Project No. 10-23 KA-3634-01

SLT | South Lawrence Trafficway

Updated Noise Study 2023

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Kansas Department of Transportation

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KDOT IKE
THE EISENHOWER LEGACY TRANSPORTATION PROGRAM

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1.0 Project Location, Description, and Background

Kansas Department of Transportation (KDOT) projects 10-23 KA-3634-02 and 40-23 KA-3634-03 propose improvements to a nearly nine (9)-mile segment of K-10 Highway, also known as the South Lawrence Trafficway (SLT) West Section, within the City of Lawrence in Douglas County. The study area extends from US-59/Iowa Street to Interstate 70 at North 1800 Road/Farmer's Turnpike, as shown in Figure 1.

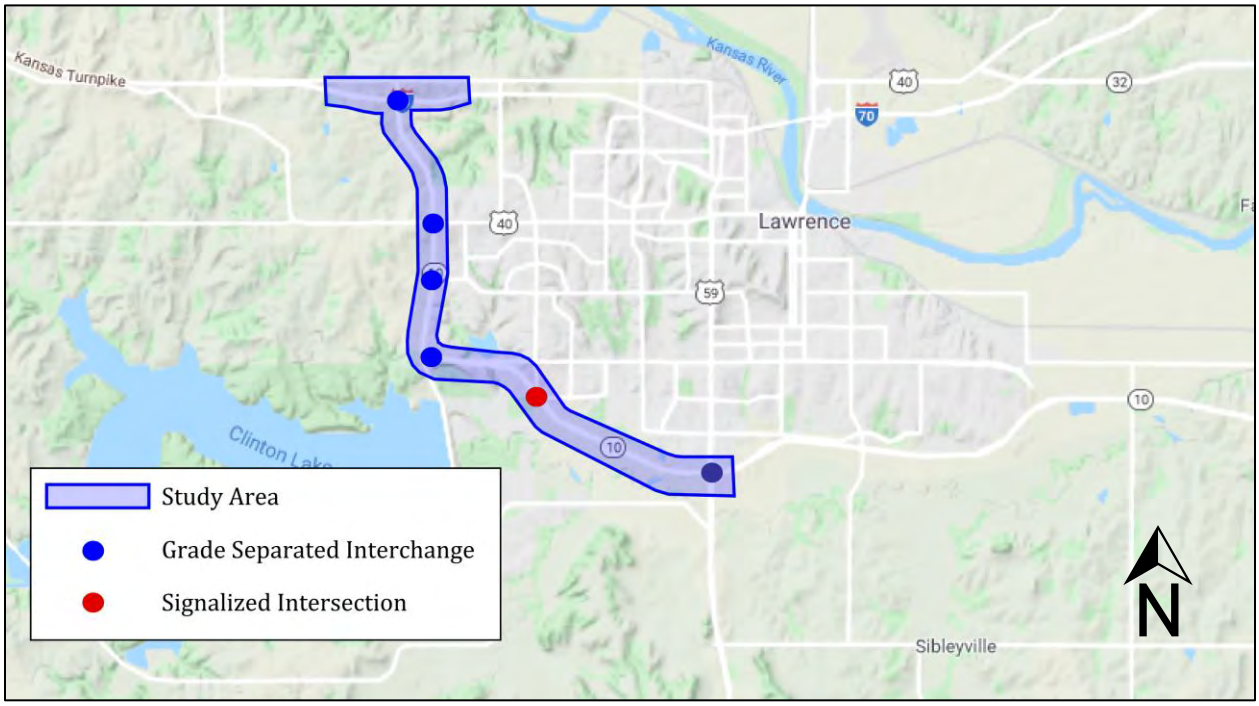


Figure 1: Study Area

In the project study area, SLT is currently an undivided two (2)-lane expressway. Grade separated interchanges exist at US-59/Iowa Street, Clinton Parkway, Bob Billings Parkway, US-40/6th Street, and I-70. An at-grade signalized intersection is currently operating at K-10 and W 27th Street, between the US-59/Iowa Street and Clinton Parkway interchanges. The Preferred Alternative Improvements include:

- Widening SLT from a two (2)-lane expressway to a four (4)-lane divided freeway. The speed limit is anticipated to increase from 65 mph to 70 mph.
- Reconfiguration of the existing K-10 and US-59/Iowa Street interchange, including realignment of both eastbound ramps.
- Replacement of the signalized intersection at K-10 and W 27th Street with a new grade-separated interchange.
- Reconstruction of the K-10 and Clinton Parkway interchange with improvements to Clinton Parkway and other local roads, including three (3) roundabouts. K-10 and the existing ramps will be realigned to accommodate the new interchange design and increased speeds.
- Replacing the existing interchange at K-10 and I-70 with a new system-to-system interchange with free-flow movement for all ramps.
- Additional improvements to local roads within the study area.

The proposed project is needed because the capacity of the SLT West Section has become insufficient to meet current and future traffic volumes, resulting in increased congestion and safety issues now that the facility connects to a four-lane freeway with controlled access on the SLT East Section. Additionally, a continuous highway connection now exists between K-10 Highway in the Kansas City metro area and I-70 and has attracted a significant amount of regional traffic to the SLT corridor.

The proposed project is needed to:

- ***Reduce congestion*** and improve the traffic capacity to meet existing and future travel demands,
- ***Enhance safety*** to help address high crash locations within the study area,
- ***Promote a multimodal transportation system*** by ensuring the project accommodates the needs of other transportation modes, and
- ***Support local and regional growth*** by providing and coordinating transportation connections to be consistent with planned and proposed community land use and development.

This noise analysis presents the existing and future acoustical environment at various receptors along the study area and is in compliance with Title 23 Code of Federal Regulations, Part 772, U.S. Department of Transportation, Federal Highway Administration (FHWA), *Procedures for Abatement of Highway Traffic Noise and Construction Noise* and KDOT's *Highway Traffic Noise Policy and Guidance*, dated June 23, 2022.

2.0 Characteristics of Noise

Noise is essentially defined as unwanted sound. It is emitted from many natural and man-made sources. Highway traffic noise is usually a composite of noises from engine exhaust, drive train, and tire-roadway interaction.

The magnitude of noise is usually described by a ratio of its sound pressure to a reference sound pressure, typically twenty micro-Pascals (20μPa). Since the range of sound pressure ratios varies greatly – over many orders of magnitude, a base-10 logarithmic scale is used to express sound levels in dimensionless units of decibels (dB). The commonly accepted limits of detectable human hearing sound magnitudes are between the threshold of hearing at 0 decibels and the threshold of pain at 140 decibels.

Sound frequencies are reported in units of Hertz (Hz), which correspond to the number of vibrations per second of a given tone. A cumulative 'sound level' is equivalent to ten times the base-10 logarithm of the ratio of the sum of the sound pressures of all frequencies to the reference sound pressure. To simplify the mathematical process of determining sound levels, sound frequencies are grouped into ranges, or 'bands.' Sound levels are then calculated by adding the cumulative sound pressure levels within each band – which are typically defined as one 'octave' or '1/3 octave' of the sound frequency spectrum.

The commonly accepted limitation of human hearing to detect sound frequencies is between 20 Hz and 20,000 Hz, and human hearing is most sensitive to the frequencies between 1,000 Hz – 6,000 Hz. Although people are generally not as sensitive to lower-frequency sounds as they are to higher frequencies, most people lose the ability to hear high-frequency sounds as they age.

To accommodate varying receptor sensitivities, frequency sound levels are commonly adjusted, or 'filtered', before being logarithmically added and reported as a single 'sound level' magnitude of that filtering scale. The 'A-weighted' decibel filtering scale applies numerical adjustments to sound frequencies to emphasize the frequencies at which human hearing is sensitive and to minimize the frequencies to which human hearing is not as sensitive, as shown in Table 1.

Table 1: Comparison of Unweighted vs A-Weighted Sound Levels for a Truck

Octave-Band Center Frequency (Hz)	Unweighted Sound Level from a Truck (dB)	Adjustment of Unweighted Sound to Reflect What Human Ear Hears (dB)	Sound Level that Human Ear Perceives = A-Weighted Sound Level or dB(A)
31	75	-39	36
63	78	-26	52
125	83	-16	67
250	84	-9	75
500	81	-3	78
1000	75	0	75
2000	71	1	72
4000	63	1	64
8000	54	-1	53
	89		**82**
	Total Unweighted Sound Level in dB		**Total A-Weighted Sound Level in dB(A)**

The A-weighted scale is commonly used in highway traffic noise studies because the typical frequency spectrum of traffic noise is higher in magnitude at the frequencies at which human hearing is noise sensitive (1,000 Hz to 6,000 Hz).

Several examples of noise levels expressed in dB(A) are listed in Table 2. A review of Table 2 indicates that most individuals are exposed to fairly high noise levels from many sources on a regular basis. In order to perceive sounds of greatly varying pressure levels, human hearing has a non-linear sensitivity to sound pressure exposure. For example, doubling the sound pressure results in a three decibel change in the noise level; however, variations of three decibels (3 dB(A)) or less are commonly considered "barely perceptible" to normal human hearing. A five decibel (5 dB(A)) change is more readily noticeable. By definition, a ten-fold increase in the sound pressure level correlates to a 10 decibel (10 dB(A)) noise level increase; however, it is judged by most people as only a doubling of the loudness – sounding "twice as loud".

Table 2: Common Indoor and Outdoor Noise Levels

Common Outdoor Noise Levels	Noise Level (dB(A))	Common Indoor Noise Levels
	110	Rock Band
Jet Flyover at 1,000 feet	100	Inside Subway Train (NY)
Gas Lawn Mower at 3 feet		
Diesel Truck at 50 feet	90	Food Blender at 3 feet
Noisy Urban Daytime	80	Garbage Disposal at 3 feet
Gas Lawn Mower at 100 feet	70	Vacuum Cleaner at 10 feet
Commercial Area		Normal Speech at 3 feet
	60	
		Large Business Office
Quiet Urban Daytime	50	Dishwasher Next Room
Quiet Urban Nighttime	40	Small Theater, Large Conference Room (Background)
Quiet Suburban Nighttime		Library
	30	
Quiet Rural Nighttime		Bedroom at Night, Concert Hall (Background)
	20	
		Broadcast and Recording Studio
	10	
	0	Threshold of Hearing

Adapted from Guide on Evaluation and Attenuation of Traffic Noise, American Association of State Highway and Transportation Officials (AASHTO). 1974 (revised 1993).

The degree of disturbance or annoyance from exposure to unwanted sound (noise) depends upon three factors:

1. The amount, nature, and duration of the intruding noise;
2. The relationship between the intruding noise and the existing (ambient) sound environment; and
3. The situation in which the disturbing noise is heard.

In considering the first of these factors, it is important to note that individuals have varying sensitivity to noise. Loud noises bother some people more than others. The time patterns and durations of noise(s) also affect perception as to whether it is offensive. For example, noises that occur during nighttime (sleeping) hours are typically considered to be more offensive than the same noises occurring in the daytime.

Regarding the second factor, individuals tend to judge the annoyance of an unwanted noise in

terms of its relationship to noise from other sources (background noise). A car horn blowing at night when background noise levels are low would generally be more objectionable than during the afternoon when background noise levels are typically higher. The response to noise stimulus is analogous to the response to turning on an interior light. During the daytime, an illuminated bulb simply adds to the ambient light, but when eyes are conditioned to the dark of night, a suddenly illuminated bulb can be temporarily blinding.

The third factor, situational noise, is related to the interference of noise with activities of individuals. In a 60 dB(A) environment, such as is commonly found in a large business office, normal conversation would be possible, while sleep might be difficult. Loud noises may easily interrupt activities that require a quiet setting for greater mental concentration or rest; however, the same loud noises may not interrupt activities requiring less mental focus or tranquility.

Over time, individuals tend to accept the noises that intrude into their lives on a regular basis. However, exposure to prolonged and/or extremely loud noise(s) can prevent use of exterior and interior spaces and has been theorized to pose health risks. Appropriately, regulations exist for noise control or abatement from many particularly offensive sources, including airplanes, factories, railroads, and highways. For all “Type I” federal, state, or federal-aid highway projects in the State of Kansas, traffic and construction noise impact analysis and abatement assessment is dictated by the 2022 KDOT *Highway Traffic Noise Policy and Guidance*. Type I projects are generally those that include the construction of a highway on a new location, the physical and substantial alteration of an existing highway, the addition of a through-traffic lane(s), or the addition/substantial alteration of a weight station, rest stop, ride share lot, or toll plaza. The SLT West Section projects are Type I projects because they propose the addition of through-traffic lanes and substantially alter the horizontal alignment of K-10 in certain locations.

3.0 Existing Land Use and Noise Abatement Criteria

3.1 Project Land Use

Existing land use in the vicinity of the SLT West Section project is mostly residential. Additionally, several trails, sports complexes (including baseball fields and tennis courts), a hospital, a church, and undeveloped lands (mostly on the west side of K-10) exist in the study area.

For the purpose of this traffic noise study, the project area was divided into 15 Noise Sensitive Areas (NSAs) to group noise sensitive receptors influenced by similar noise sources. Receptors within 500’ of the project were generally included. Beyond this distance, noise impacts and any benefits provided by noise abatement are not anticipated. In certain locations, receptors were modeled further out to ensure all impacts and benefits were identified. The NSAs are defined as follows and are shown in Attachment A:

NSA 1 North of K-10 and west of Iowa Street
NSA 2: North and east of K-10 between approximately Clinton Parkway and the Kanza Southwind Nature Preserve
NSA 3: South and west of K-10 on either side of W 27th Street
NSA 4: North of K-10 along Clinton Parkway, between E 965 Road and the Pinnacle Woods Apartments
NSA 5: North and east of K-10 along Clinton Parkway, west of E 965 Road and south of N 1452 Road
NSA 6: South of K-10 and east of the Clinton Parkway interchange
NSA 7: East of K-10 between N 1452 Road and Bob Billings Parkway
NSA 8: East of K-10 between Bob Billings Parkway and US-40/6th Street
NSA 9: West of K-10 between Bob Billings Parkway and US-40/6th Street
NSA 10: East of K-10 between US-40/6th Street and N 1750 Road
NSA 11: West of K-10 between US-40/6th Street and N 1750 Road
NSA 12: East of K-10 between N 1750 Road and I-70
NSA 13: West of K-10 between N 1750 Road and I-70
NSA 14: East of K-10 and North of I-70
NSA 15: West of K-10 and North of I-70

3.2 Noise Abatement Criteria

FHWA has developed Noise Abatement Criteria (NAC) and procedures to be used in the planning and design of highways. The purpose of Title 23 CFR 772 is, “To provide procedures for noise studies and noise abatement measures to help protect the public’s health, welfare and livability, to supply noise abatement criteria, and to establish requirements for information to be given to local officials for use in the planning and design of highways approved pursuant to title 23 U.S.C.”

The abatement criteria and procedures are set forth in Title 23 CFR 772, which also states, “In abating traffic noise impacts, a highway agency shall give primary consideration to exterior areas where frequent human use occurs.” A summary of the NAC for various land uses is presented in Table 3. The L_{eq}, or equivalent sound level, is the equivalent steady-state sound level which in a stated period of time contains the same acoustical energy as a time-varying sound level during the same period. Regarding traffic noise, fluctuating sound levels of traffic noise are represented in terms of Leq, the steady, or ‘equivalent’, noise level with the same energy.

Table 3: Noise Abatement Criteria

Hourly Equivalent A-Weighted Sound Level (decibels (dB(A))			
Activity Category	Activity Criteria[1] $L_{eq(h)}$[2]	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[3]	67	Exterior	Residential
C[3]	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, Section4(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[3]	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. The $L_{eq(h)}$ Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.
2. The equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with $L_{eq(h)}$ being the hourly value of L_{eq}.
3. Includes undeveloped lands permitted for this activity category.

At single-family homes, one receptor is modeled at an exterior area of frequent human use at each residence. For multi-family dwellings, a receptor is placed at each individual exterior activity areas (such as balconies). At other noise sensitive locations (including the trails, sports complexes, hospital, and church in the study area), receptors are generally analyzed at either each exterior area distinctly recognized for human activity or at one (1) location per Midwest Median Lot (12,000 ft^2). Additionally, each formal trail crossing is represented with one (1) receptor.

4.0 Existing Noise Levels and Model Validation

K-10 traffic is the dominant noise source for the majority of receptors in proximity to the existing SLT West Section. For certain receptors near I-70, I-70 is a larger noise contributor due to the higher volumes and speeds. In addition to gathering information and making general observations about the project study area, noise measurements and field work are conducted to develop a comparison between noise levels measured in the field at locations where traffic noise is the dominant noise source and the predicted hourly-equivalent traffic noise levels obtained from FHWA's Traffic Noise Model (TNM), Version 2.5. This exercise is performed to

validate the model to local conditions so that it can be used with confidence to predict the future loudest-hour equivalent noise levels and assess potential traffic noise impacts.

Noise measurement data was collected over a 15-minute period at nine (9) sites along the project corridor using sound level meters meeting ANSI and IEC Type 2 specifications. The sound level meters were calibrated in the field prior to each measurement. The noise measurement locations are shown in Attachments B1 – B31. The field measured L_{eq}, concurrent traffic counts, observed vehicle speeds, weather information for the monitoring sites, and laboratory calibration certificates are included in Appendix A.

To validate the accuracy of the traffic noise model, TNM 2.5 was used to compare the field measured L_{eq} to TNM-predicted hourly-equivalent traffic noise levels ($L_{eq(h)}$) at the field measurement locations. For each monitoring location, traffic volumes counted during the field measurement (15-minute) periods were normalized to one (1)-hour volumes. These normalized volumes were assigned to the corresponding project area roadways to simulate the noise source strength at the roadways during the actual measurement period. Speeds were observed during field measurements and input into TNM. TNM-predicted hourly-equivalent traffic noise levels were then compared to the noise levels measured in the field to determine the accuracy of the model. The KDOT-accepted tolerance for TNM model validation is ±3.0 dB(A). The TNM-predicted hourly-equivalent traffic noise levels fell within the ±3.0 dB(A) tolerance when compared to the noise levels measured in the field at all nine (9) locations. The results of TNM model validation are shown in Table 4.

Table 4: Field Measured Existing Noise Levels

Measurement Site	Location	TNM-Predicted $L_{eq(h)}$ dB(A)[1]	Measured L_{eq} dB(A)[1]	Validation Delta (Pred. – Meas.)[1]
FM-1	NSA 1: On SLT Trail, south of Easy Living Manufactured Home Community	62.6	59.8	**2.8**
FM-2	NSA 2: South of Larkspur Court homes	63.0	60.1	**2.9**
FM-3	NSA 2: On Stoneback Drive	47.7	48.7	**-1.0**
FM-4	NSA 5: South of Lake Pointe Drive circle	58.3	56.0	**2.3**
FM-5	NSA 5: On south end of E 902 Road	59.8	60.6	**-0.8**
FM-6	NSA 7: On Lawrence Loop Trail near E 902 Rod and N 1500 Road curve	64.8	62.0	**2.8**
FM-7	NSA 8: First row of Renaissance Drive homes	60.8	58.2	**2.6**
FM-8	NSA 15: Near Heritage Baptist Church	57.5	55.6	**1.9**
FM-9	NSA 9: West of E 900 Road	59.7	57.7	**2.0**

[1]Hourly equivalent noise levels, $L_{eq(h)}$, are expressed to the nearest one-tenth decibels to ensure that TNM-predicted levels validate to within +/- 3.0 dB(A) of measured noise levels without the benefits of rounding.

5.0 Procedure for Predicting Future Noise Levels

Traffic noise emission is composed of several variables, including the number, types, and travel speeds of the vehicles, as well as the geometry of the roadway(s) on which the vehicles travel. Additionally, variables such as weather and intervening topography affect the transmission of traffic noise from the vehicle(s) to noise sensitive receptors.

In accordance with FHWA requirements, detailed computer models were created using the FHWA TNM 2.5 software. As mentioned previously, the computer models were validated to within acceptable tolerances of field-measured traffic noise data and were used to predict

loudest-hour equivalent traffic noise levels for receptor locations in the vicinity of the SLT West Section project.

Traffic noise consists of three primary parts: tire/pavement noise, engine noise, and exhaust noise. Of these sources, tire/pavement noise is typically the most offensive at unimpeded travel speeds. Sporadic traffic noises such as horns, squealing brakes, screeching tires, etc. are considered aberrant and are not included within the predictive model algorithm. Traffic noise is not constant; it varies in time depending upon the number, speed, type, and frequency of vehicles that pass by a given receptor. Furthermore, since traffic noise emissions are different for various types of vehicles, the TNM algorithm distinguishes between the source emissions from the following vehicle types: automobiles, medium trucks, heavy trucks, buses, and motorcycles, as shown in Table 5. The traffic noise prediction model uses the number and type of vehicles on the planned roadway, vehicle speeds, the physical characteristics of the road (curves, hills, depressions, elevations, etc.), receptor location and height, and, if applicable, barrier type, barrier ground elevation, and barrier segment top elevations.

Table 5: Traffic Noise Model (TNM) Vehicle Classification Types

TNM Vehicle Type	Description
Autos	All vehicles with two axles and four tires, including passenger cars and light trucks, weighing 9,900 pounds or less
Medium Trucks	All vehicles having two axles and six tires, weighing between 9,900 and 26,400 pounds
Heavy Trucks	All vehicles having three or more axles, weighing more than 26,400 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

Sources: FHWA Measurement of Highway-Related Noise, § 5.1.3 Vehicle Types.
FHWA Traffic Monitoring Guide, § 4.1 Classification Schemes

Interior hourly-equivalent noise levels are determined for NAC Category D land uses, such as hospitals, medical facilities and places of worship, by applying building noise reduction factors based on building type and window treatment that can be found in FHWA publication Highway Traffic Noise: Analysis and Abatement Guidance. One (1) NAC Category D receptor (Lawrence Memorial Hospital in NSA 10) is located in the study area.

The Preferred Alternative identified from the Supplemental Environmental Impact Statement process for the SLT West Section was used in this traffic noise study. Per FHWA regulation 772.9(d), the predictions documented in this report are based upon the Design Year 2045 Build Alternative traffic volumes resulting in the loudest predicted hourly-equivalent traffic noise levels for each receptor. Base Year 2019 and Design Year 2045 peak hour volumes were obtained from the SLT West Leg SEIS Traffic and Safety Appendix. Both AM and PM peak hours were modeled in all scenarios to predict the loudest hour.

