	CNE(s) Benefited	Benefited Receptors[1]	Barrier Length (ft)[2]	Average Barrier Height (ft)[2]	Barrier Construction Cost[3]	Drainage and Right of Way Costs[4]	Actual Cost per Benefited Receptor	Adjusted Allowable Cost per Benefited Receptor[5]	Ratio[6]	Finding
B1	R1	8	450	10	$135,000	$40,000	$21,875	$30,000	0.73	Cost-Effective
B2	R10	Does not meet Feasibility Criteria of 2 Impacted Receptors Receiving at least a 5 dB(A) Reduction							N/A	Not Feasible
B3	R13/R14	Does not meet Feasibility Criteria of 2 Impacted Receptors Receiving at least a 5 dB(A) Reduction							N/A	Not Feasible
B4	R15	Does not meet Feasibility Criteria of 2 Impacted Receptors Receiving at least a 5 dB(A) Reduction							N/A	Not Feasible
B5	R16	Does not meet Feasibility Criteria of 2 Impacted Receptors Receiving at least a 5 dB(A) Reduction							N/A	Not Feasible

[1] Any receptor receiving at least a 5 dB(A) reduction due to the proposed barrier
[2] Barrier length and height are not listed for barriers that are not reasonable or feasible
[3] Based on the IDOT policy value of $30 per square foot
[4] Besides barrier construction costs, a five-foot permanent easement will need to be purchased for maintenance purposes ($32,500) and a five-foot temporary construction easement will need to be purchased for grading/restoration behind the wall ($7,500).
[5] Per IDOT traffic noise policy and the reasonableness analysis
[6] Ratio of actual build cost of a barrier per benefitted receptor to the adjusted allowable cost per benefitted receptor. This is used to determine if a barrier can be cost-effective through cost averaging. For a single noise abatement measure to be considered as part of a cost-averaging evaluation, this ratio must not exceed 2.0 (the cost of noise abatement per benefitted receptor may not exceed two times the adjusted allowable noise abatement cost per benefitted receptor).

Noise wall B1 is considered cost-effective, as the actual cost per benefited receptor meets the allowable cost per benefited receptor.

Viewpoints Solicitation

The third component of reasonableness is obtaining the viewpoints of those who would be benefitted by a feasible and cost-effective noise barrier meeting the IDOT noise reduction design goal. Viewpoints solicitation packages, including an informational letter, voting form, and maps of the proposed wall, were sent to property owners via certified mail on May 27, 2020 at receptors that would benefit proposed walls. A noise forum meeting was held on June 9th, 2020 to inform befitted receptors of the proposed improvement, traffic noise policy/analysis, and the solicitation process. The first solicitation period was open until June 23, 2020. Table 7 is a summary of the viewpoints solicitation voting results. The received votes were tallied by noise wall per IDOT policy. The eligible noise wall received at least a 33% response rate in the first round of voting, meaning a second round of voting was not required or conducted. If more than fifty percent of the received wall's votes are in support of wall construction, the wall is recommended for construction and will likely be included in final design plans for the project. Conversely, if the wall does not have more than fifty percent of the received votes in favor of the wall then it would not be recommended for construction as part of the project.

Table 7 shows that the eligible wall was voted in favor and will be recommended for construction.

TABLE 7. VIEWPOINTS SOLICITATION SUMMARY

Noise Wall	Voting Response Rate[1]	Percent of Votes In Favor	Voting Results	Wall Recommended for Construction?[2]
B1	63%	80%	In Favor	Yes

[1] Of all potential votes of receptors benefited by the noise wall
[2] In order to be recommended for construction, a noise wall must have greater than 50% of votes received in favor of the wall

8.0 LIKELIHOOD STATEMENT

Noise barrier B1 was determined to meet the feasibility criteria, the noise reduction design goal, the cost effectiveness criteria, and the benefited receptor survey as identified in Table 6 and Table 7. The noise barriers were determined to meet the feasibility and reasonableness criteria. If the project's final design characteristics is different from the preliminary design, IDOT will determine if revisions to the traffic noise analysis are necessary. A final decision on noise abatement will not be made until the project's final design is approved and the public involvement processes is complete.