6.0 Traffic Noise Impacts

Traffic noise impacts occur when the predicted hourly-equivalent traffic noise levels either: [a] approach or exceed the FHWA NAC (with "approach" defined in the KDOT noise policy as reaching one (1) decibel less than the NAC values listed in Table 4), or [b] substantially exceed

the existing noise levels by more than 10 dB. Thirty-six (36) noise impacts were identified in the Base Year 2019 scenario, 58 noise impacts were identified in the 2045 No-Build scenario, and 98 noise impacts were identified in the 2045 Build scenario. Noise impacts for each NSA are discussed below. Base Year 2019, 2045 No-Build, and 2045 Build hourly equivalent traffic noise levels (AM or PM peak, depending on which is the loudest) are listed in Appendix B.

NSA 1

NSA 1 is on the north side of K-10 and west of Iowa Street. There were 52 receptors analyzed in this area, including 50 residences at the Easy Living Manufactured Home Community and two (2) receptors on the SLT Trail. One (1) predicted noise impact was identified in the 2045 No-Build scenario, and two (2) predicted noise impacts were identified in the 2045 Build scenarios, both along the SLT trail.

NSA 2

NSA 2 is located north and east of K-10 between approximately Clinton Parkway and the Kanza Southwind Nature Preserve. Noise impacts were evaluated at 240 receptors, including 236 residences and four (4) trail locations. Of the 236 residences, 100 are located at the Aberdeen Apartments, including both first-story patios and second-story balconies. Eleven (11) traffic noise impacts were identified in the Base Year 2019 scenario, 27 traffic noise impacts were identified in the 2045 No-Build scenario, and 38 traffic noise impacts were identified in the 2045 Build scenario. One (1) of the traffic noise impacts is located along the KANZA Southwind Nature Preserver trail, and the remainder are at single-family homes and duplexes.

NSA 3

NSA 3 is located south and west of K-10 on either side of 27th Street. There are 19 receptors located in NSA 3, all NAC Activity Category C. These locations include the Clinton Lake Youth Sports Complex, the Arboretum/Sports Complex Trail, and the Clinton Lake Softball Complex. No traffic noise impacts were identified in any of the scenarios.

NSA 4

NSA 4 is located north of K-10 along Clinton Parkway, between E 965 Road and the Pinnacle Woods Apartments. Noise impacts were evaluated at 15 receptors, including five (5) residential receptors and 10 NAC Activity Category C receptors. The residential receptors included a single-family home and four (4) units at the Pinnacle Woods Apartments. The Activity Category C receptors included the tennis courts at the Genesis Health Clubs and the Clinton Parkway Trail. Five (5) traffic noise impacts were identified in the Base Year 2019 scenario, and six (6) traffic noise impacts were identified in the 2045 No-Build and Build scenarios, all located along the Clinton Parkway Trail.

NSA 5

NSA 5 is located north and east of K-10 along Clinton Parkway, west of E 965 Road and south of N 1452 Road. There were 103 receptors analyzed, including 95 residences and eight (8) receptors along the Clinton Parkway Trail and SLT Trail. Where the Clinton Parkway Trail is being realigned as part of the project, receptors were also relocated to the nearest proposed location. Seven (7) noise impacts were identified in the Base Year 2019 scenario, eight (8) impacts were identified in the 2045 No-Build scenario, and 25 noise impacts were identified in the 2045 Build

scenario, including 18 residences and seven (7) trail locations. Of the 25 receptors impacted, 19 were approaching the NAC values, four (4) had a substantial increase of more than 10 dB(A) between existing and build, and two (2) met both impact criteria, approaching the NAC values and having a substantial increase.

NSA 6

NSA 6 is located south of K-10 and east of the Clinton Parkway interchange. Two (2) receptors were analyzed for noise impacts, both located on the SLT Trail. No noise impacts were identified.

NSA 7

NSA 7 is located east of K-10 between N 1452 Road and Bob Billings Parkway. Noise impacts were evaluated at 14 receptors, including 10 single-family homes and four (4) on the SLT Trail. One noise impact was identified in all scenarios, located on the SLT Trail.

NSA 8

NSA 8 is located east of K-10 between Bob Billings Parkway and US-40/6th Street. Noise was evaluated at 105 receptors, including 101 residences and four (4) along the SLT Trail. One (1) noise impact was identified in the Base Year 2019 along the SLT Trail. Two (2) noise impacts were identified in the 2045 No-Build, both along the SLT Trail. In the 2045 Build, 14 noise impacts were identified, including two (2) along the SLT Trail and 12 residences.

NSA 9

NSA 9 is located west of K-10 between Bob Billings Parkway and US-40/6th Street. Three (3) single-family homes were analyzed. No noise impacts were identified.

NSA 10

NSA 10 is located east of K-10 between US-40/6th Street and N 1750 Road. Noise was evaluated at 15 receptors, including two (2) single-family homes, 10 locations on trails, one (1) at the Rock Chalk Park Track, one (1) at the Jayhawk Tennis Center, and one (1) at the Lawrence Memorial Hospital, which was analyzed for interior noise impacts. Six noise impacts were identified in the Base Year 2019 scenario, and seven (7) noise impacts were identified in the 2045 No-Build and Build scenarios, all located along the SLT Trail.

NSA 11

NSA 11 is located west of K-10 between US-40/6th Street and N 1750 Road. Seven (7) single-family homes were analyzed. No noise impacts were identified.

NSA 12

NSA 12 is located east of K-10 between 1750 Road and I-70. Four (4) single-family homes were analyzed. No noise impacts were identified.

NSA 13

NSA 13 is located west of K-10 between 1750 Road and I-70. Five (5) single-family homes were

analyzed. Two (2) noise impacts were identified in the Base Year 2019, three (3) noise impacts were identified in the 2045 No-Build, and two (2) noise impacts were identified in the 2045 Build. It was assumed the single-family home located at 844 N 1750 Road would be relocated in the Build Alternative, and it was not analyzed for noise impacts in that scenario.

NSA 14

NSA 14 is located east of K-10 and North of I-70. Seven (7) single-family homes were analyzed. One (1) noise impact was identified in all scenarios.

NSA 15

NSA 15 is located west of K-10 and North of I-70. Three (3) single-family homes were analyzed as well as one (1) receptor located at the Heritage Baptist Church. Two (2) noise impacts were identified in all scenarios, including one (1) at the church and one (1) at a residence.

Summary of Traffic Noise Impacts

As shown in Table 6, traffic noise is predicted to result in 98 total impacts in the 2045 Design Year Build Alternative.

Table 6: Traffic Noise Impact Summary for 2045 Build Alternative

Reason for Noise Impact	Summary of Impacted Receptors By Activity Category							
	A	B	C	D	E	F[1]	G[2]	All Activity Categories
Based on NAC Criteria Only	0	67	25	0	0	0	0	**92**
Based on Substantial Increase Criteria Only	0	4	0	0	0	0	0	**4**
Based on Both Criteria	0	1	1	0	0	0	0	**2**
TOTAL IMPACTS	0	72	26	0	0	0	0	**98**

1. *There are no impact criteria for land use facilities in this activity category and no analysis of noise impacts is required.*
2. *There are no impact criteria for undeveloped lands but some noise levels may need to be provided to local officials to aid them in future land use planning efforts.*

7.0 Potential Traffic Noise Abatement Measures

FHWA and KDOT require that feasible and reasonable noise abatement measures be considered and evaluated for the benefit of all predicted build-condition traffic noise impacts. Feasibility and reasonableness are distinct and separate considerations. Feasibility is the combination of acoustical and engineering factors considered in the evaluation of a noise barrier, such as topography, access, drainage, safety, and maintenance. Reasonableness is the consideration of the social, economic, and environmental factors considered in the evaluation of a noise barrier.

Feasibility criteria specifically include:

- Safety: The noise barrier shall not excessively restrict sight distances, restrict drainage or exacerbate potential flooding.

- Maintenance: Access is needed to both sides of the barrier.
- Acoustic Considerations: An acoustically feasible noise barrier must have a minimum of three first-row impacted receptors and must achieve at least a five dB(A) highway traffic noise reduction for 80% of first-row impacted receptors.

Reasonableness criteria specifically include:

- Noise Reduction Design Goal: The noise barrier must achieve a minimum of seven (7) dBA insertion loss for the majority of benefited receptors or a minimum of an eight (8) dBA insertion loss for at least one (1) impacted Activity Category B receptor that will benefit from the noise barrier. A minimum of five (5) dBA insertion loss per receptor is counted as one (1) benefited receptor.
- Cost: Barrier cost-effectiveness is defined as area of noise barrier per benefited receptor (i.e. receptor with a five (5) dBA insertion loss) and is calculated by taking the total area of a proposed noise wall divided by the number of benefited receptors determined for the noise wall. For a noise barrier to meet the cost effectiveness criteria, barrier cost effectiveness shall not exceed 1,200 square feet per benefited receptor.
- Public Approval: Viewpoints of benefited receptors are solicited via a ballot. One (1) ballot is assigned to each property with the following weight points:
    - Benefited property owner per residence / unit = 1 point
    - Benefited tenant per residence / unit = 1 point

  A noise barrier shall be permitted when the majority of the points indicate approval of the barrier. Support for or opposition of a noise barrier is based on responses received, provided that 50 percent or more of the points available are returned from the benefited owners and tenants by the deadline. If a majority of points are not returned, then a reminder by any reasonable and easily verifiable means will be sent extending the deadline as appropriate. If a majority of benefited receptors still do not respond, KDOT will make a final determination on the noise abatement.

Noise barriers were evaluated for every receptor predicted to be impacted in the build alternative. Depending on the location of the noise impacts, barriers were analyzed in either the AM or the PM peak hour, whichever was determined to be the loudest hour. Generally, barriers were analyzed along the shoulder of K-10 or near the right-of-way line depending on the topography of the area. In certain locations, multiple barriers were analyzed.

Five (5) noise barriers were determined to be both preliminarily feasible and reasonable per KDOT's traffic noise policy, pending a vote of the benefitted receptors. The remaining barriers were either determined to not be feasible or exceeded the maximum of 1,200 square feet of wall allotted per benefited receptor. The following breakdown provides details regarding each of the noise barriers examined. Additional information on individual noise loss reductions can be found in Appendix C, and the locations of the analyzed barriers are shown in Attachments B1-B31.

- **Noise Wall 1 – NSA 1**
    - First-row Impacted Receptors: 2
    - Feasible: No
        - A feasible barrier must have a minimum of three first-row impacted receptors.

- **Noise Wall 2A – NSA 2**
    - Feasible: Yes
    - Length of barrier: 1,056'
    - Average height of barrier: 14.1'

- Square footage: 14,910 ft^2
- Benefited receptors: 23
- Square footage of wall per benefitted receptor: 648
- Reasonable: Yes

- **Noise Wall 2B – NSA 2**
  - First-row impacted receptors receiving at least a 5 dBA reduction: 0
  - Feasible: No
    - 80% of first-row impacted receptors must achieve at least a five (5) dBA reduction

- **Noise Wall 2C – NSA 2**
  - Feasible: Yes
  - Length of barrier: 1,523’
  - Average height of barrier: 18.5’
  - Square footage: 28,229 ft^2
  - Benefited receptors: 26
  - Square footage of wall per benefitted receptor: 1,086
  - Reasonable: Yes

- **Noise Wall 4 – NSA 4**
  - First-row impacted receptors receiving at least a 5 dBA reduction: 1
  - Feasible: No
    - 80% of first-row impacted receptors must achieve at least a five (5) dBA reduction

- **Noise Wall 5A – NSA 5**
  - Feasible: Yes
  - Length of barrier: 1,495’
  - Average height of barrier: 15.9’
  - Square footage: 23,757 ft^2
  - Benefited receptors: 21
  - Square footage of wall per benefitted receptor: 1,131
  - Reasonable: Yes

- **Noise Wall 5B – NSA 5**
  - Feasible: Yes
  - Length of barrier: 1,236’
  - Average height of barrier: 17.3’
  - Square footage: 21,410 ft^2
  - Benefited receptors: 19
  - Square footage of wall per benefitted receptor: 1,127
  - Reasonable: Yes

- **Noise Wall 7 – NSA 7**
  - First-row Impacted Receptors: 1
  - Feasible: No
    - A feasible barrier must have a minimum of three first-row impacted receptors.

- **Noise Wall 8 – NSA 8**
  - Feasible: Yes
  - Length of barrier: 2,301’
  - Average height of barrier: 10.1’
  - Square footage: 23,208 ft^2
  - Benefited receptors: 37
  - Square footage of wall per benefitted receptor: 627
  - Reasonable: Yes

- **Noise Wall 10 – NSA 10**
  - Feasible: Yes
  - Length of barrier: 7,571’
  - Average height of barrier: 6.9’
  - Square footage: 52,037 ft^2
  - Benefited receptors: 6
  - Square footage of wall per benefitted receptor: 8,673
  - Reasonable: No

- **Noise Wall 13 – NSA 13**
  - First-row Impacted Receptors: 2
  - Feasible: No
    - A feasible barrier must have a minimum of three first-row impacted receptors.

- **Noise Wall 14 – NSA 14**
  - First-row Impacted Receptors: 1
  - Feasible: No
    - A feasible barrier must have a minimum of three first-row impacted receptors.

- **Noise Wall 15 – NSA 15**
  - First-row Impacted Receptors: 2
  - Feasible: No
    - A feasible barrier must have a minimum of three first-row impacted receptors.

8.0 Construction Noise

The predominant construction activities associated with this project are expected to be earth removal, hauling, grading, and paving. Temporary and localized construction noise impacts may occur as a result of these activities. During daytime hours, the predicted effects of these impacts could be temporary speech interference for passers-by and those individuals living or working near the project. During evening and nighttime hours, steady-state construction noise emissions, such as those from paving operations, could be audible and may cause impacts to activities such as sleep. Sporadic evening and nighttime construction equipment noise emissions, such as from backup alarms, lift gate closures (“slamming” of dump truck gates),

etc., will be perceived as distinctly louder than the steady-state acoustic environment, and could impact the general peace and usage of noise-sensitive areas – particularly residences.

Construction activities that will produce extremely loud noises should be scheduled during times of the day when such noises will create as minimal disturbance as possible, specifically weekday daytime hours since the primary land use expected to be temporarily impacted by construction noise for the project is residential.

Generally, low-cost and easily implemented construction noise control measures should be incorporated into the project plans and specifications to the extent possible. These measures include, but are not limited to, work-hour limits, equipment exhaust muffler requirements, haul-road locations, elimination of "tail gate banging", ambient-sensitive backup alarms, construction noise complaint mechanisms, and consistent and transparent community communication.

9.0 Local Officials' Statement

A copy of this report will be provided to local officials in the City of Lawrence. Per 23 CFR 772.9(c) and the KDOT noise policy, noise contour lines shall not be used for determining highway traffic noise impacts. However, the 71 dB(A) and 66 dB(A) noise level contour information should assist local authorities in exercising land use control over the remaining undeveloped lands (NAC "G"), so as to avoid development of incompatible activities near the SLT West Section project.

Noise contours were developed for representative locations of undeveloped lands throughout the project study area. However, for individual locations, the distance at which traffic noise impacts will occur can vary depending on several factors including, but not limited to, traffic volumes, nearby topography, shielding from nearby structures, etc. Table 7 shows contour distances correlating to the traffic noise impact thresholds for FHWA NAC "E" land uses, 71 dB(A), and NAC "B" and "C" land uses, 66 dB(A). Given the variation in cross sections and elevations adjacent to the project, it is recommended that any future development proposed in the area of the project be modeled with accurate survey data to avoid creating incompatible land uses adjacent to the project.

Table 7: Predicted 2045 Build Alternative Traffic Noise Level Contours

Approx. NSA	Location	Predicted Contour Distances from Centerline (K-10 or I-70)	
		71 dB(A)	66 dB(A)
1	North and south of K-10 between US-59 and Wakarusa Drive	**250'**	**325'**
2 & 3	North and south of K-10 near Wakarusa Drive	**200'**	**300'**
4 & 5	North of K-10 and east of Clinton Parkway	**200'**	**325'**
6	South of K-10 and east of Clinton Parkway	**200'**	**300'**
7	East and west of K-10 between Clinton Parkway and Bob Billings Parkway	**200'**	**300'**
8	East of K-10 between Bob Billings Parkway and 6th Street	**225'**	**350'**
9	West of K-10 between Bob Billings Parkway and 6th Street	**200'**	**350'**
10	East of K-10 between 6th Street and I-70	**175'**	**225'**
11	West of K-10 between 6th Street and I-70	**175'**	**275'**
12	South of I-70 and east of K-10	**275'**	**425'**
13	South of I-70 and west of K-10	**275'**	**500'**
14	North of I-70 and east of K-10	**300'**	**500'**
15	North of I-70 and west of K-10	**275'**	**425'**

10.0 Summary

KDOT projects 10-23 KA-3634-02 and 40-23 KA-3634-03 propose improvements to a nearly nine (9)-mile segment of K-10 in Lawrence, KS. The Preferred Alternative would provide proposed improvements extending from US-59/Iowa Street to I-70 at North 1800 Road/Farmer's Turnpike in Douglas County. The purpose of the proposed improvements is to reduce congestion, enhance safety, promote a multimodal transportation system, and support local and regional growth.

Traffic noise impacts and temporary construction noise impacts can be a consequence of transportation projects, especially for noise-sensitive land uses near high-volume and/or high-speed existing steady-state traffic noise sources. This traffic noise study utilized computer models created with the FHWA TNM 2.5 software, validated with field-collected traffic noise measurement data, to determine existing, and to predict future, loudest-hour equivalent noise levels and identify impacted receptors resulting from the SLT West Section project.

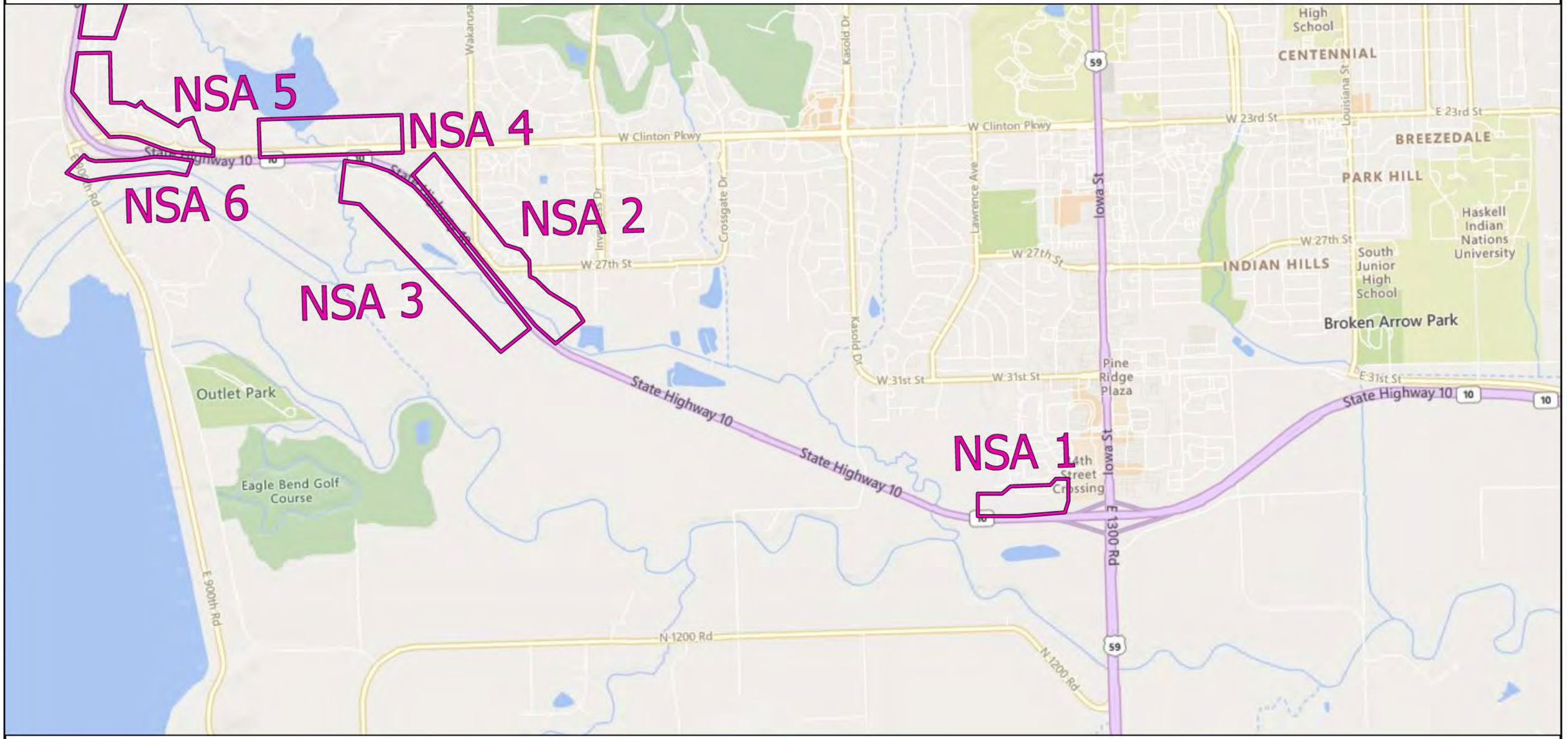
In the vicinity of the SLT West Section project, 595 receptors were analyzed for noise impacts. The receptors are comprised of residences, apartments, multi-use trails, places of worship, and recreational facilities. Of the 595 total receptors, 36 noise impacts were identified in the 2019 Base Year, 58 impacts were identified in the 2045 No-Build, and 98 impacts were identified in the 2045 Build Alternative.

As is required in KDOT's 2022 *Highway Traffic Noise Policy and Guidance*, consideration for noise abatement measures was given to all impacted receptors for the SLT West Section project. Five (5) noise abatement measures, in the form of noise walls, preliminarily meet both the feasibility and reasonableness criteria that would benefit 126 individual receptors. A vote of the benefitted receptors at each noise wall location will be held to determine if noise walls will be implemented into the project.

SLT South Lawrence Trafficway

Noise Sensitive Areas

Attachment A-1



— Noise Sensitive Area Boundaries

Feet

0 1,500 3,000 6,000

N

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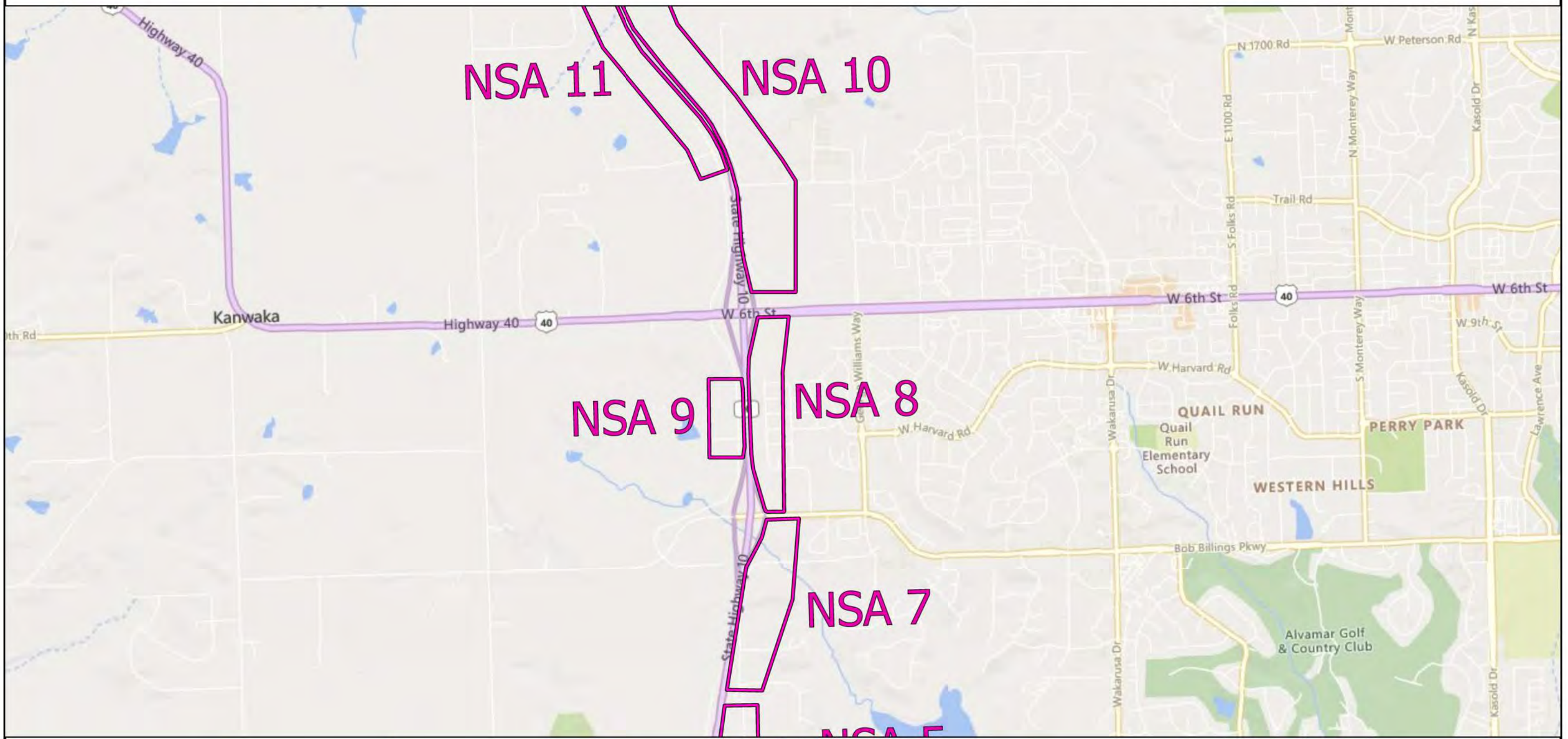
Noise Sensitive Areas

Attachment A-2



— Noise Sensitive Area Boundaries

N

Feet

0 1,500 3,000 6,000

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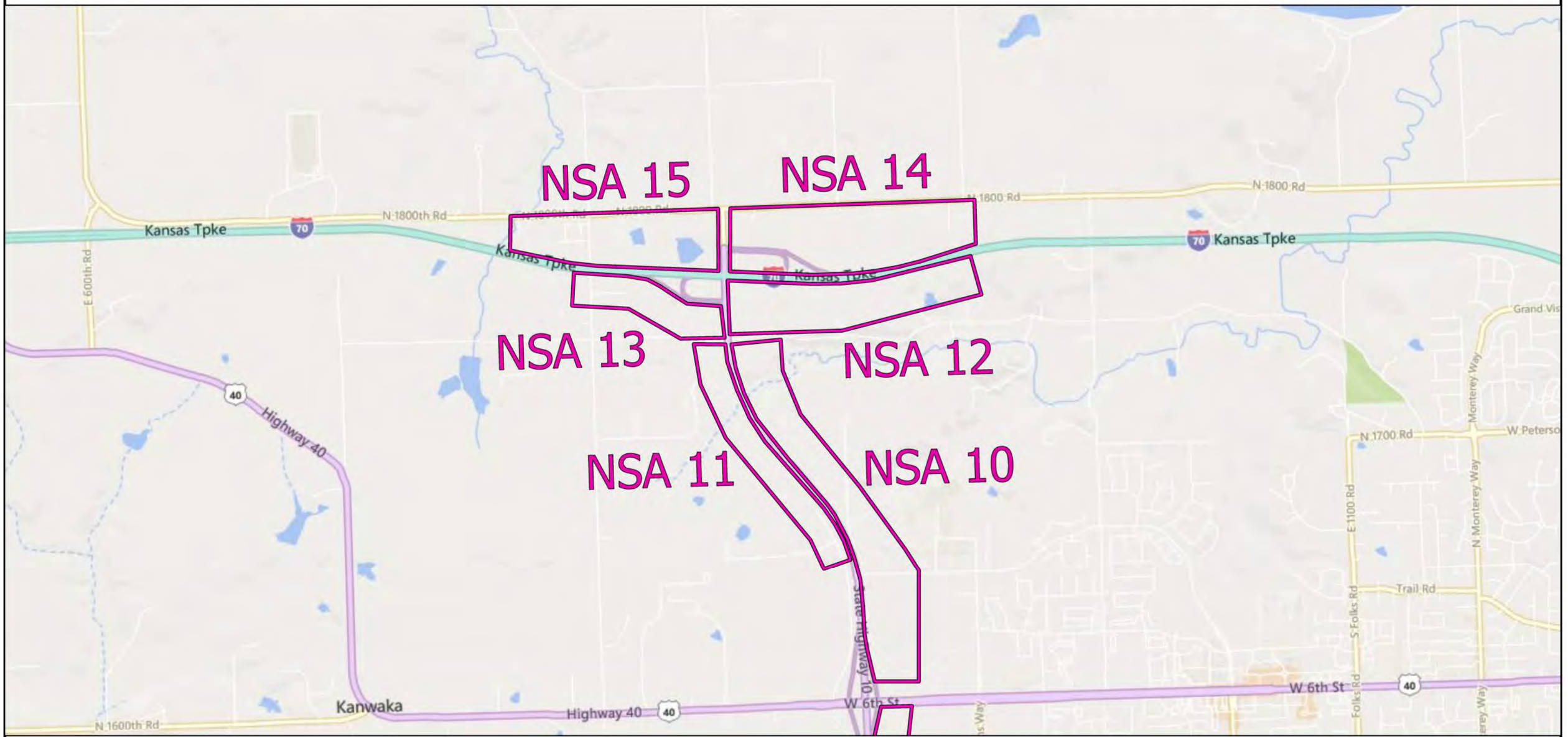
Noise Sensitive Areas

Attachment A-3



— Noise Sensitive Area Boundaries

N

Feet

0 1,500 3,000 6,000

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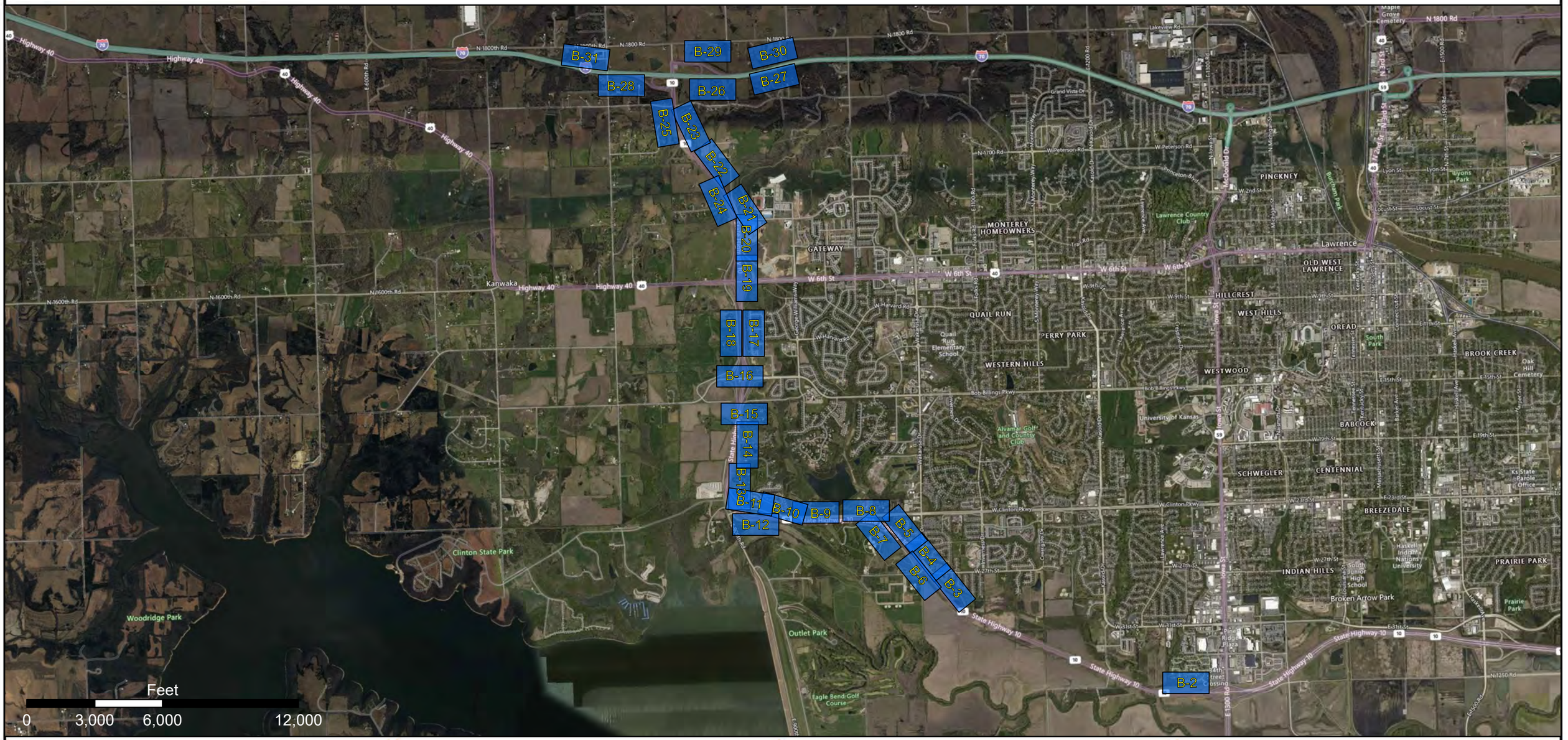
Noise Receptor Locations Attachment B-1



Attachment Number

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Noise Receptor Locations Attachment B-2

- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

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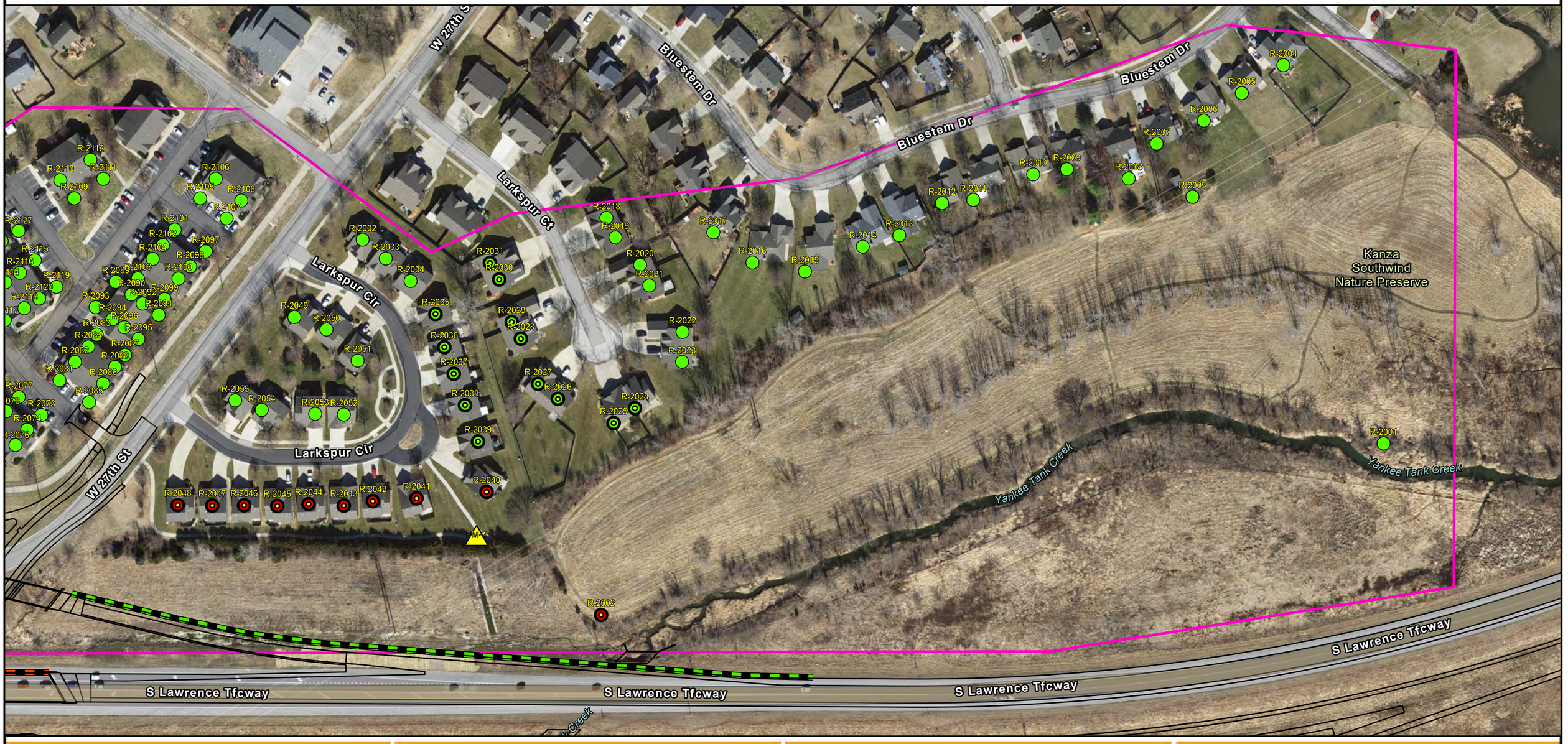
Noise Receptor Locations Attachment B-3



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- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

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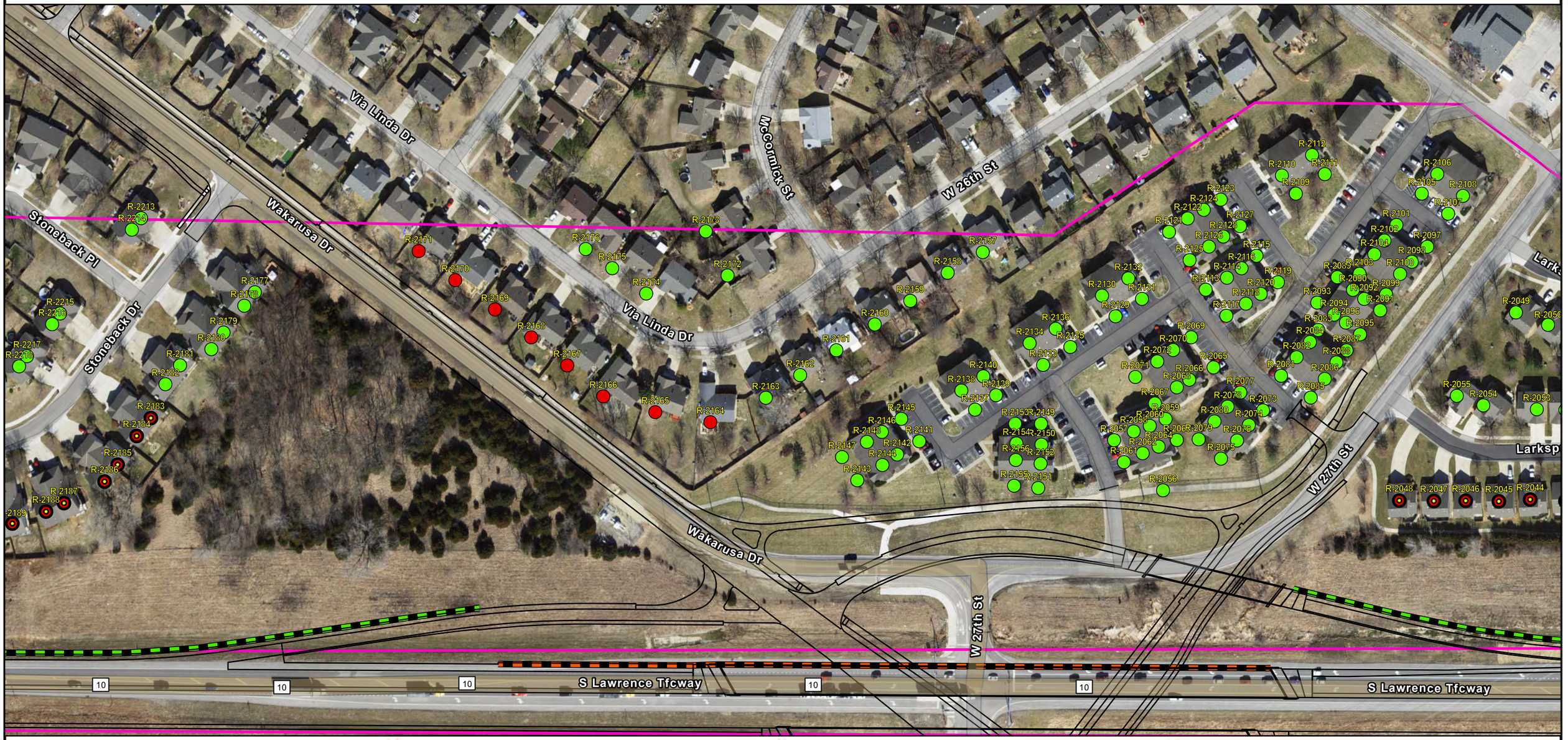
Noise Receptor Locations Attachment B-4



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- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

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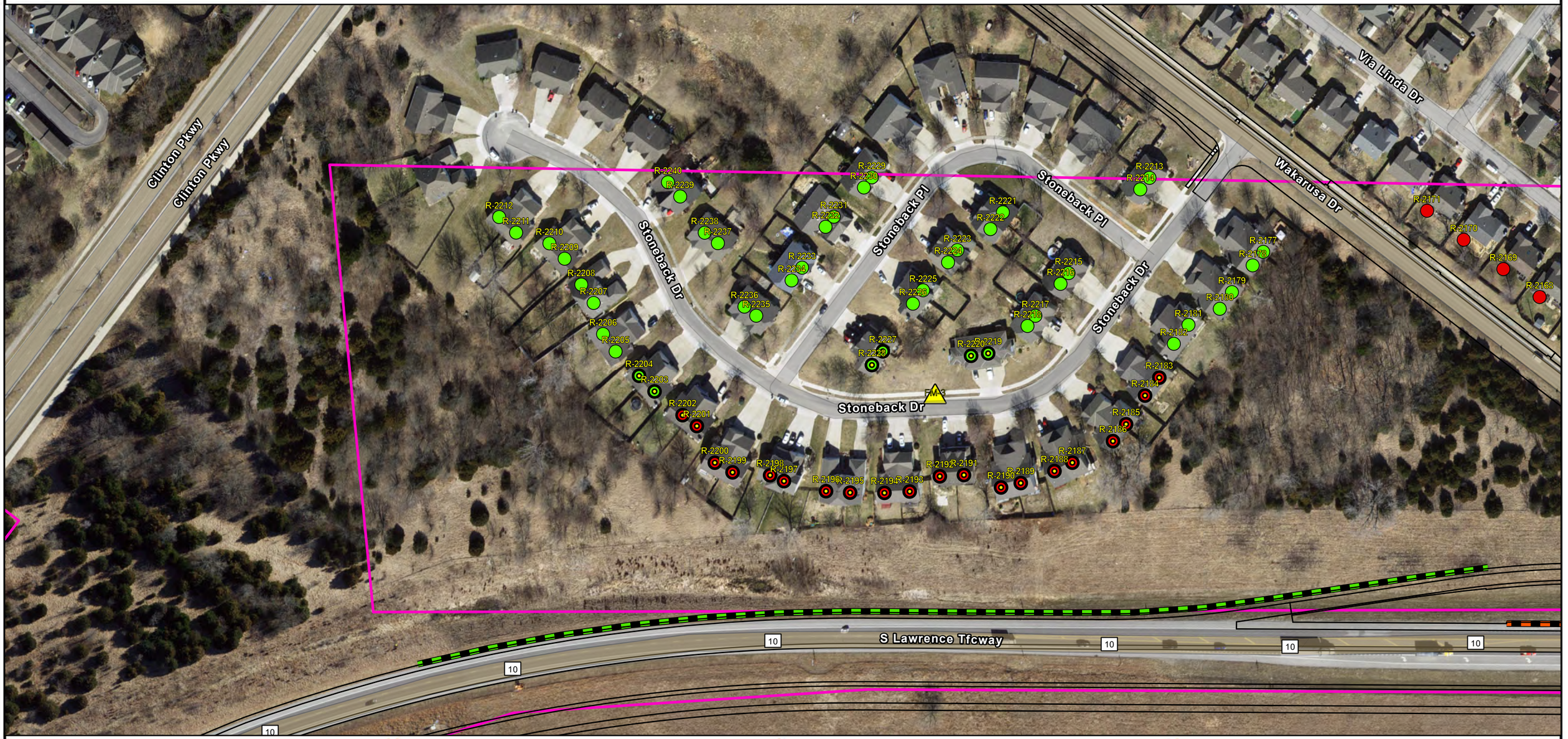
Noise Receptor Locations Attachment B-5



- Non-Impacted, Non-Benefitted Receiver
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- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