9.0 COORDINATION WITH LOCAL OFFICIALS FOR UNDEVELOPED LANDS

Figure 2 depicts the land use within the project limits. Undeveloped parcels of land exist throughout the corridor. For planning purposes, the Year 2050 Build scenario was analyzed to predict traffic noise levels on the undeveloped areas. Noise level contours were developed at 66 dB(A) and 71 dB(A) noise levels to determine where the NAC would be approached in the Build scenario.

Appendix A includes an exhibit which can be sent as an attachment with letters to the local officials having jurisdiction over the undeveloped lands. This exhibit depicts the approximate distances where the NACs Activity Categories B/C, (67 dB(A)) and E (72 dB(A)) are approached.

10.0 CONSTRUCTION NOISE

Trucks and machinery used for construction produce noise that may affect some land uses and activities during the construction period. Residents along the alignment will at some time experience perceptible construction noise from implementation of the project. To minimize or eliminate the effect of construction noise on these receptors, mitigation measures have been incorporated into IDOT's Standard Specifications for Road and Bridge Construction as Article 107.35.

11.0 CONCLUSION

This traffic noise study has been conducted to evaluate traffic noise impacts for the proposed roadway improvements to 143rd Street in Orland Park, Illinois. Traffic noise was evaluated at 27 receptor locations. The Existing 2020 noise levels range from 51 dB(A) to 70 dB(A). The projected No-Build 2050 traffic noise levels range from 52 dB(A) to 72 dB(A). Receptor noise levels either remain the same or increase up to 2 dB(A) from the existing scenario to the 2050 No-Build scenario. Any increase in traffic noise levels is due to an increase in traffic volumes.

The projected Build 2050 traffic noise levels range from 52 dB(A) to 72 dB(A). The projected Build 2050 noise levels increase from the existing scenario to the build scenario by between 1 dB(A) and 5 dB(A).

Under the proposed 2050 Build scenario, noise levels at six receptor locations approach or exceed the FHWA NAC, and therefore warrant a noise abatement analysis. No receptors are considered impacted due to a substantial increase (15 dB(A) increase or greater) in traffic noise levels.

Five potential noise walls were evaluated for the six impacted receptors. This includes a shared noise wall for two impacted receptors due to their close proximity. One noise wall was found to be feasible, meaning it could achieve at least a 5 dB(A) reduction at two or more impacted receptors. The remaining noise walls were found to be not acoustically feasible either because there is only a single impacted receptor present (B2, B4, and B5), or because gaps in the barriers to maintain driveway access limit the wall's effectiveness (B3).

The feasible noise barrier (B1) would meet the first criterion of reasonableness, as it achieves the IDOT noise reduction design goal of at least an 8 dB(A) traffic noise reduction at one or more benefited receptors. The feasible noise wall that also achieves the noise reduction design goal was then evaluated for cost-effectiveness. Noise Wall B1 is considered cost-effective as the actual cost per benefited receptor is less than the allowable cost per benefited receptor. This wall was voted in favor of through the benefited receptor survey.

Due to this, traffic noise abatement measures are likely to be implemented based on preliminary design. If the project's final design is different from the preliminary design, IDOT will verify if revisions to the traffic noise analysis are necessary. A final decision on noise abatement will not be made until the project's final design is approved and the public involvement processes is complete.

REFERENCES

IDOT Bureau of Design and Environment (BDE) Manual, Chapter 26-6, Noise Analyses.

IDOT Bureau of Design and Environment (BDE) Manual, Appendix D, Guidance on EA/EIS Preparation.

IDOT Highway Traffic Noise Assessment Manual, 2017 Addition.

FHWA Construction Noise Handbook, FHWA-HEP-06-015, August 2006.