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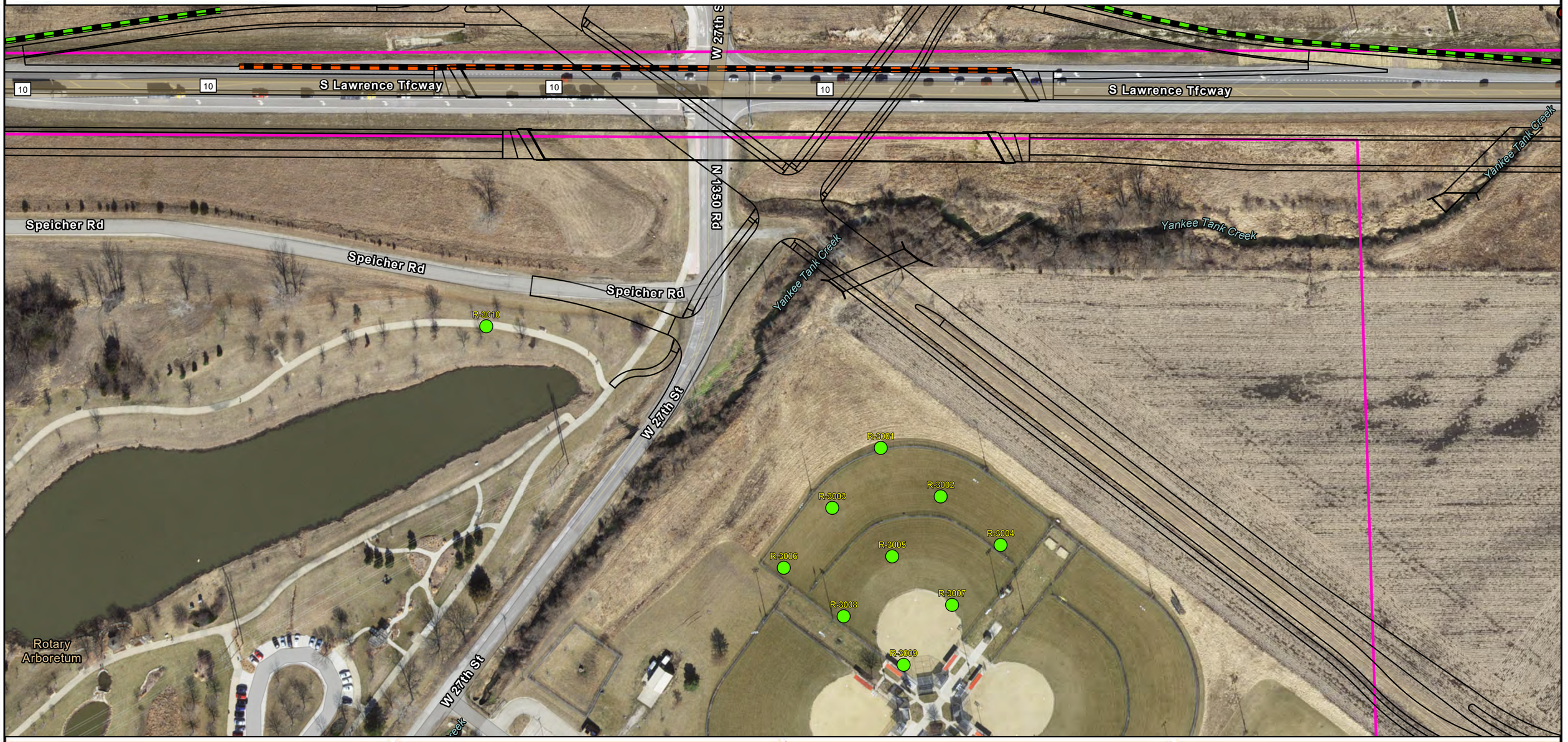
Noise Receptor Locations Attachment B-6



- Non-Impacted, Non-Benefitted Receiver
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- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

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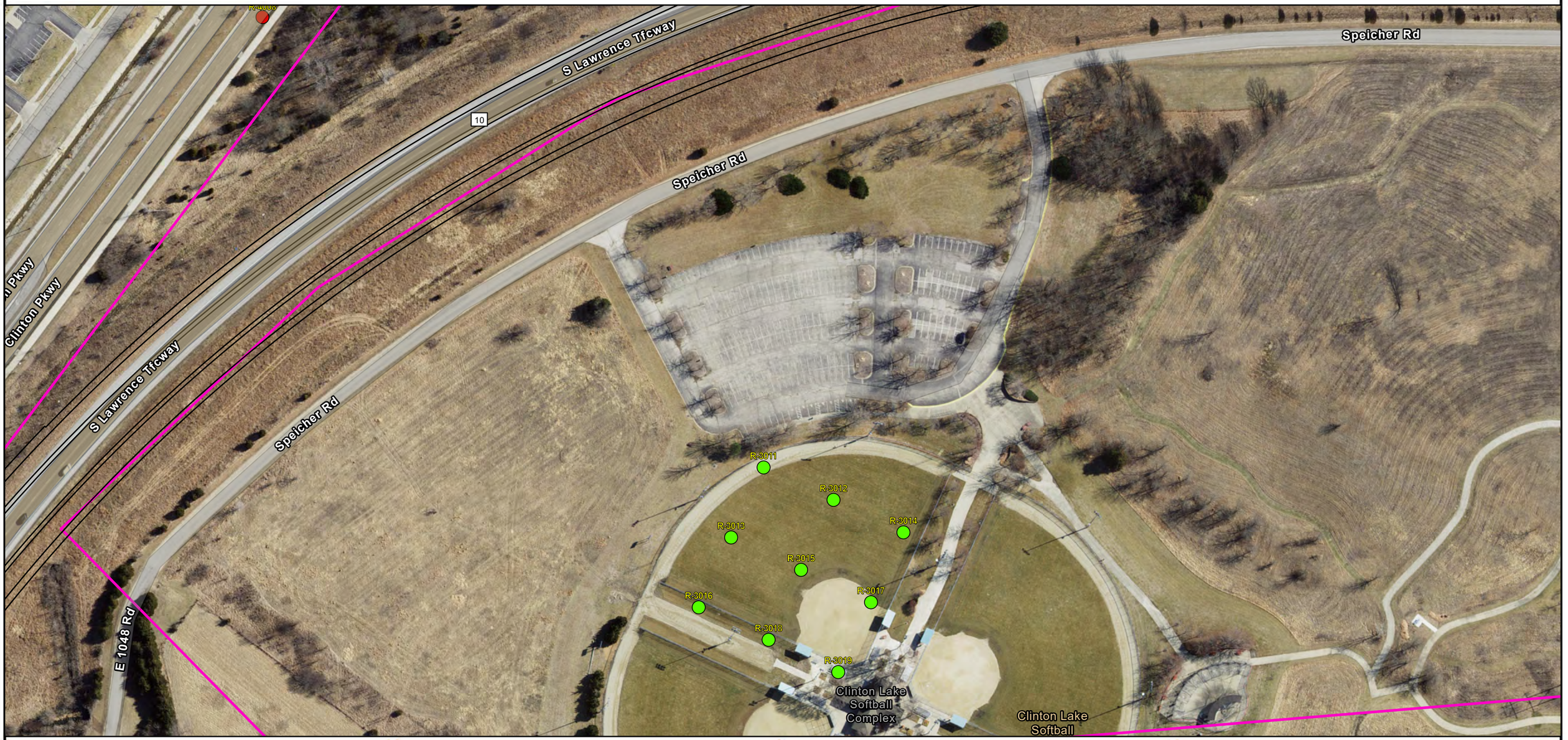
Noise Receptor Locations Attachment B-7



- Non-Impacted, Non-Benefitted Receiver
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- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

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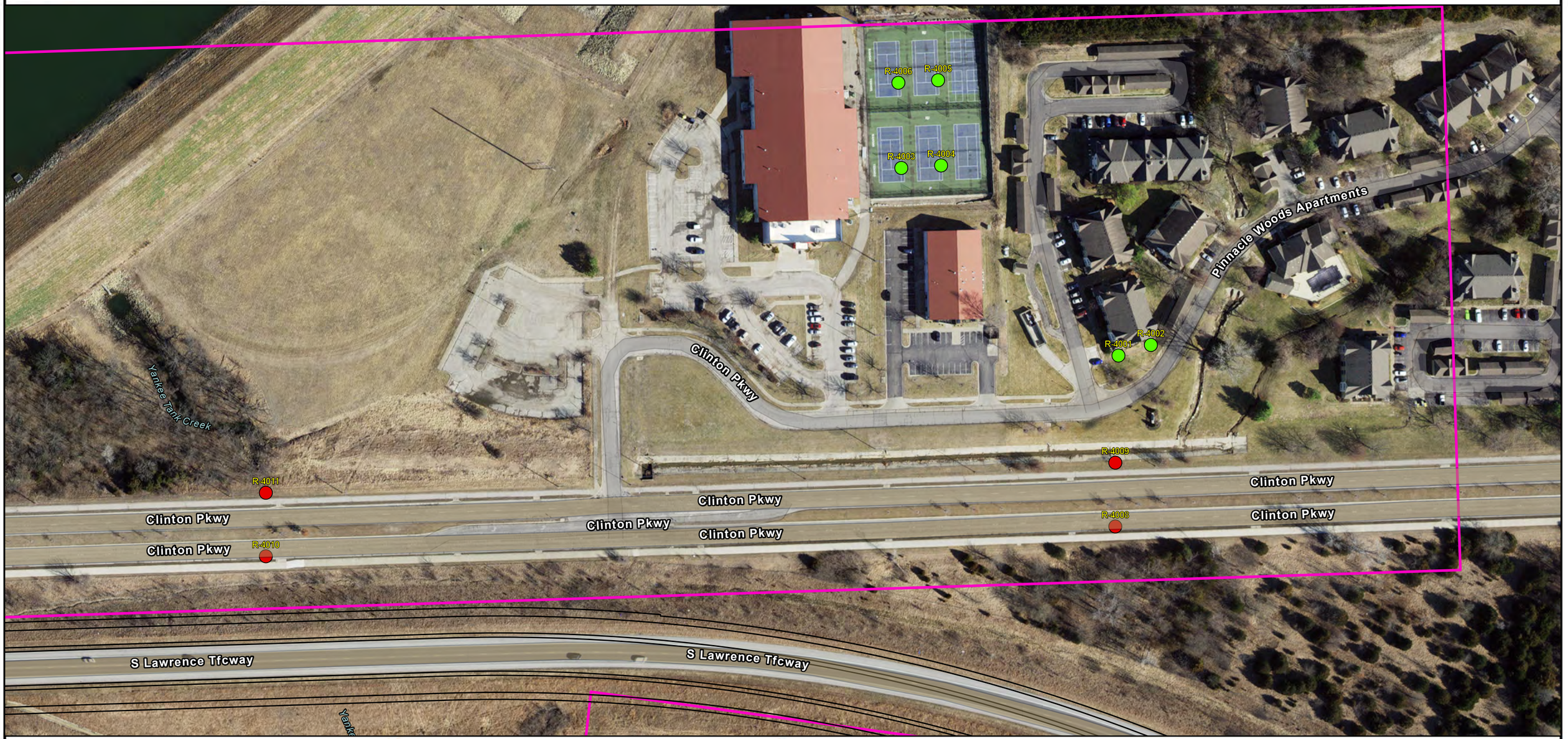
Noise Receptor Locations Attachment B-8



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- Field Measurement Locations

N

Feet

0 125 250 500

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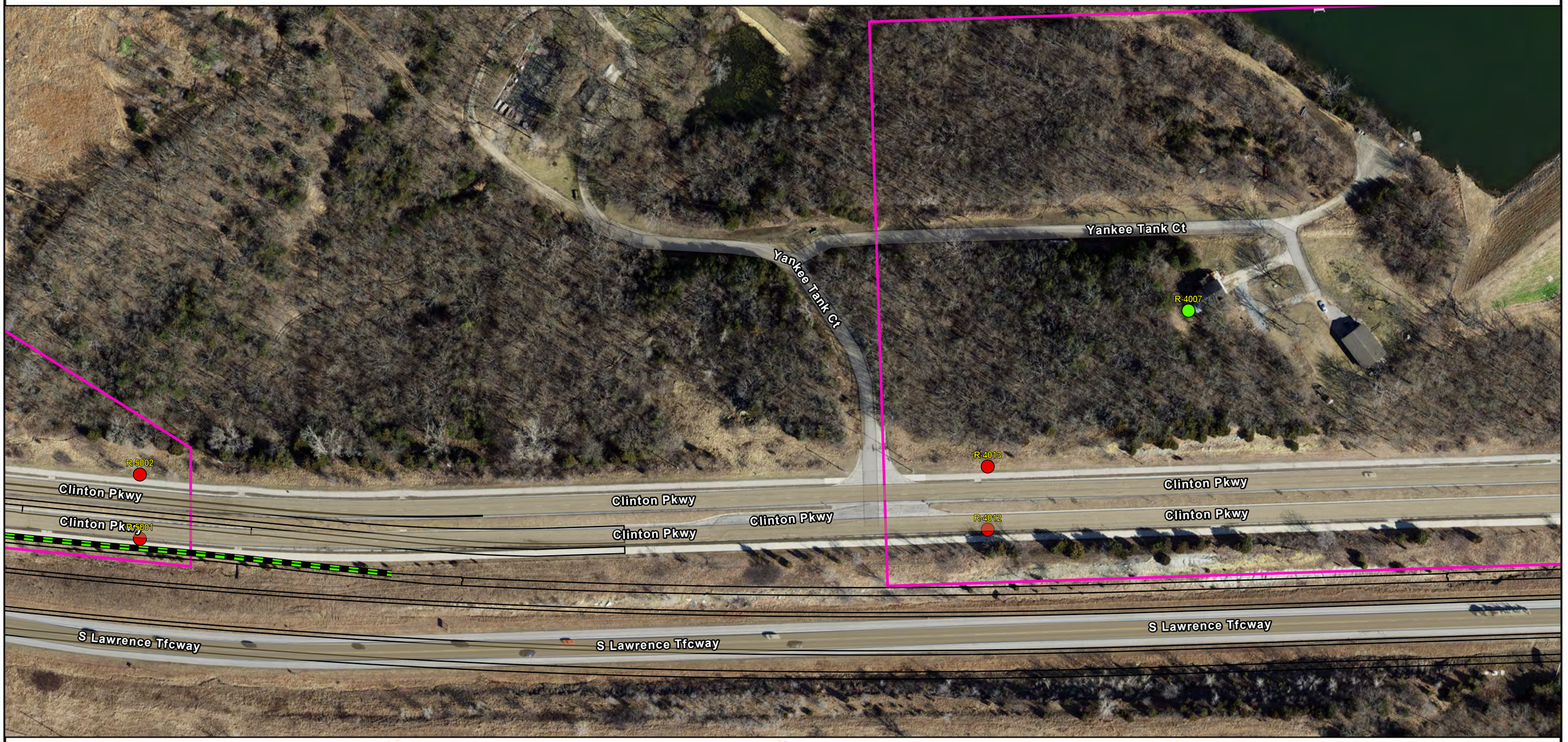
Noise Receptor Locations Attachment B-9



- Non-Impacted, Non-Benefitted Receiver
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- Noise Wall - Feasible and Reasonable
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- Field Measurement Locations

N

Feet

0 125 250 500

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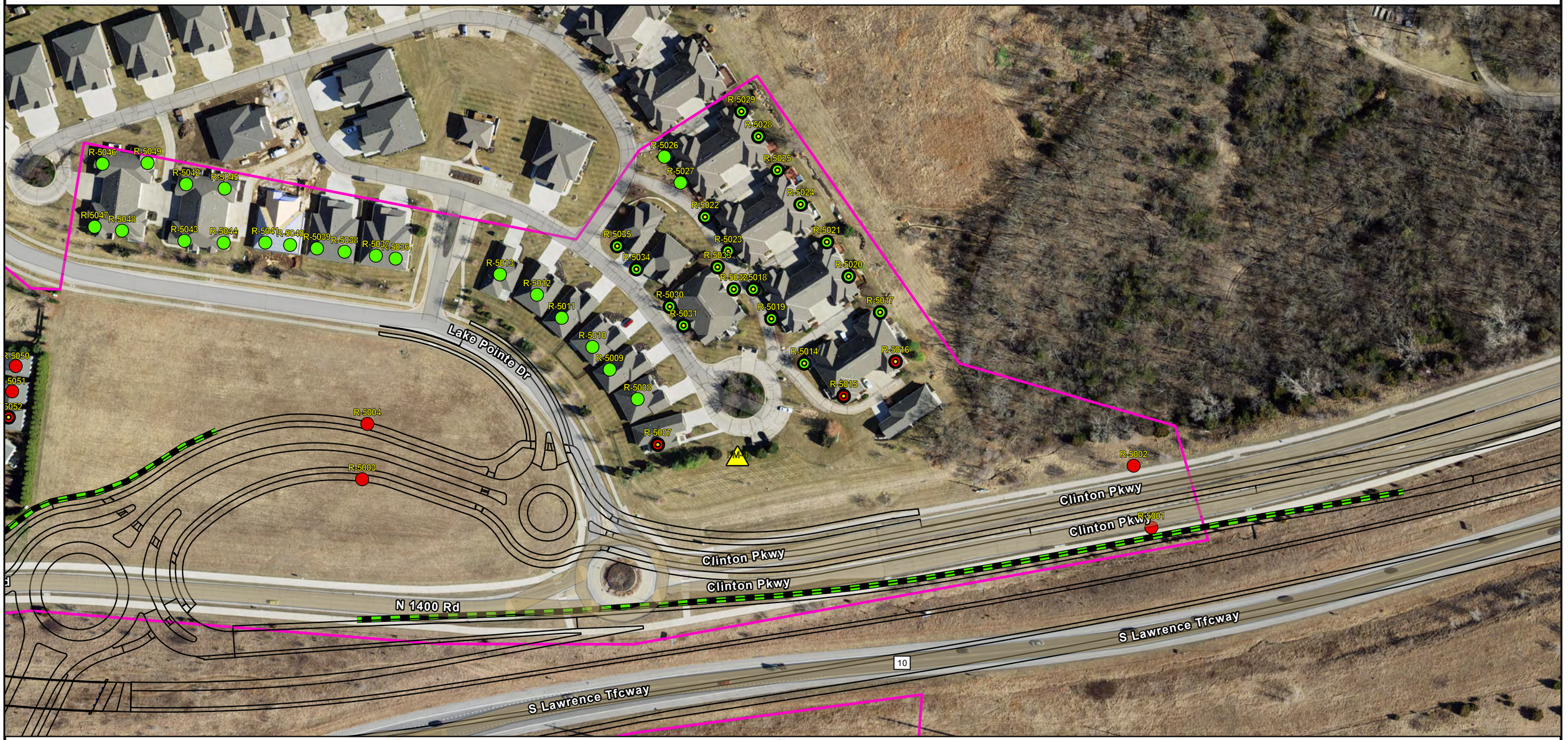
Noise Receptor Locations Attachment B-10



- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

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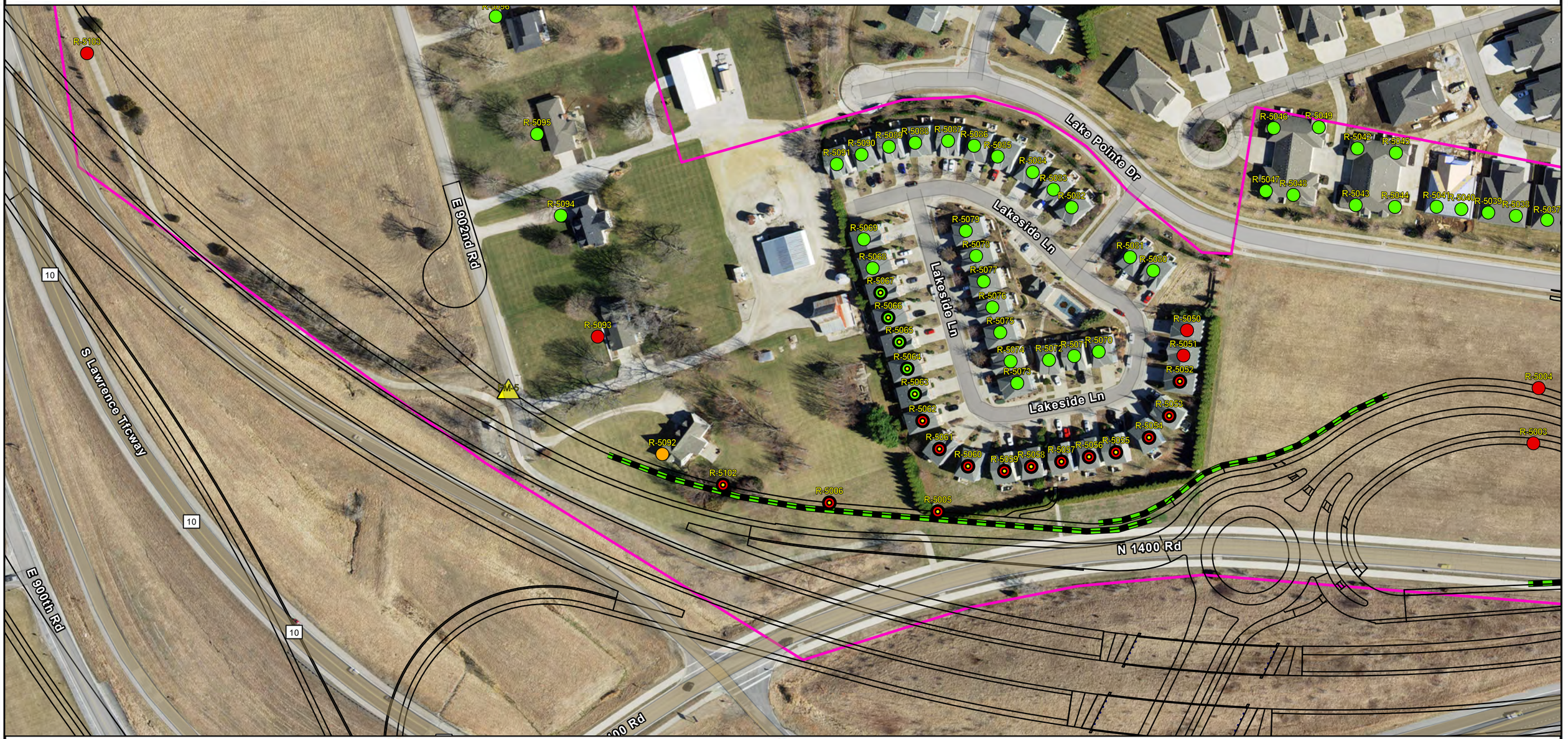
Noise Receptor Locations Attachment B-11



- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

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Noise Receptor Locations Attachment B-12

- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

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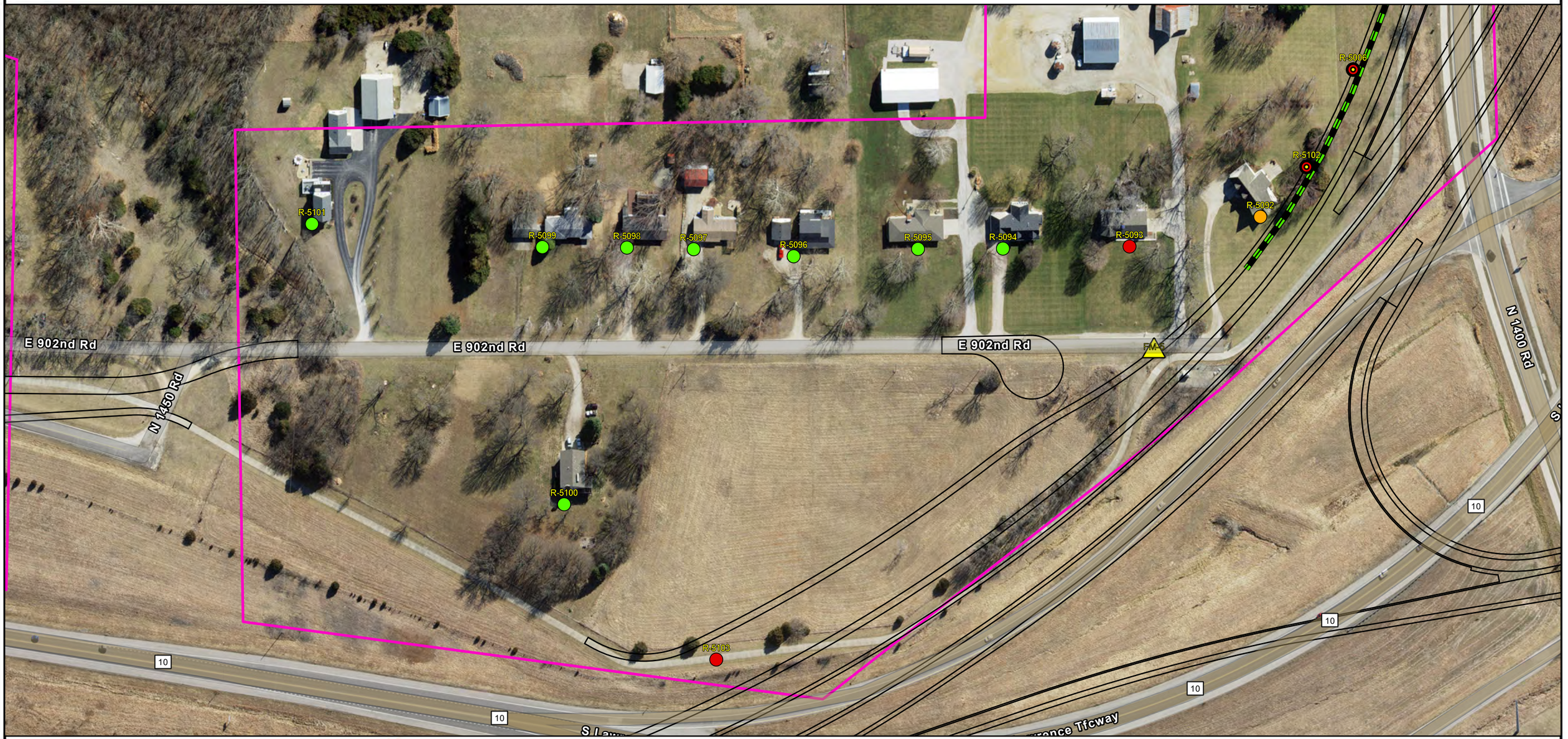
Noise Receptor Locations Attachment B-13



- Non-Impacted, Non-Benefitted Receiver
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- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

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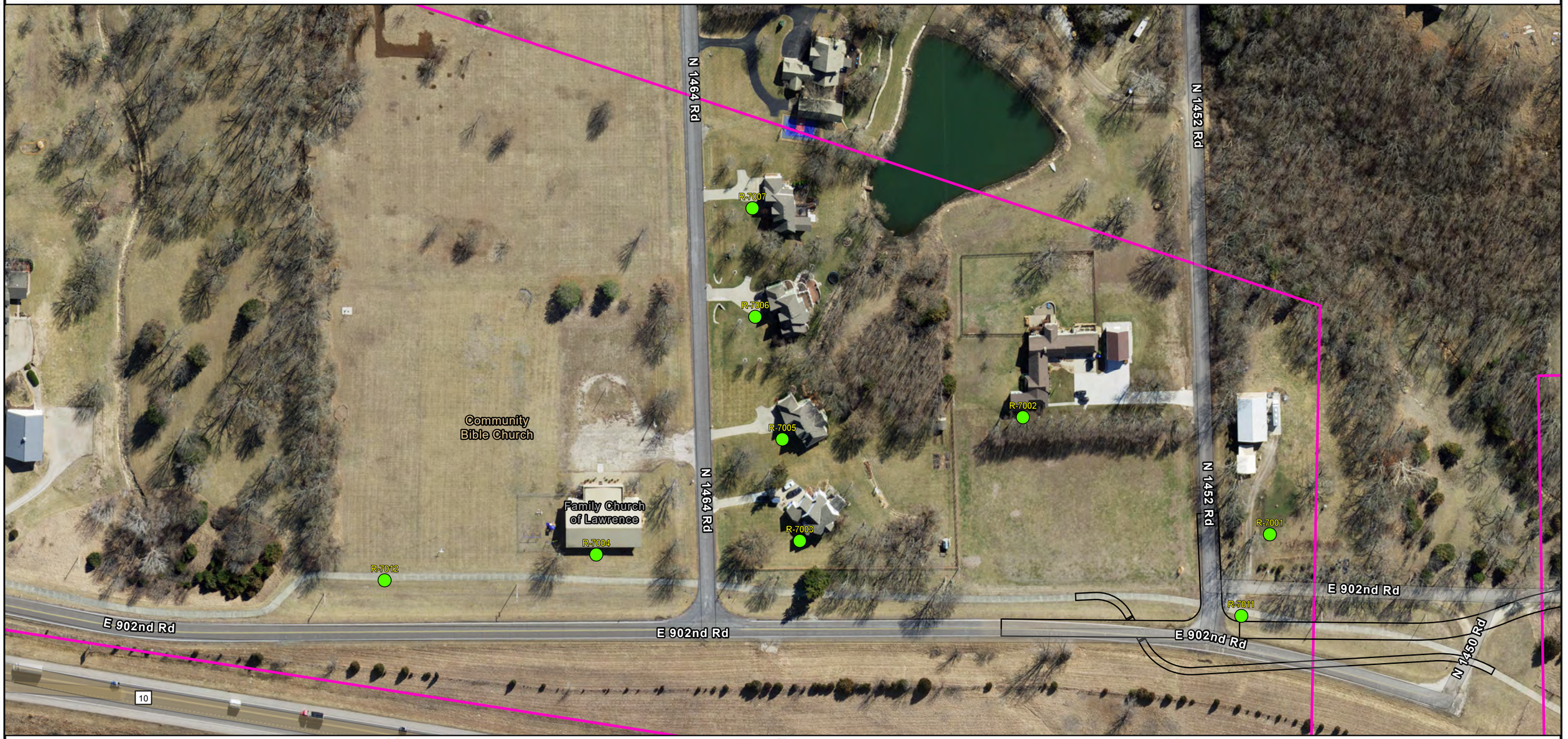
Noise Receptor Locations Attachment B-14



- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

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Noise Receptor Locations Attachment B-15

- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

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Noise Receptor Locations Attachment B-16

- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

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Noise Receptor Locations Attachment B-17

- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

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Noise Receptor Locations Attachment B-18

- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

South Lawrence Trafficway Supplemental Environmental Impact Statement KDOT # 10-23 KA-3634-01

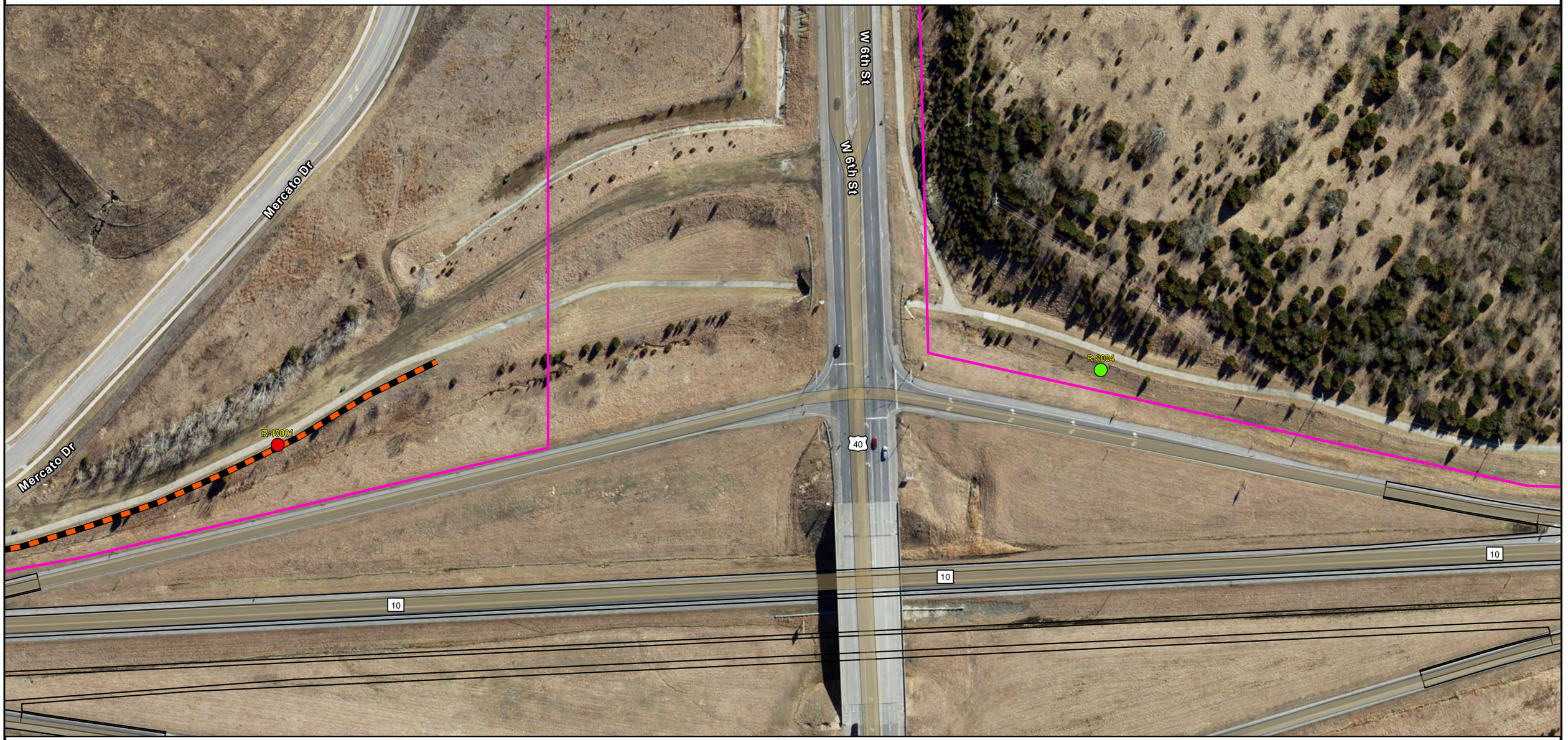
Kansas Department of Transportation

U.S. Department of Transportation Federal Highway Administration

Kansas Turnpike Authority

SLT South Lawrence Trafficway

Noise Receptor Locations Attachment B-19



- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

South Lawrence Trafficway
Supplemental Environmental Impact Statement
KDOT # 10-23 KA-3634-01

Kansas Department of Transportation

U.S. Department of Transportation
Federal Highway Administration

Kansas Turnpike Authority

SLT South Lawrence Trafficway

Noise Receptor Locations Attachment B-20

- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

South Lawrence Trafficway Supplemental Environmental Impact Statement KDOT # 10-23 KA-3634-01

Kansas Department of Transportation

U.S. Department of Transportation Federal Highway Administration

Kansas Turnpike Authority

SLT South Lawrence Trafficway

Noise Receptor Locations Attachment B-21

- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

South Lawrence Trafficway Supplemental Environmental Impact Statement
KDOT # 10-23 KA-3634-01

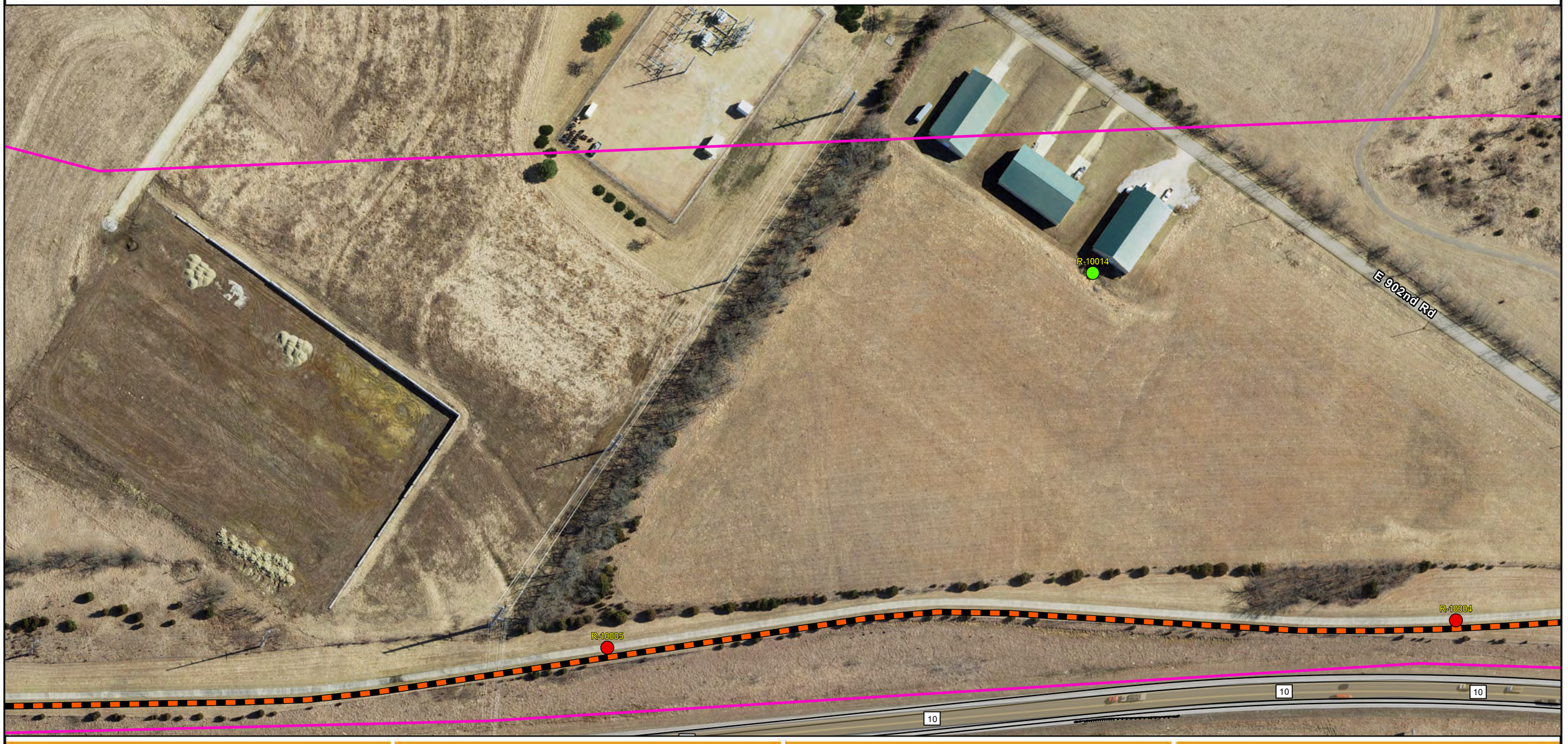
Kansas Department of Transportation

U.S. Department of Transportation Federal Highway Administration

Kansas Turnpike Authority

SLT South Lawrence Trafficway

Noise Receptor Locations Attachment B-22



- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

South Lawrence Trafficway Supplemental Environmental Impact Statement KDOT # 10-23 KA-3634-01

Kansas Department of Transportation

U.S. Department of Transportation Federal Highway Administration

Kansas Turnpike Authority

SLT South Lawrence Trafficway

Noise Receptor Locations Attachment B-23

- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

South Lawrence Trafficway Supplemental Environmental Impact Statement
KDOT # 10-23 KA-3634-01

Kansas Department of Transportation
U.S. Department of Transportation Federal Highway Administration
Kansas Turnpike Authority

SLT South Lawrence Trafficway

Noise Receptor Locations Attachment B-24

- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

South Lawrence Trafficway Supplemental Environmental Impact Statement KDOT # 10-23 KA-3634-01

Kansas Department of Transportation

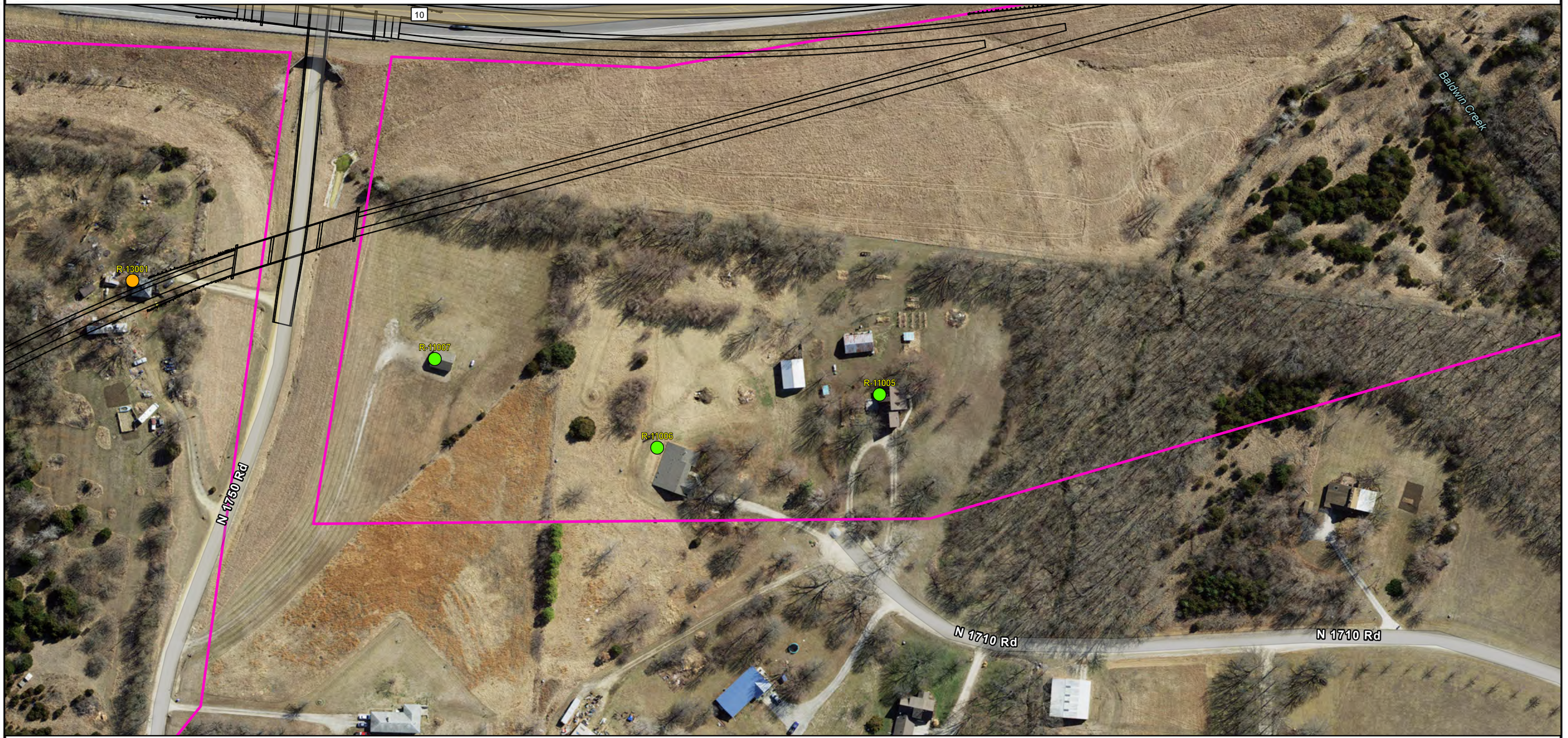
U.S. Department of Transportation Federal Highway Administration

Kansas Turnpike Authority

SLT South Lawrence Trafficway

Noise Receptor Locations

Attachment B-25



- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

South Lawrence Trafficway
Supplemental Environmental Impact Statement
KDOT # 10-23 KA-3634-01

Kansas Department of Transportation

U.S. Department of Transportation Federal Highway Administration

Kansas Turnpike Authority

SLT South Lawrence Trafficway

Noise Receptor Locations Attachment B-26

- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

South Lawrence Trafficway
Supplemental Environmental Impact Statement
KDOT # 10-23 KA-3634-01

Kansas Department of Transportation

U.S. Department of Transportation Federal Highway Administration

Kansas Turnpike Authority

SLT South Lawrence Trafficway

Noise Receptor Locations Attachment B-27

- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

South Lawrence Trafficway Supplemental Environmental Impact Statement KDOT # 10-23 KA-3634-01

Kansas Department of Transportation

U.S. Department of Transportation Federal Highway Administration

Kansas Turnpike Authority

SLT South Lawrence Trafficway

Noise Receptor Locations Attachment B-28

- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

South Lawrence Trafficway Supplemental Environmental Impact Statement
KDOT # 10-23 KA-3634-01

Kansas Department of Transportation

U.S. Department of Transportation Federal Highway Administration

Kansas Turnpike Authority

SLT South Lawrence Trafficway

Noise Receptor Locations Attachment B-29

- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

South Lawrence Trafficway
Supplemental Environmental Impact Statement
KDOT # 10-23 KA-3634-01

Kansas Department of Transportation

U.S. Department of Transportation Federal Highway Administration

Kansas Turnpike Authority

SLT South Lawrence Trafficway

Noise Receptor Locations Attachment B-30

- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

South Lawrence Trafficway Supplemental Environmental Impact Statement KDOT # 10-23 KA-3634-01

Kansas Department of Transportation

U.S. Department of Transportation Federal Highway Administration

Kansas Turnpike Authority

SLT South Lawrence Trafficway

Noise Receptor Locations Attachment B-31

- Non-Impacted, Non-Benefitted Receiver
- Non-Impacted, Benefitted Receiver
- Impacted, Non-Benefitted Receiver
- Impacted, Benefitted Receiver
- Property Acquisition
- Noise Wall - Feasible and Reasonable
- Noise Wall - NOT Feasible and/or Reasonable
- Field Measurement Locations

N

Feet

0 125 250 500

South Lawrence Trafficway Supplemental Environmental Impact Statement
KDOT # 10-23 KA-3634-01

Kansas Department of Transportation

U.S. Department of Transportation Federal Highway Administration

Kansas Turnpike Authority

Appendix A
Field Measurement Data

Table A-1: Field Measured Existing Noise Levels

Measurement Site	Date	Time	Location	TNM-Predicted $L_{eq(h)}$ dB(A)[1]	Measured L_{eq} dB(A)[1]	Validation Delta (Pred. – Meas.)[1]
FM-1	4/25/19	7:16-7:31 AM	NSA 1: On SLT Trail, south of Easy Living Manufactured Home Community	62.6	59.8	**2.8**
FM-2	4/26/19	8:49-9:04 AM	NSA 2: South of Larkspur Court homes	63.0	60.1	**2.9**
FM-3	4/26/19	9:14-9:29 AM	NSA 2: On Stoneback Drive	47.7	48.7	**-1.0**
FM-4	4/25/19	8:02-8:17 AM	NSA 5: South of Lake Pointe Drive circle	58.3	56.0	**2.3**
FM-5	4/25/19	9:07-9:22 AM	NSA 5: On south end of E 902 Road	59.8	60.6	**-0.8**
FM-6	4/25/19	8:36-8:51 AM	NSA 7: On Lawrence Loop Trail near E 902 Rod and N 1500 Road curve	64.8	62.0	**2.8**
FM-7	4/26/19	8:07-8:22 AM	NSA 8: First row of Renaissance Drive homes	60.8	58.2	**2.6**
FM-8	8/15/19	8:28-8:43 AM	NSA 15: Near Heritage Baptist Church	57.5	55.6	**1.9**
FM-9	4/26/19	8:07-8:22 AM	NSA 9: West of E 900 Road	59.7	57.7	**2.0**

[1]Hourly equivalent noise levels, $L_{eq(h)}$, are expressed to the nearest one-tenth decibels to ensure that TNM-predicted levels validate to within +/- 3.0 dB(A) of measured noise levels without the benefits of rounding.