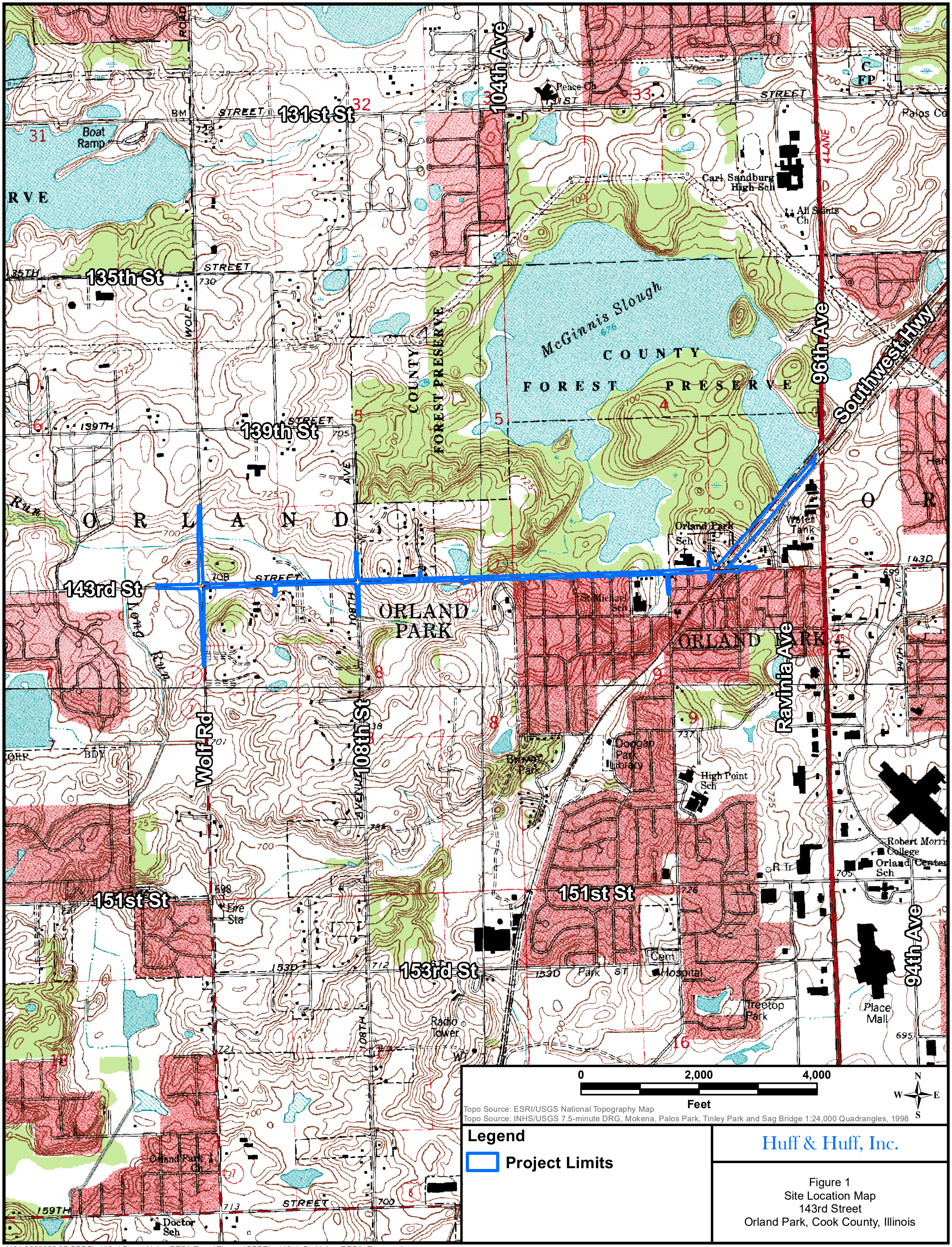
FHWA Noise Measurement Handbook, FHWA-HEP-18-065, June 1, 2018.

23 CFR 772 "Procedures for Abatement of Highway Traffic Noise and Construction Noise", July 13, 2010.

FHWA Highway Traffic Noise: Analysis and Abatement Guidance, FHEA-HEP-10-025, December 2011.