Table A-2: Field Measurement Weather Data

Measurement Site	Date	Time	Temp (°F)	Dew Point (°F)	Pressure (in)	Wind Dir.	Wind Speed (mph)	Relative Humidity (%)	Precip. (in)
FM-1	4/25/19	7:16-7:31 AM	48	44	29.82	-	0	89	0.0
FM-2	4/26/19	8:49-9:04 AM	55	34	30.17	N	3	55	0.0
FM-3	4/26/19	9:14-9:29 AM	57	32	30.17	N	3	41	0.0
FM-4	4/25/19	8:02-8:17 AM	50	49	29.81	-	0	93	0.0
FM-5	4/25/19	9:07-9:22 AM	54	53	29.81	NE	2	94	0.0
FM-6	4/25/19	8:36-8:51 AM	52	51	29.81	-	0	92	0.0
FM-7	4/26/19	8:07-8:22 AM	54	42	30.17	NW	2	62	0.0
FM-8	8/15/19	8:28-8:43 AM	65	63	30.08	SE	3	88	0.0
FM-9	4/26/19	8:07-8:22 AM	54	42	30.17	NW	2	62	0.0

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: K-10 SLT JOB #: 62780 BY: JJF

SITE: FM - 1 DATE: 4/25/19 TIME: 7:16 AM

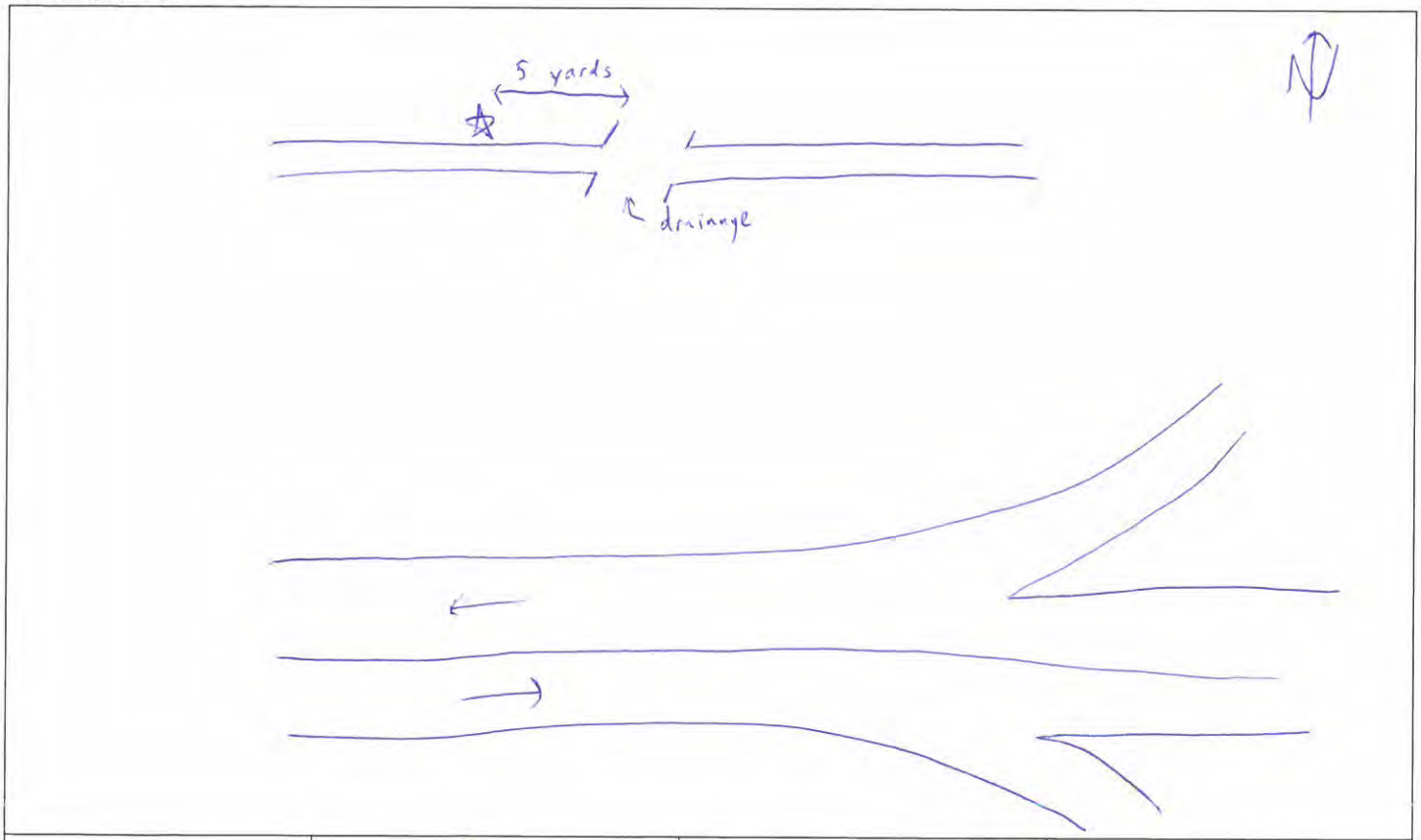
CALIBRATION: 94.0 dB.

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

TRAFFIC DATA		
ROAD (Name/Dir)	WB K10 / Ramp	EB K10 / Ramp
AUTOS	157 / 66	156 / 46
MED TRKS	1 / 0	1 / 0
HVY TRKS	13 / 3	7 / 1
BUS	0 / 0	0 / 0
MOTORCYCLE	1 / 0	0 / 0
SPEED	60	60

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	ExTech
SLM MODEL	SDL600
SLM	S / N Z372647
CALIBRATOR – 40744	S / N Z372652

SITE SKETCH



MEASUREMENT DATA	Duration 15 mins	Leq	

WEATHER DATA WIND SPEED (MPH) 0 DIR. TEMP. 48° HUMIDITY 89% CLOUD COVER cloudy / Foggy

BACKGROUND NOISE

MAJOR SOURCES

UNUSUAL EVENTS

OTHER NOTES

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: K-10 SLT JOB #: 62780 BY: JJF

SITE: FM - 2 DATE: 4/26/19 TIME: 8:49 AM

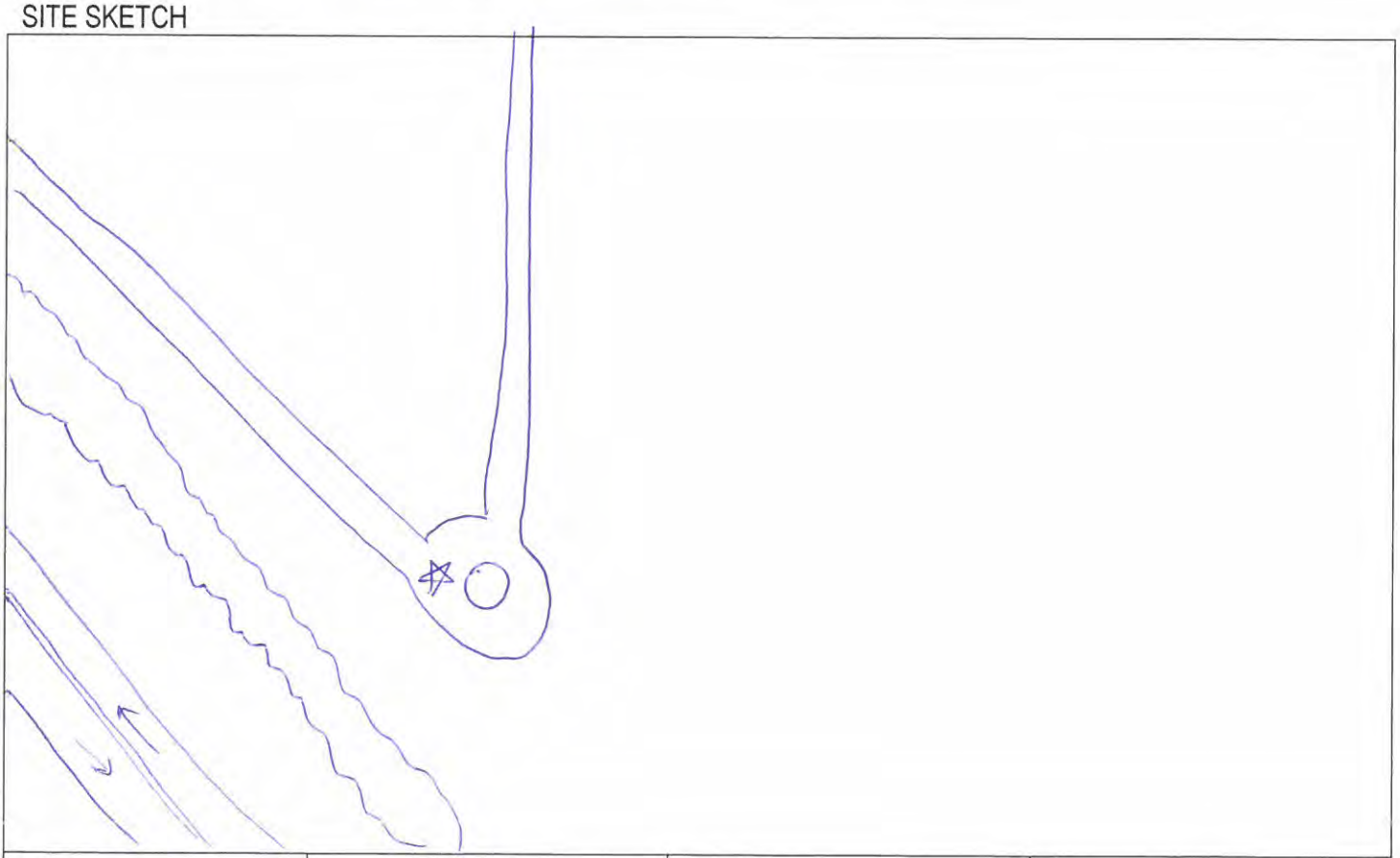
CALIBRATION: 94.0 dB.

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

TRAFFIC DATA		
ROAD (Name/Dir)	WB K10	EB K10
AUTOS	163	182
MED TRKS	5	5
HVY TRKS	7	12
BUS	0	0
MOTORCYCLE	0	0
SPEED	60 → 0	60 → 0

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	ExTech
SLM MODEL	SDL600
SLM	S / N Z372646
CALIBRATOR – 40744	S / N Z372652

SITE SKETCH



MEASUREMENT DATA	Duration 15 mins	Leq	

WEATHER DATA WIND SPEED (MPH) 3 DIR. N TEMP. 55° HUMIDITY 55% CLOUD COVER Sunny

BACKGROUND NOISE

MAJOR SOURCES

UNUSUAL EVENTS

OTHER NOTES Signal causes significant backups/slowdowns approaching intersection

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: K-10 SLT JOB #: 62780 BY: JJF

SITE: FM - 3 DATE: 4/26/19 TIME: 9:14 AM

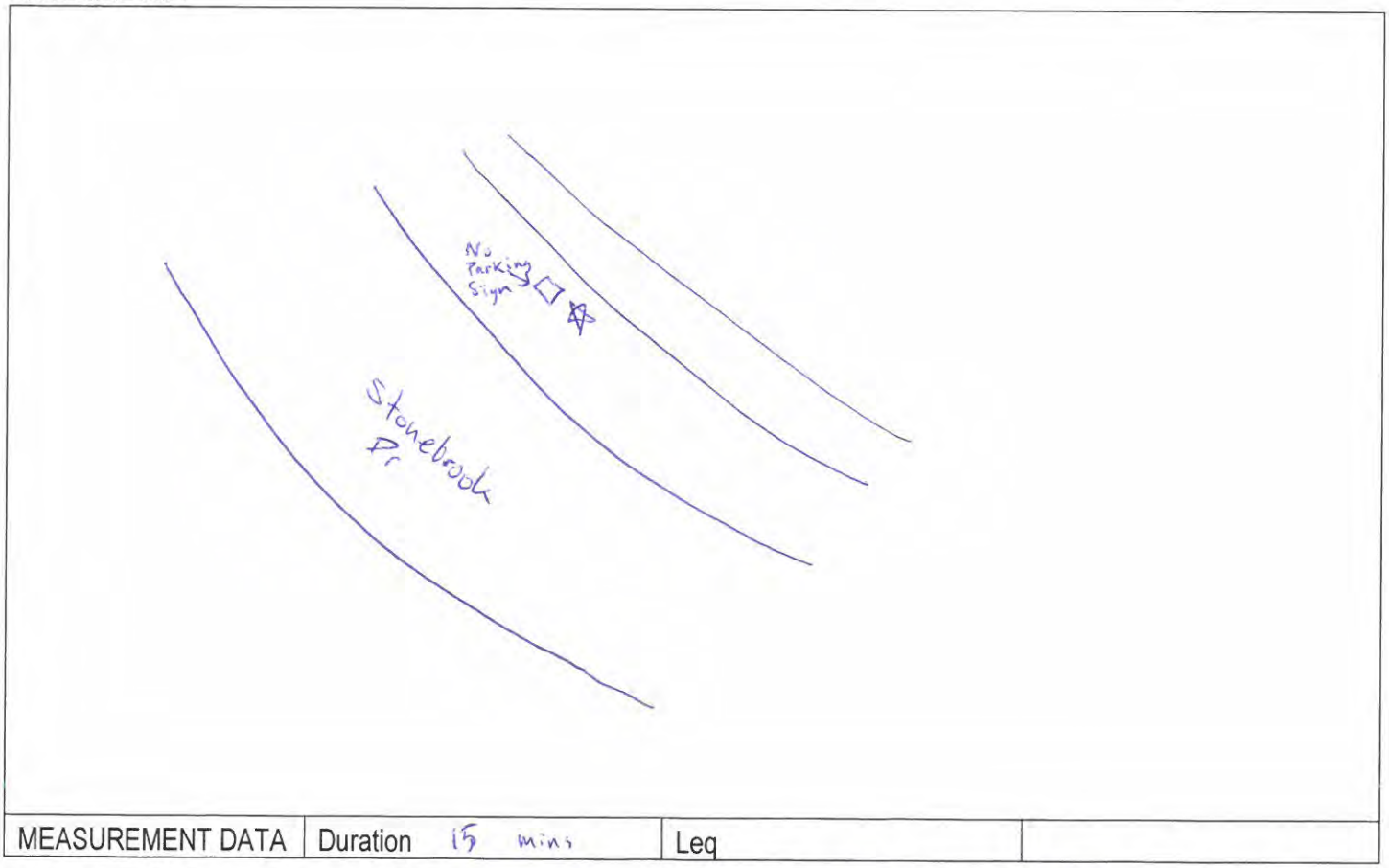
CALIBRATION: 94.0 dB.

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

TRAFFIC DATA		
ROAD (Name/Dir)	WB K10	EB K10
AUTOS	86	111
MED TRKS	16	5
HVY TRKS	12	10
BUS	0	0
MOTORCYCLE	0	1
SPEED	60→0	60→0

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	ExTech
SLM MODEL	SDL600
SLM	S / N Z237264b
CALIBRATOR – 40744	S / N Z372652

SITE SKETCH



MEASUREMENT DATA	Duration 15 mins	Leq	

WEATHER DATA WIND SPEED (MPH) 3 DIR. N TEMP. 57% HUMIDITY 41% CLOUD COVER Sunny

BACKGROUND NOISE

MAJOR SOURCES

UNUSUAL EVENTS

OTHER NOTES Signal causes backups / slowdowns approaching intersection

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: K-10 SLT JOB #: 62780 BY: JJF

SITE: FM - 4 DATE: 4/25/19 TIME: 8:02 AM

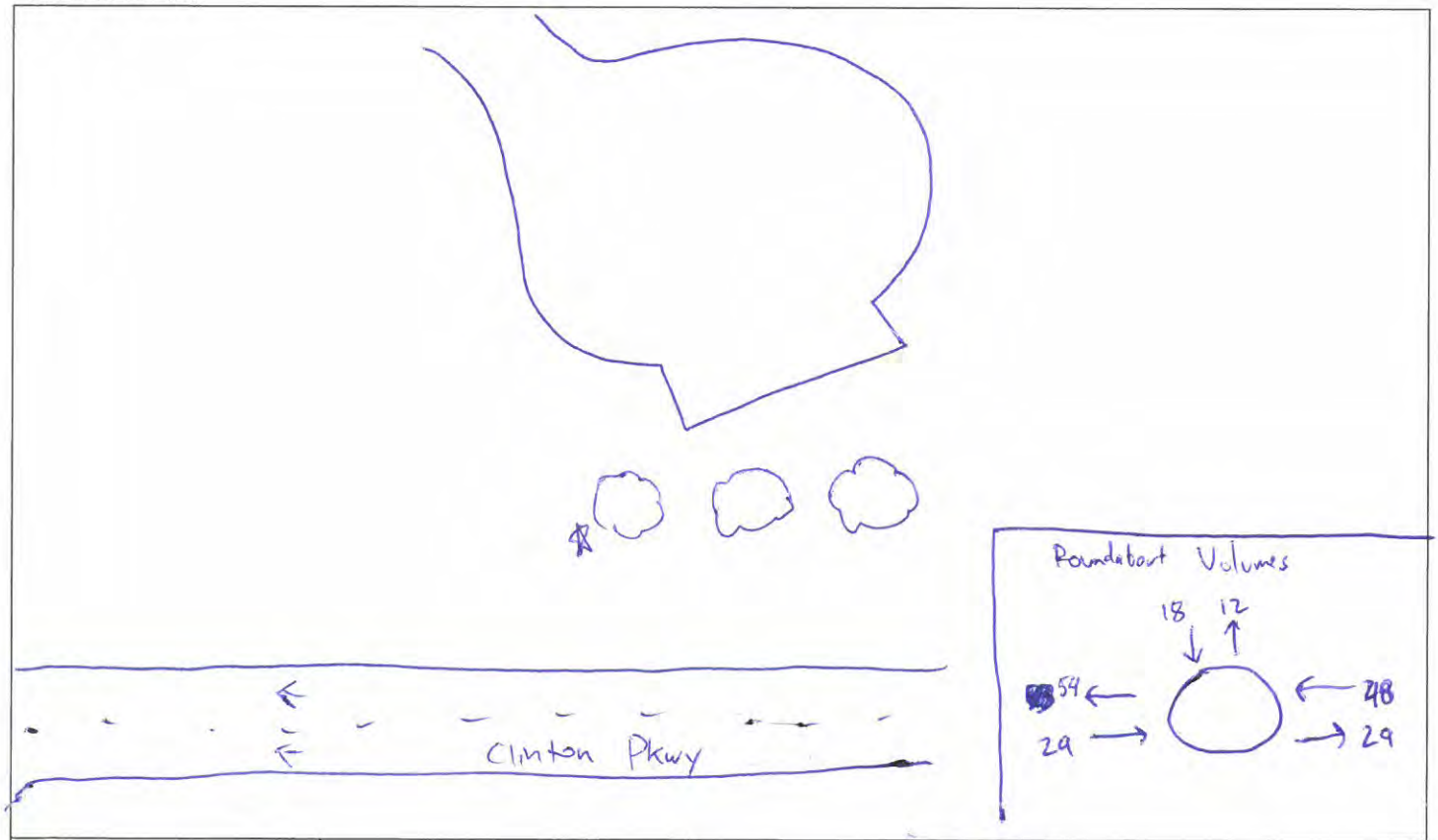
CALIBRATION: 94.0 dB.