FHWA Highway Noise Barrier Design Handbook, FHWA-EP-00-005, February 2000.

Figures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Southwest Hwy
McGinnis Slough
COUNTY FOREST PRESERVE
ORLAND PARK
Boat Ramp
Peace Ch
Carl Sandburg High Sch
All Saints Ch
Orland Park Sch
Water Tank
St Michael Sch
Doogan Park Library
High Point Sch
Brown Park
Robert Morris College
Orland Center Sch
Fire Sta
Cem
Hospital
Treetop Park
Place Mall
Radio Tower
Orland Park Ch
Doctor Sch
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2,000
4,000
Feet
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W
Topo Source: ESRI/USGS National Topography Map
Topo Source: INHS/USGS 7.5-minute DRG, Mokena, Palos Park, Tinley Park and Sag Bridge 1:24,000 Quadrangles, 1998
Legend
Project Limits
Huff & Huff, Inc.
Figure 1
Site Location Map
143rd Street
Orland Park, Cook County, Illinois

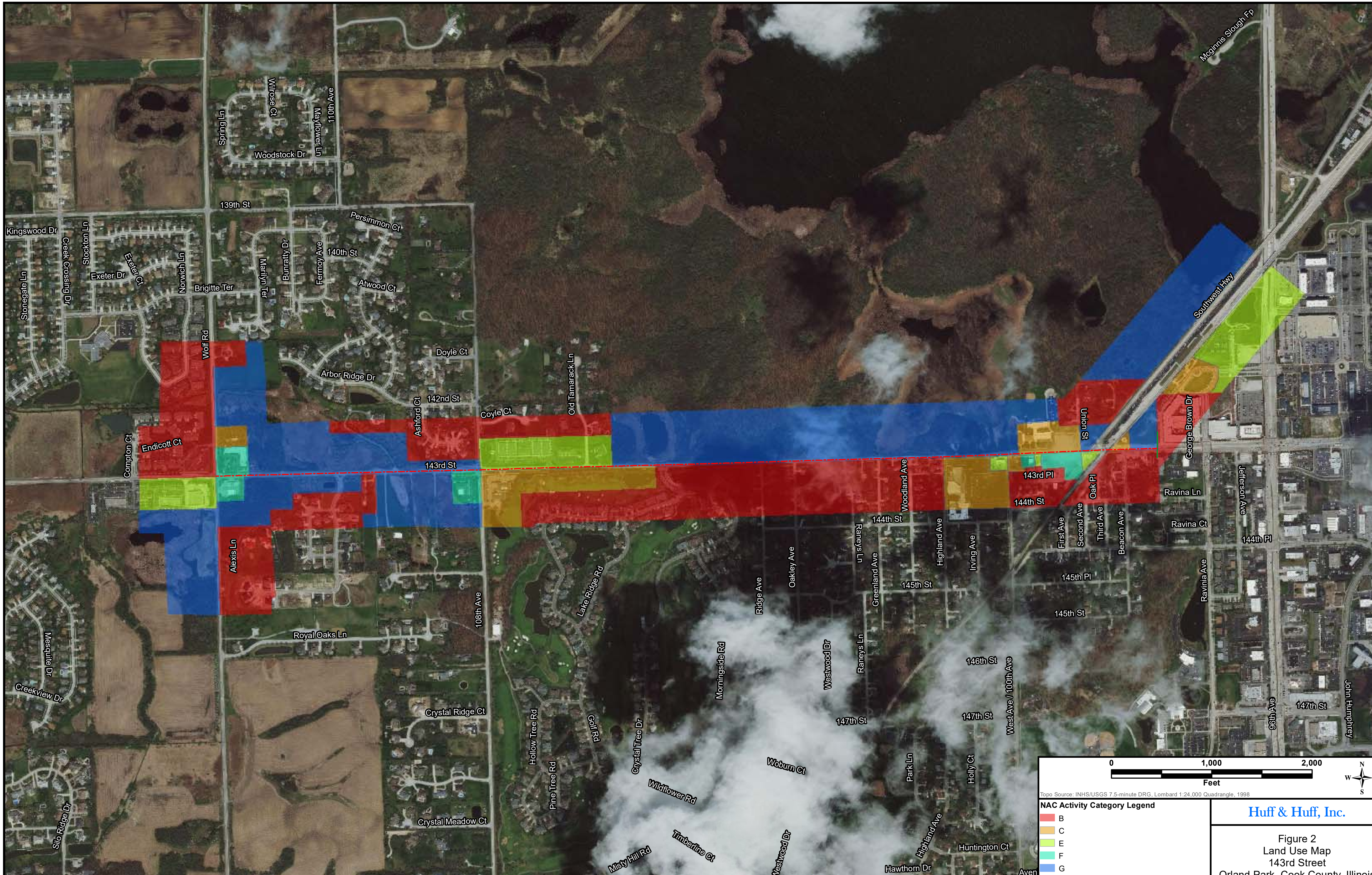

Figure 2
Land Use Map
143rd Street
Orland Park, Cook County, Illinois

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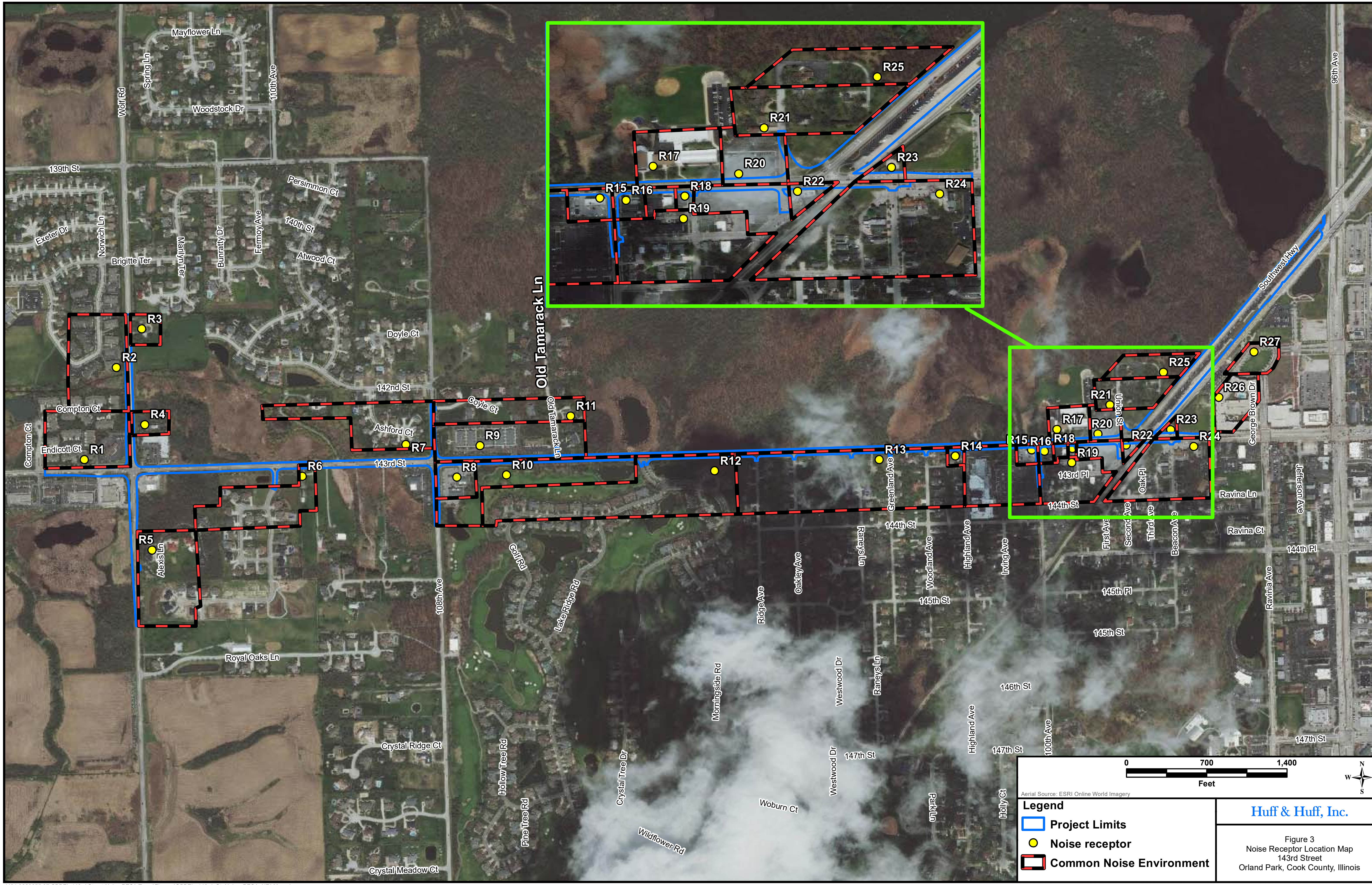
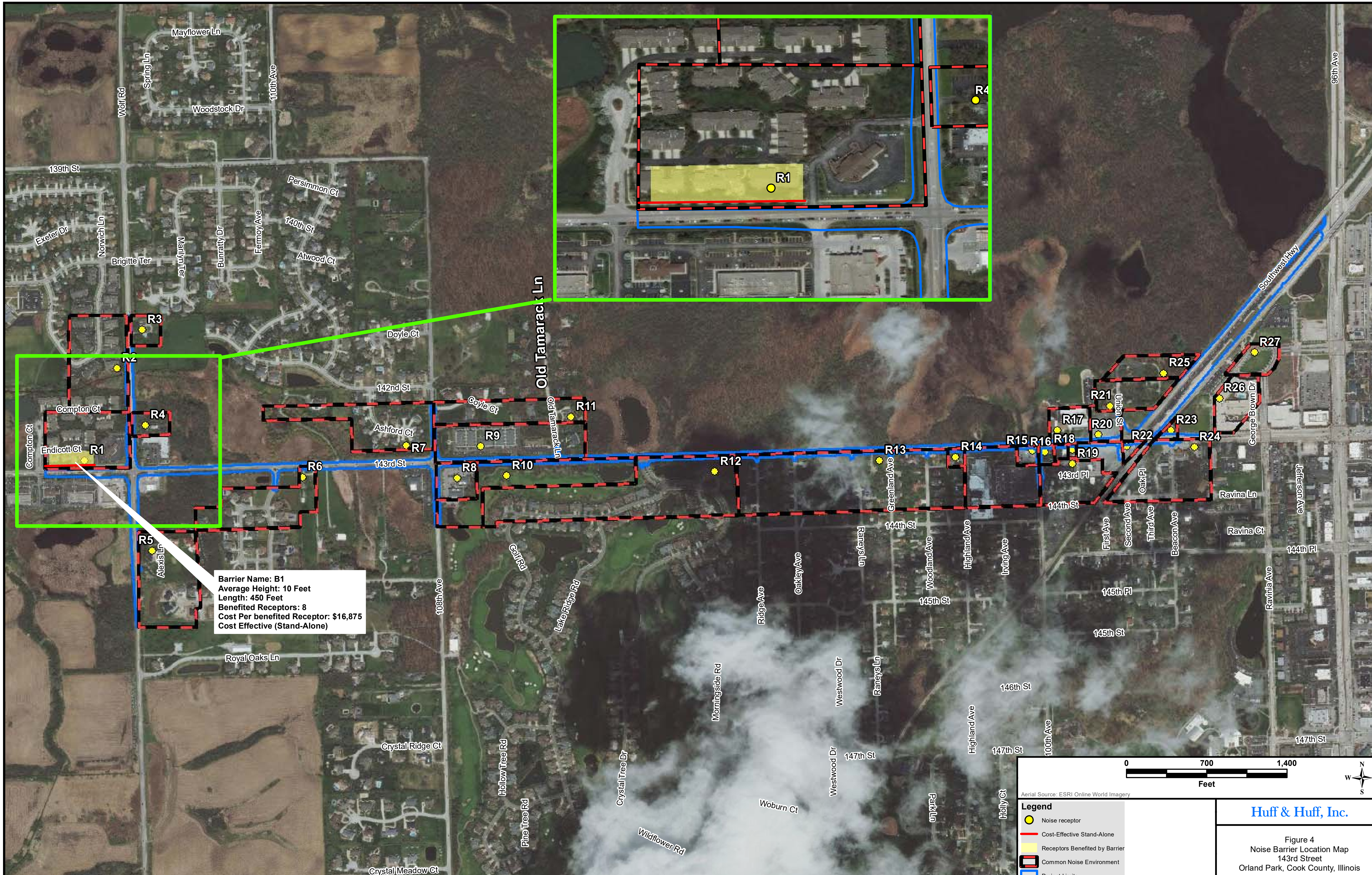