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

TRAFFIC DATA		
ROAD (Name/Dir)	WB K10 / Ramp	EB K10 / Ramp
AUTOS	179 / 6	135 / 4
MED TRKS	2 / 0	2 / 0
HVY TRKS	4 / 0	4 / 0
BUS	0	0
MOTORCYCLE	0	0
SPEED	50	60

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	ExTech
SLM MODEL	SDL600
SLM	S / N 2372647
CALIBRATOR – 40744	S / N Z372652

SITE SKETCH



MEASUREMENT DATA	Duration 15 mins	Leq	

WEATHER DATA WIND SPEED (MPH) 0 DIR. TEMP. 50° HUMIDITY 93% CLOUD COVER Partly Cloudy

BACKGROUND NOISE

MAJOR SOURCES

UNUSUAL EVENTS

OTHER NOTES WB traffic travels in waves from signal upstream

NOISE MEASUREMENT DATA SHEET

PROJECT: K-10 SLT JOB #: 62780 BY: JJF

SITE: FM - 5 DATE: 4/25/19 TIME: 9:07 AM

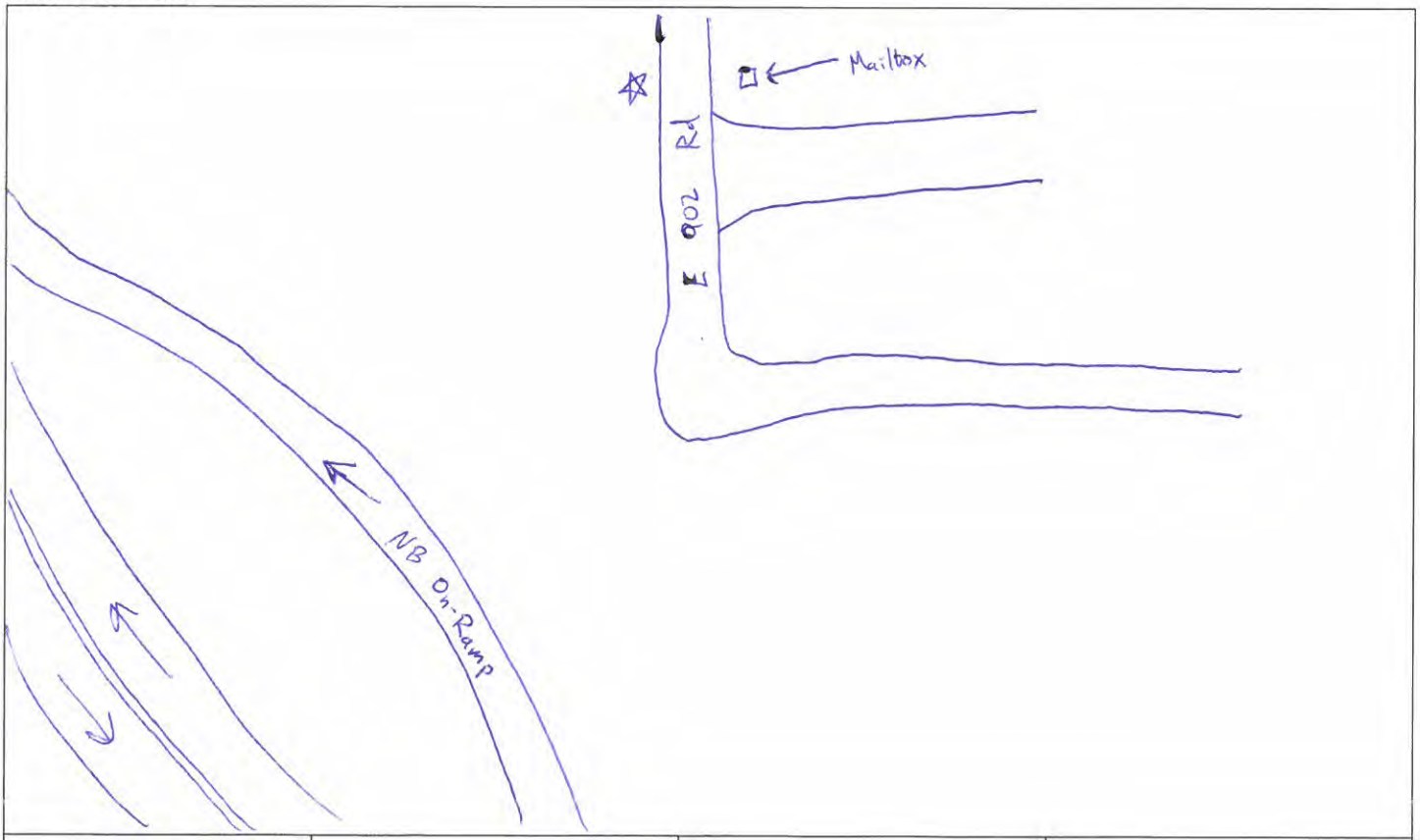
CALIBRATION: 94.0 dB.

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

TRAFFIC DATA		
ROAD (Name/Dir)	WB K10 / Ramp	EB K10 / Ramp
AUTOS	103 / 31	91 / 35
MED TRKS	1 / 1	3 / 0
HVY TRKS	16 / 0	6 / 0
BUS	0	0
MOTORCYCLE	0	0
SPEED	60	60

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	ExTech
SLM MODEL	SDL600
SLM	S / N Z372647
CALIBRATOR – 40744	S / N Z372652

SITE SKETCH



MEASUREMENT DATA	Duration 15 mins	Leq	

WEATHER DATA WIND SPEED (MPH) 2 DIR. NE TEMP. 54° HUMIDITY 94% CLOUD COVER Sunny

BACKGROUND NOISE

MAJOR SOURCES

UNUSUAL EVENTS

OTHER NOTES

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: K-10 SLT JOB #: 62780 BY: JJF

SITE: FM - 6 DATE: 4/25/19 TIME: 8:36 AM

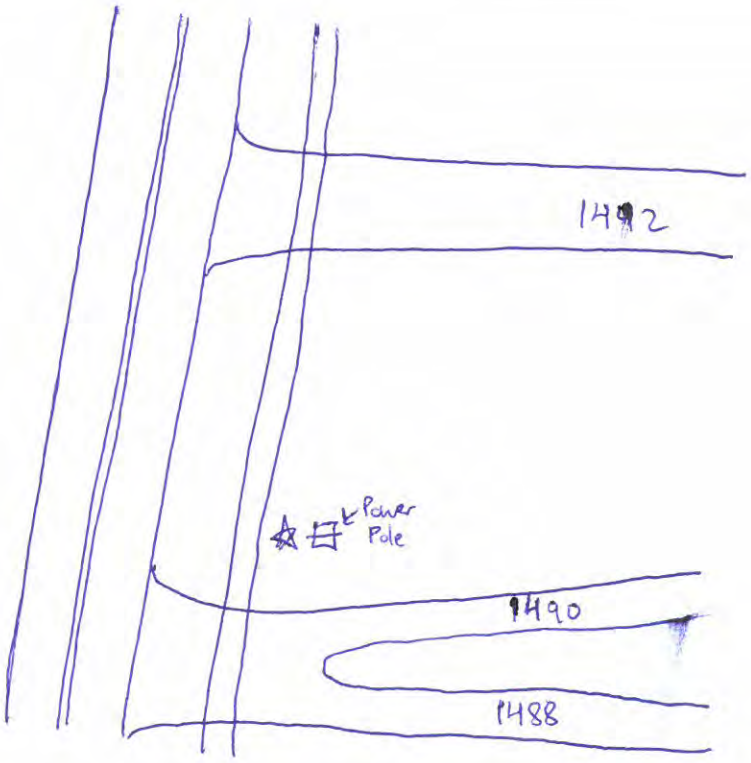
CALIBRATION: 94.0 dB.

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

TRAFFIC DATA		
ROAD (Name/Dir)	NB K10 / Ramp	SB K10 / Ramp
AUTOS	148 / 11	135 / 23
MED TRKS	2 / 1	8 / 0
HVY TRKS	3 / 0	10 / 0
BUS	0	0
MOTORCYCLE	0	1 / 0
SPEED	60	60

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	ExTech
SLM MODEL	SDL600
SLM	S / N Z372647
CALIBRATOR – 40744	S / N Z372652

SITE SKETCH



MEASUREMENT DATA	Duration 15 mins	Leq	

WEATHER DATA WIND SPEED (MPH) 0 DIR. TEMP. 52° HUMIDITY 92% CLOUD COVER Sunny

BACKGROUND NOISE

MAJOR SOURCES

UNUSUAL EVENTS

OTHER NOTES

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: K-10 SLT JOB #: 62780 BY: JJF

SITE: FM - 7 DATE: 4/26/19 TIME: 8:07 AM

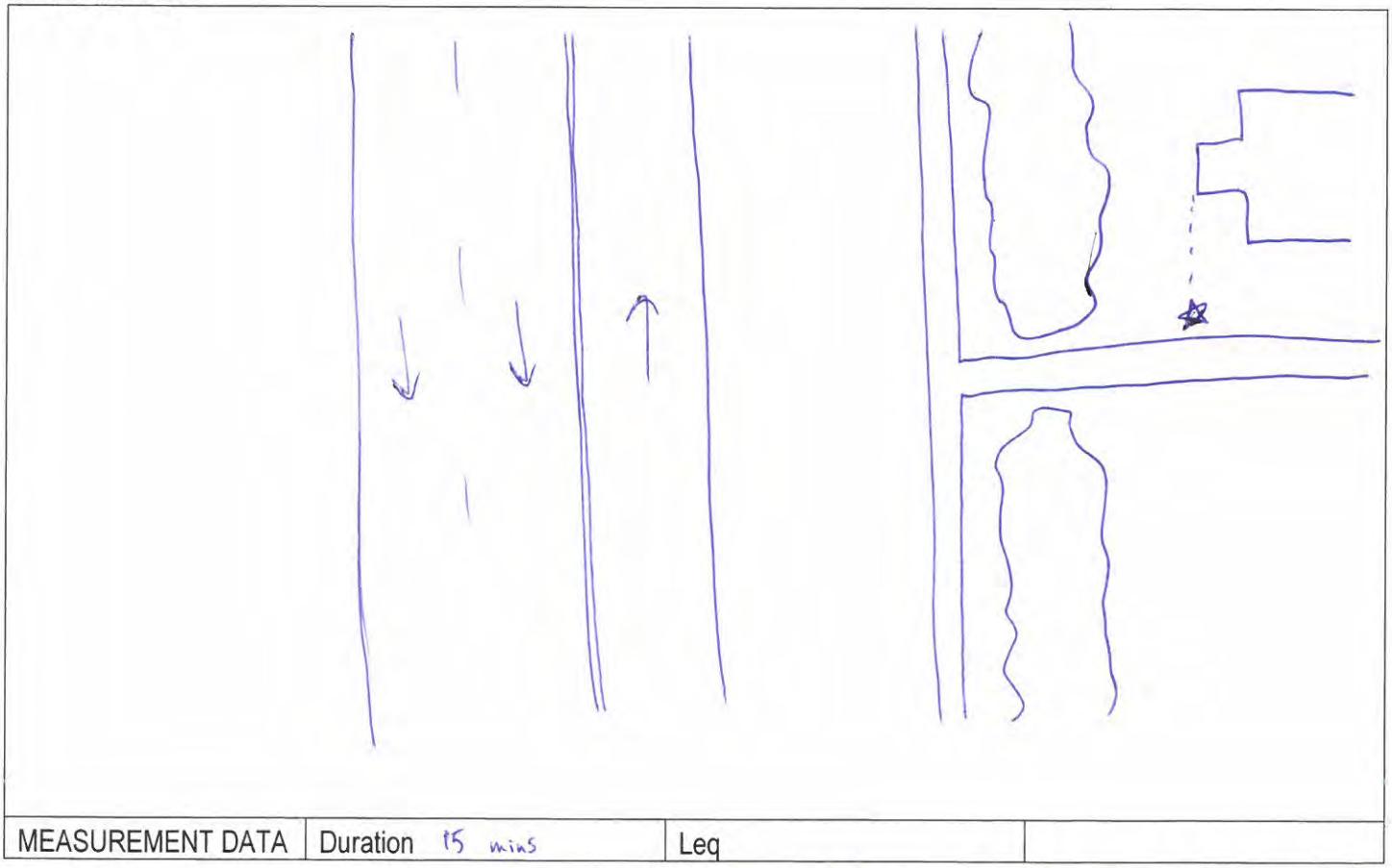
CALIBRATION: 94.0 dB.

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

TRAFFIC DATA		
ROAD (Name/Dir)	NB K10 / Ramp	SB K10 / Ramp
AUTOS	196 / 30	117 / 47
MED TRKS	5 / 0	5 / 0
HVY TRKS	13 / 0	6 / 1
BUS	0	0
MOTORCYCLE	0	0 / 1
SPEED	60	60

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	ExTech
SLM MODEL	SDL600
SLM	S / N Z372647
CALIBRATOR – 40744	S / N Z372652

SITE SKETCH



MEASUREMENT DATA	Duration 15 mins	Leq	

WEATHER DATA WIND SPEED (MPH) 2 DIR. NW TEMP. 54° HUMIDITY 62% CLOUD COVER Sunny

BACKGROUND NOISE

MAJOR SOURCES

UNUSUAL EVENTS

OTHER NOTES

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: K-10 SLT JOB #: 62780 BY: JJF

SITE: FM - 8 DATE: 8/15/19 TIME: 8:28 AM

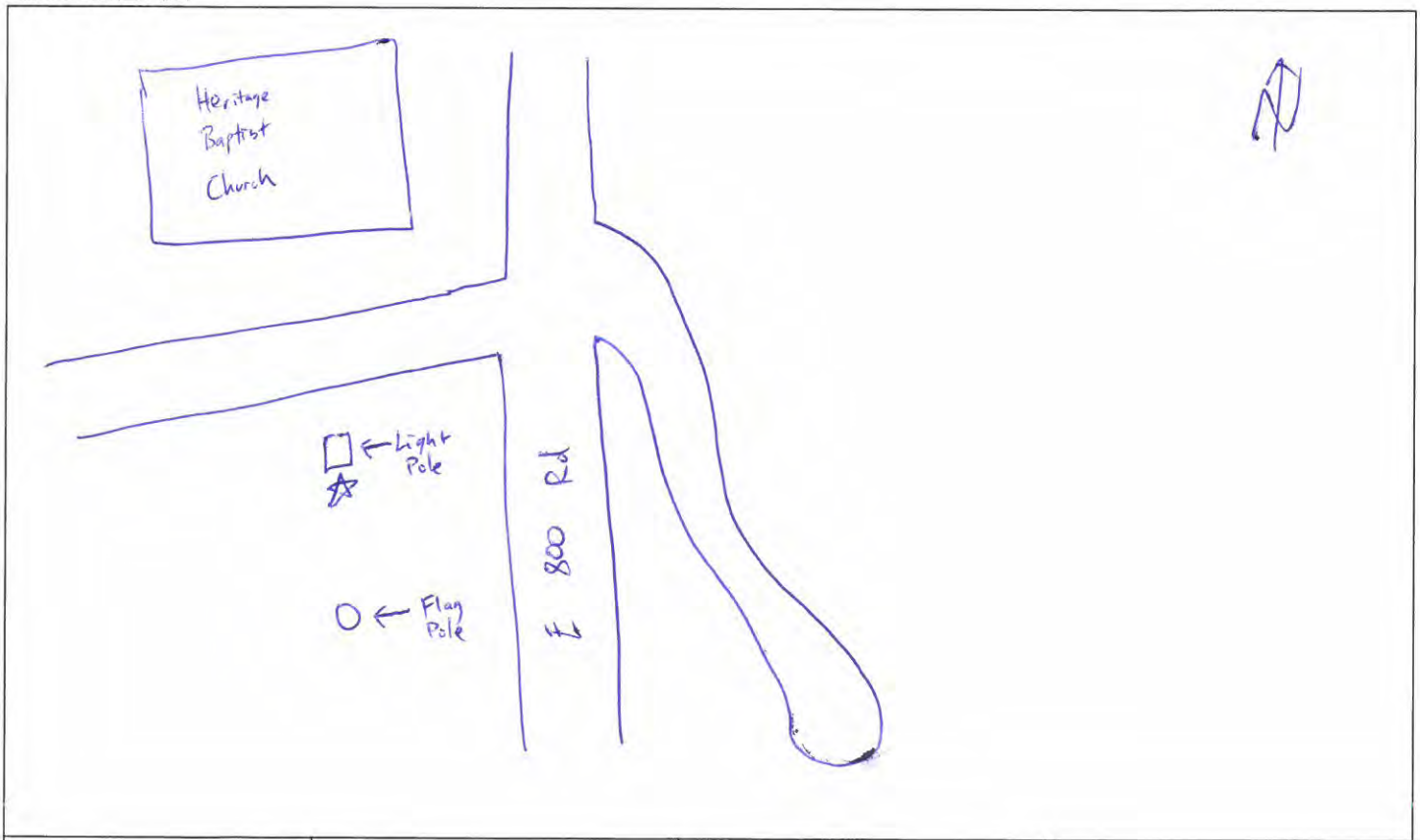
CALIBRATION: 94.0 dB.

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

TRAFFIC DATA		
ROAD (Name/Dir)	WB I-70	EB I-70
AUTOS	61/159/155	107/138/50
MED TRKS	2/9/0	7/4/1
HVY TRKS	17/31/3	24/13/4
BUS	0	0
MOTORCYCLE	0	1/0/0
SPEED	75	75

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	ExTech
SLM MODEL	SDL600
SLM	S / N Z2372646
CALIBRATOR – 40744	S / N Z372652

SITE SKETCH



MEASUREMENT DATA	Duration 15 mins	Leq	

WEATHER DATA WIND SPEED (MPH) 3 DIR. SE TEMP. 65° HUMIDITY 88% CLOUD COVER Sunny

BACKGROUND NOISE

MAJOR SOURCES

UNUSUAL EVENTS

OTHER NOTES

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: K-10 SLT JOB #: 62780 BY: JJF

SITE: FM - 9 DATE: 4/26/19 TIME: 8:07 AM

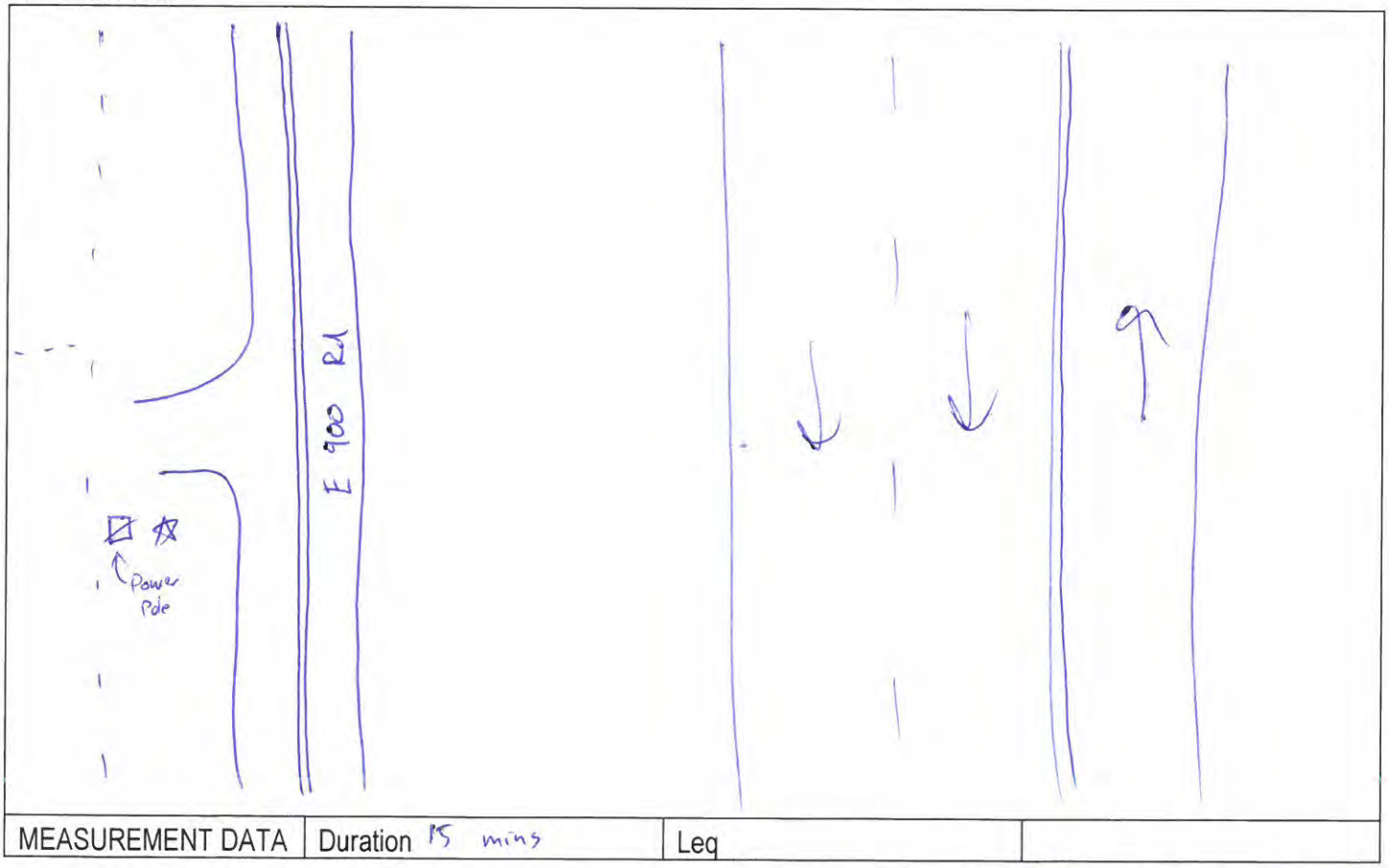
CALIBRATION: 94.0 dB.

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

TRAFFIC DATA		
ROAD (Name/Dir)	NB K10 / Ramp	SB K10 / Ramp
AUTOS	196 / 30	117 / 47
MED TRKS	5 / 0	5 / 0
HVY TRKS	13 / 0	6 / 1
BUS	0	0
MOTORCYCLE	0	0 / 1
SPEED	60	60

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	ExTech
SLM MODEL	SDL600
SLM	S / N Z372647
CALIBRATOR – 40744	S / N Z372652

SITE SKETCH



MEASUREMENT DATA	Duration 15 mins	Leq	

WEATHER DATA WIND SPEED (MPH) 2 DIR. NW TEMP. 54° HUMIDITY 62% CLOUD COVER Sunny

BACKGROUND NOISE

MAJOR SOURCES

UNUSUAL EVENTS

OTHER NOTES

Certificate of Calibration

Certificate Number: 208312
Document Number: 149008

Customer Details:

Customer Name: BRANDON YARBROUGH

Instrument Details:

Manufacturer:	EXTECH INSTRUMENTS	**Calibration Date:**	March 22, 2019
Description:	SOUND LEVEL METER W/ SD CARD	**Calibration Due:**	March 22, 2020
Model Number:	SDL600	**Cal. Interval:**	12 MONTHS
Serial Number:	Z372646	**As Received:**	NEW
Equip. ID Number:	N/A		

Environmental Details:

Temperature: 21 Deg. +/- 5 C **Relative Humidity:** 40 %+/- 15 %

Procedures Used:

Calibration Procedure: EICMSDL600-CP

Certification

Extech certifies that the instrument listed above meets the specifications of the manufacturer at the completion of its calibration. Standards used are traceable to the National Institute of Standards and Technology (NIST). Methods used are in accordance with ISO 10012 and ANSI/NCSL Z540-1-1994 and have been derived from accepted values, natural physical constants, or through the use of self-calibration techniques.