Figure 3
Noise Receptor Location Map
143rd Street
Orland Park, Cook County, Illinois



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Appendix A – Local Agency Noise Coordination

[DATE]

Ed Lelo
Director of Development Services
14700 S. Ravinia Ave.
Orland Park, IL 60462

Re: Traffic Noise Information for Undeveloped Lands
143rd Street Improvements (Wolf Road to Southwest Highway)

The Village of Orland Park is currently conducting environmental (Phase I) preliminary engineering studies for proposed improvements to 143rd Street from west of Wolf Road (Compton Court) to east of Southwest Highway (Main Street) in Orland Park, Illinois.

As part of the Phase I Environmental Study for this proposed project, projected future traffic noise levels were evaluated for lands (either currently under your jurisdiction or land that may come under your jurisdiction) near the proposed roadway improvement. For your information, this study area includes land that may be planned for future development in a comprehensive land use plan.

This letter includes an exhibit showing the predicted design year (2050) build traffic noise levels for the undeveloped lands along the project corridor within your jurisdiction. This information is for your use in planning and permitting future development. We recommend that you carefully consider the future predicted noise levels to avoid potential issues of public concern over incompatible noise levels.

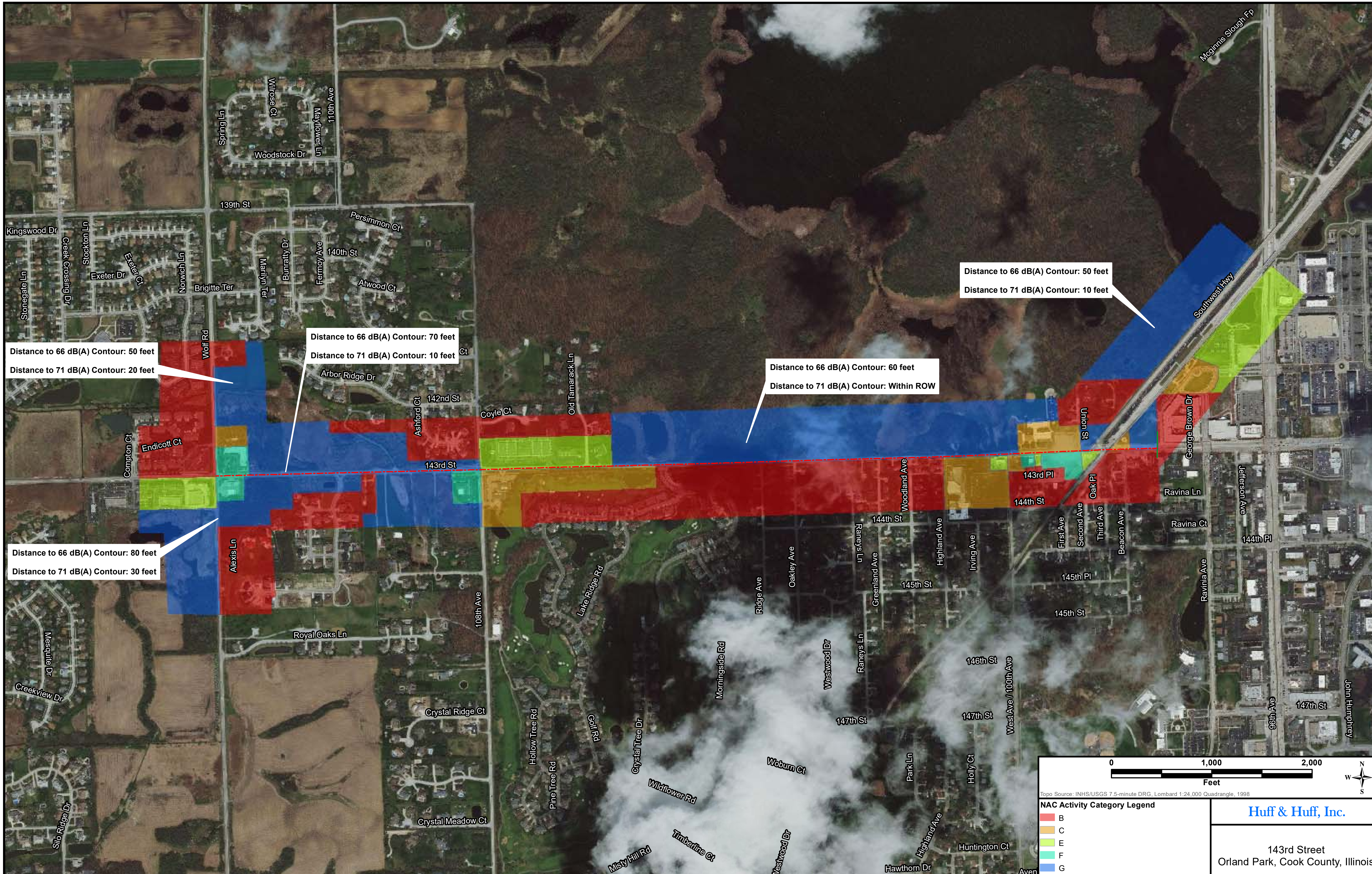
The figure shows currently vacant/future development areas in red, and also shows the distance from the center of the nearest outside project area travel lane (based on the proposed improvement) to both the 66- and 71-dB(A) noise level contours.

- A 66-dB(A) noise contour represents noise levels that would be a noise impact for residential areas, schools, places of worship, medical offices, recreational areas, and institutional uses.
- A 71-dB(A) noise contour represents noise levels that would be a noise impact for hotels, restaurants, and offices.

To help with your future planning and discernment regarding permitting decisions, we encourage you to obtain the Federal Highway Administration (FHWA) publication titled *Entering the Quiet Zone: Noise Compatible Land Use Planning.* This publication can be obtained from the FHWA website:

www.fhwa.dot.gov/environment/noise/noise_compatible_planning/federal_approach/land_use/quitezon.pdf

For additional information regarding traffic noise, regulations and policy, noise analyses or noise abatement, we encourage you to visit the Department’s web site at: http://www.dot.il.gov/. Click on the “Environment” link and then the “Traffic Noise” link to access this information.
Sincerely



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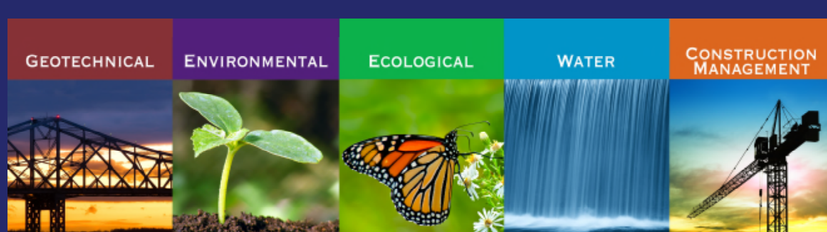

Huff & Huff, a Subsidiary of GZA