Technicians Notes:

Technician: CHAWNNI CHANSY **Approved By:**

Certificate of Calibration

Certificate Number: 208313
Document Number: 149009

Customer Details:

Customer Name: BRANDON YARBROUGH

Instrument Details:

Manufacturer:	EXTECH INSTRUMENTS	**Calibration Date:**	March 22, 2019
Description:	SOUND LEVEL METER W/ SD CARD	**Calibration Due:**	March 22, 2020
Model Number:	SDL600	**Cal. Interval:**	12 MONTHS
Serial Number:	Z372647	**As Received:**	NEW
Equip. ID Number:	N/A		

Environmental Details:

Temperature: 21 Deg. +/- 5 C **Relative Humidity:** 40 % +/- 15 %

Procedures Used:

Calibration Procedure: EICMSDL600-CP

Certification

Extech certifies that the instrument listed above meets the specifications of the manufacturer at the completion of its calibration. Standards used are traceable to the National Institute of Standards and Technology (NIST). Methods used are in accordance with ISO 10012 and ANSI/NCSL Z540-1-1994 and have been derived from accepted values, natural physical constants, or through the use of self-calibration techniques.
This certificate is not to be reproduced other than in full, except with prior written approval of Extech.

Technicians Notes:

Technician: CHAWNNI CHANSY **Approved By:**

Appendix B
Hourly Equivalent Noise Levels

Table B-1: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (PM Peak Hour) – NSA 1								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-1001	Res.	B	1	3323 Iowa St LOT 500	51.2	53.3	54.0	2.8
R-1002	Res.	B	1	3323 Iowa St LOT 502	51.4	53.5	54.6	3.2
R-1003	Res.	B	1	3323 Iowa St LOT 504	51.8	53.8	55.6	3.8
R-1004	Res.	B	1	3323 Iowa St LOT 506	51.9	54.0	56.3	4.4
R-1005	Res.	B	1	3323 Iowa St LOT 508	55.7	57.8	60.3	4.6
R-1006	Res.	B	1	3323 Iowa St LOT 510	58.4	60.4	62.9	4.5
R-1007	Res.	B	1	3323 Iowa St LOT 512	58.6	60.7	63.3	4.7
R-1008	Res.	B	1	3323 Iowa St LOT 514	59.5	61.5	63.7	4.2
R-1009	Res.	B	1	3323 Iowa St LOT 516	53.6	55.7	57.9	4.3
R-1010	Res.	B	1	3323 Iowa St LOT 518	57.8	59.9	61.9	4.1
R-1011	Res.	B	1	3323 Iowa St LOT 520	58.2	60.3	62.4	4.2
R-1012	Res.	B	1	3323 Iowa St LOT 522	58.5	60.5	62.8	4.3
R-1013	Res.	B	1	3323 Iowa St LOT 524	58.8	60.8	63.1	4.3
R-1014	Res.	B	1	3323 Iowa St LOT 526	58.6	60.6	62.8	4.2
R-1015	Res.	B	1	3323 Iowa St LOT 528	58.6	60.6	62.8	4.2
R-1016	Res.	B	1	3323 Iowa St LOT 530	59.0	61.1	63.6	4.6
R-1017	Res.	B	1	3323 Iowa St LOT 532	59.3	61.4	63.8	4.5
R-1018	Res.	B	1	3323 Iowa St LOT 534	59.3	61.4	63.7	4.4
R-1019	Res.	B	1	3323 Iowa St LOT 536	59.4	61.5	63.8	4.4
R-1020	Res.	B	1	3323 Iowa St LOT 538	58.7	60.7	63.0	4.3
R-1021	Res.	B	1	3323 Iowa St LOT 540	58.1	60.1	62.7	4.6
R-1022	Res.	B	1	3323 Iowa St LOT 542	58.3	60.4	63.0	4.7
R-1023	Res.	B	1	3323 Iowa St LOT 544	56.9	58.9	61.5	4.6
R-1024	Res.	B	1	3323 Iowa St LOT 546	55.4	57.5	59.8	4.4
R-1025	Res.	B	1	3323 Iowa St LOT 548	51.4	53.5	55.2	3.8
R-1026	Res.	B	1	3323 Iowa St LOT 550	57.5	59.5	61.6	4.1
R-1027	Res.	B	1	3323 Iowa St LOT 552	55.7	57.7	59.4	3.7
R-1028	Res.	B	1	3323 Iowa St LOT 554	53.7	55.7	57.2	3.5
R-1029	Res.	B	1	3323 Iowa St LOT 556	53.1	55.1	56.7	3.6
R-1030	Res.	B	1	3323 Iowa St LOT 558	48.5	50.6	52.0	3.5
R-1031	Res.	B	1	3323 Iowa St LOT 501	50.6	52.7	53.6	3.0
R-1032	Res.	B	1	3323 Iowa St LOT 505	50.7	52.8	54.0	3.3
R-1033	Res.	B	1	3323 Iowa St LOT 509	51.2	53.4	54.6	3.4
R-1034	Res.	B	1	3323 Iowa St LOT 513	52.0	54.1	55.4	3.4
R-1035	Res.	B	1	3323 Iowa St LOT 517	53.5	55.5	57.3	3.8
R-1036	Res.	B	1	3323 Iowa St LOT 519	51.3	53.4	55.0	3.7
R-1037	Res.	B	1	3323 Iowa St LOT 521	52.3	54.3	56.1	3.8
R-1038	Res.	B	1	3323 Iowa St LOT 523	50.8	52.9	54.8	4.0
R-1039	Res.	B	1	3323 Iowa St LOT 525	50.6	52.7	54.4	3.8
R-1040	Res.	B	1	3323 Iowa St LOT 527	50.6	52.7	54.3	3.7
R-1041	Res.	B	1	3323 Iowa St LOT 529	50.3	52.4	54.0	3.7
R-1042	Res.	B	1	3323 Iowa St LOT 531	50.7	52.8	54.6	3.9
R-1043	Res.	B	1	3323 Iowa St LOT 533	51.0	53.1	54.8	3.8
R-1044	Res.	B	1	3323 Iowa St LOT 535	51.8	53.8	55.7	3.9
R-1045	Res.	B	1	3323 Iowa St LOT 537	51.7	53.8	55.6	3.9
R-1046	Res.	B	1	3323 Iowa St LOT 539	51.4	53.5	55.4	4.0
R-1047	Res.	B	1	3323 Iowa St LOT 541	52.8	54.9	56.9	4.1
R-1048	Res.	B	1	3323 Iowa St LOT 545	50.0	52.1	53.7	3.7
R-1049	Res.	B	1	3323 Iowa St LOT 549	48.5	50.6	52.5	4.0
R-1050	Res.	B	1	3323 Iowa St LOT 553	48.3	50.5	52.1	3.8
R-1051	Trail	C	1	SLT Trail 1	63.5	65.6	67.5	4.0
R-1052	Trail	C	1	SLT Trail 2	64.6	66.6	67.4	2.8
Predicted NSA 1 Build Alternative 2045 Traffic Noise Impacts							**2**	

Table B-2: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (PM Peak Hour) – NSA 2								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-2001	Trail	C	1	KANZA Soutwhind Nature Preserve Trails 1	62.9	65.0	65.0	2.1
R-2002	Trail	C	1	KANZA Soutwhind Nature Preserve Trails 2	70.0	72.1	70.9	0.9
R-2003	Trail	C	1	KANZA Soutwhind Nature Preserve Trails 3	52.4	54.4	57.3	4.9
R-2004	Res.	B	1	2825 Bluestem Dr	49.9	51.9	55.5	5.6
R-2005	Res.	B	1	2821 Bluestem Dr	50.3	52.3	55.8	5.5
R-2006	Res.	B	1	2817 Bluestem Dr	50.7	52.7	56.1	5.4
R-2007	Res.	B	1	2813 Bluestem Dr	50.9	52.9	56.4	5.5
R-2008	Res.	B	1	2809 Bluestem Dr	51.7	53.7	56.9	5.2
R-2009	Res.	B	1	2805 Bluestem Dr	51.2	53.3	56.7	5.5
R-2010	Res.	B	1	2801 Bluestem Dr	51.2	53.2	56.8	5.6
R-2011	Res.	B	1	2749 Bluestem Dr	51.7	53.7	57.2	5.5
R-2012	Res.	B	1	2745 Bluestem Dr	51.7	53.7	57.3	5.6
R-2013	Res.	B	1	2741 Bluestem Dr	52.4	54.5	57.9	5.5
R-2014	Res.	B	1	2737 Bluestem Dr	52.7	54.7	58.1	5.4
R-2015	Res.	B	1	2733 Bluestem Dr	53.2	55.2	58.7	5.5
R-2016	Res.	B	1	2731 Bluestem Dr	52.3	54.4	57.5	5.2
R-2017	Res.	B	1	2725 Bluestem Dr	49.9	51.9	55.6	5.7
R-2018	Res.	B	1	2714 Larkspur Ct	46.0	48.1	50.9	4.9
R-2019	Res.	B	1	2716 Larkspur Ct	46.5	48.5	51.2	4.7
R-2020	Res.	B	1	2718 Larkspur Ct	48.1	50.2	52.5	4.4
R-2021	Res.	B	1	2720 Larkspur Ct	48.9	50.9	52.9	4.0
R-2022	Res.	B	1	2722 Larkspur Ct	52.7	54.7	56.3	3.6
R-2023	Res.	B	1	2724 Larkspur Ct	55.0	57.1	59.5	4.5
R-2024	Res.	B	1	2725 Larkspur Ct	57.9	59.9	63.4	5.5
R-2025	Res.	B	1	2723 Larkspur Ct	58.6	60.7	64.2	5.6
R-2026	Res.	B	1	2721 Larkspur Ct	57.1	59.2	63.3	6.2
R-2027	Res.	B	1	2719 Larkspur Ct	55.4	57.5	61.5	6.1
R-2028	Res.	B	1	2717 Larkspur Ct	50.1	52.2	57.2	7.1
R-2029	Res.	B	1	2715 Larkspur Ct	48.9	50.9	56.0	7.1
R-2030	Res.	B	1	2713 Larkspur Ct	46.5	48.6	53.7	7.2
R-2031	Res.	B	1	2711 Larkspur Ct	46.3	48.4	53.3	7.0
R-2032	Res.	B	1	4701 Larkspur Cir	40.8	42.8	44.7	3.9
R-2033	Res.	B	1	4705 Larkspur Cir	40.3	42.4	45.5	5.2
R-2034	Res.	B	1	4709 Larkspur Cir	43.6	45.6	48.2	4.6
R-2035	Res.	B	1	4713 Larkspur Cir	48.2	50.3	53.8	5.6
R-2036	Res.	B	1	4717 Larkspur Cir	50.3	52.4	55.5	5.2
R-2037	Res.	B	1	4721 Larkspur Cir	51.7	53.8	56.6	4.9
R-2038	Res.	B	1	4725 Larkspur Cir	53.4	55.4	58.2	4.8
R-2039	Res.	B	1	4729 Larkspur Cir	55.4	57.4	60.1	4.7
R-2040	Res.	B	1	4733 Larkspur Cir	62.2	64.2	67.4	5.2
R-2041	Res.	B	1	4737 Larkspur Cir	64.7	66.7	68.5	3.8
R-2042	Res.	B	1	4741 Larkspur Cir	64.9	67.0	67.5	2.6
R-2043	Res.	B	1	4745 Larkspur Cir	65.2	67.2	66.9	1.7
R-2044	Res.	B	1	4749 Larkspur Cir	65.3	67.3	66.9	1.6
R-2045	Res.	B	1	4753 Larkspur Cir	65.5	67.6	66.8	1.3
R-2046	Res.	B	1	4757 Larkspur Cir	65.6	67.6	66.7	1.1
R-2047	Res.	B	1	4761 Larkspur Cir	65.8	67.8	67.0	1.2
R-2048	Res.	B	1	4765 Larkspur Cir	65.9	68.0	67.7	1.8
R-2049	Res.	B	1	4702 Larkspur Cir	56.3	58.3	58.9	2.6
R-2050	Res.	B	1	4706 Larkspur Cir	51.7	53.8	56.6	4.9

Table B-2: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (PM Peak Hour) – NSA 2								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-2051	Res.	B	1	4712 Larkspur Cir	50.9	52.9	56.1	5.2
R-2052	Res.	B	1	4746 Larkspur Cir	51.1	53.1	54.8	3.7
R-2053	Res.	B	1	4750 Larkspur Cir	51.4	53.5	54.8	3.4
R-2054	Res.	B	1	4756 Larkspur Cir	54.7	56.7	57.7	3.0
R-2055	Res.	B	1	4764 Larkspur Cir	58.1	60.1	60.6	2.5
R-2056	Trail	C	1	SLT Trail 3	65.5	67.6	65.6	0.1
R-2057	Res.	B	1	4700 W 27th St Apt AA1	58.0	60.1	58.5	0.5
R-2058	Res.	B	1	4700 W 27th St Apt AA2	60.1	62.2	60.7	0.6
R-2059	Res.	B	1	4700 W 27th St Apt AA3	43.5	45.6	47.9	4.4
R-2060	Res.	B	1	4700 W 27th St Apt AA4	48.7	50.8	52.8	4.1
R-2061	Res.	B	1	4700 W 27th St Apt AA5	59.2	61.2	59.3	0.1
R-2062	Res.	B	1	4700 W 27th St Apt AA6	61.1	63.2	61.6	0.5
R-2063	Res.	B	1	4700 W 27th St Apt AA7	47.1	49.2	51.7	4.6
R-2064	Res.	B	1	4700 W 27th St Apt AA8	52.0	54.1	56.0	4.0
R-2065	Res.	B	1	4700 W 27th St Apt BB1	38.9	41.1	44.0	5.1
R-2066	Res.	B	1	4700 W 27th St Apt BB2	43.9	46.0	49.9	6.0
R-2067	Res.	B	1	4700 W 27th St Apt BB3	46.2	48.3	49.6	3.4
R-2068	Res.	B	1	4700 W 27th St Apt BB4	48.8	51.0	54.2	5.4
R-2069	Res.	B	1	4700 W 27th St Apt BB5	38.5	40.7	43.7	5.2
R-2070	Res.	B	1	4700 W 27th St Apt BB6	43.6	45.8	49.6	6.0
R-2071	Res.	B	1	4700 W 27th St Apt BB7	50.9	53.0	53.3	2.4
R-2072	Res.	B	1	4700 W 27th St Apt BB8	53.2	55.3	56.3	3.1
R-2073	Res.	B	1	4700 W 27th St Apt CC1	43.1	45.2	46.9	3.8
R-2074	Res.	B	1	4700 W 27th St Apt CC2	47.7	49.8	51.1	3.4
R-2075	Res.	B	1	4700 W 27th St Apt CC3	60.8	62.9	62.5	1.7
R-2076	Res.	B	1	4700 W 27th St Apt CC4	62.7	64.8	63.5	0.8
R-2077	Res.	B	1	4700 W 27th St Apt CC5	40.1	42.2	44.5	4.4
R-2078	Res.	B	1	4700 W 27th St Apt CC6	45.5	47.6	49.8	4.3
R-2079	Res.	B	1	4700 W 27th St Apt CC7	59.9	61.9	61.6	1.7
R-2080	Res.	B	1	4700 W 27th St Apt CC8	61.9	64.0	62.6	0.7
R-2081	Res.	B	1	4700 W 27th St Apt DD1	56.5	58.5	60.8	4.3
R-2082	Res.	B	1	4700 W 27th St Apt DD2	59.6	61.6	61.9	2.3
R-2083	Res.	B	1	4700 W 27th St Apt DD3	42.7	44.8	46.1	3.4
R-2084	Res.	B	1	4700 W 27th St Apt DD4	46.8	48.9	50.3	3.5
R-2085	Res.	B	1	4700 W 27th St Apt DD5	57.5	59.5	61.5	4.0
R-2086	Res.	B	1	4700 W 27th St Apt DD6	60.4	62.5	62.6	2.2
R-2087	Res.	B	1	4700 W 27th St Apt DD7	47.1	49.3	50.1	3.0
R-2088	Res.	B	1	4700 W 27th St Apt DD8	50.0	52.1	53.4	3.4
R-2089	Res.	B	1	4700 W 27th St Apt EE1	35.5	37.8	40.3	4.8
R-2090	Res.	B	1	4700 W 27th St Apt EE2	41.8	43.9	46.6	4.8
R-2091	Res.	B	1	4700 W 27th St Apt EE3	53.4	55.5	56.7	3.3
R-2092	Res.	B	1	4700 W 27th St Apt EE4	56.1	58.1	59.6	3.5
R-2093	Res.	B	1	4700 W 27th St Apt EE5	35.5	37.7	40.4	4.9
R-2094	Res.	B	1	4700 W 27th St Apt EE6	41.7	43.8	46.8	5.1
R-2095	Res.	B	1	4700 W 27th St Apt EE7	53.6	55.7	57.0	3.4
R-2096	Res.	B	1	4700 W 27th St Apt EE8	56.2	58.3	59.9	3.7
R-2097	Res.	B	1	4700 W 27th St Apt FF1	36.2	38.3	40.8	4.6
R-2098	Res.	B	1	4700 W 27th St Apt FF2	42.4	44.5	47.7	5.3
R-2099	Res.	B	1	4700 W 27th St Apt FF3	52.0	54.0	56.9	4.9
R-2100	Res.	B	1	4700 W 27th St Apt FF4	55.8	57.8	59.3	3.5
R-2101	Res.	B	1	4700 W 27th St Apt FF5	35.4	37.5	39.3	3.9
R-2102	Res.	B	1	4700 W 27th St Apt FF6	41.7	43.8	46.7	5.0
R-2103	Res.	B	1	4700 W 27th St Apt FF7	43.5	45.6	49.1	5.6

Table B-2: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (PM Peak Hour) – NSA 2								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-2104	Res.	B	1	4700 W 27th St Apt FF8	47.3	49.4	52.8	5.5
R-2105	Res.	B	1	4700 W 27th St Apt GG1	50.0	52.1	55.0	5.0
R-2106	Res.	B	1	4700 W 27th St Apt GG2	53.3	55.4	57.5	4.2
R-2107	Res.	B	1	4700 W 27th St Apt GG5	46.6	48.7	52.7	6.1
R-2108	Res.	B	1	4700 W 27th St Apt GG6	50.2	52.3	55.4	5.2
R-2109	Res.	B	1	4700 W 27th St Apt II1	44.6	46.6	50.8	6.2
R-2110	Res.	B	1	4700 W 27th St Apt II2	48.6	50.6	53.7	5.1
R-2111	Res.	B	1	4700 W 27th St Apt II5	44.3	46.3	50.4	6.1
R-2112	Res.	B	1	4700 W 27th St Apt II6	48.5	50.5	53.6	5.1
R-2113	Res.	B	1	4700 W 27th St Apt JJ1	45.0	47.1	50.4	5.4
R-2114	Res.	B	1	4700 W 27th St Apt JJ2	48.4	50.6	53.4	5.0
R-2115	Res.	B	1	4700 W 27th St Apt JJ3	35.6	37.9	39.8	4.2
R-2116	Res.	B	1	4700 W 27th St Apt JJ4	41.5	43.6	46.3	4.8
R-2117	Res.	B	1	4700 W 27th St Apt JJ5	47.1	49.1	51.4	4.3
R-2118	Res.	B	1	4700 W 27th St Apt JJ6	50.3	52.5	54.0	3.7
R-2119	Res.	B	1	4700 W 27th St Apt JJ7	35.6	37.8	39.8	4.2
R-2120	Res.	B	1	4700 W 27th St Apt JJ8	41.4	43.5	46.1	4.7
R-2121	Res.	B	1	4700 W 27th St Apt KK1	47.4	49.5	51.3	3.9
R-2122	Res.	B	1	4700 W 27th St Apt KK2	50.1	52.3	54.1	4.0
R-2123	Res.	B	1	4700 W 27th St Apt KK3	36.1	38.4	40.3	4.2
R-2124	Res.	B	1	4700 W 27th St Apt KK4	41.3	43.5	46.3	5.0
R-2125	Res.	B	1	4700 W 27th St Apt KK5	48.3	50.4	52.6	4.3
R-2126	Res.	B	1	4700 W 27th St Apt KK6	50.9	53.0	55.2	4.3
R-2127	Res.	B	1	4700 W 27th St Apt KK7	36.0	38.2	40.1	4.1
R-2128	Res.	B	1	4700 W 27th St Apt KK8	41.4	43.6	46.0	4.6
R-2129	Res.	B	1	4700 W 27th St Apt LL1	50.8	52.8	54.5	3.7
R-2130	Res.	B	1	4700 W 27th St Apt LL2	53.7	55.8	57.0	3.3
R-2131	Res.	B	1	4700 W 27th St Apt LL5	48.3	50.2	52.2	3.9
R-2132	Res.	B	1	4700 W 27th St Apt LL6	51.4	53.4	55.6	4.2
R-2133	Res.	B	1	4700 W 27th St Apt MM1	54.6	56.6	57.4	2.8
R-2134	Res.	B	1	4700 W 27th St Apt MM2	57.5	59.5	59.6	2.1
R-2135	Res.	B	1	4700 W 27th St Apt MM5	54.7	56.6	57.0	2.3
R-2136	Res.	B	1	4700 W 27th St Apt MM6	57.4	59.5	59.2	1.8
R-2137	Res.	B	1	4700 W 27th St Apt NN1	57.4	59.4	58.1	0.7
R-2138	Res.	B	1	4700 W 27th St Apt NN2	59.5	61.5	59.6	0.1
R-2139	Res.	B	1	4700 W 27th St Apt NN5	56.6	58.5	57.2	0.6
R-2140	Res.	B	1	4700 W 27th St Apt NN6	58.7	60.7	59.1	0.4
R-2141	Res.	B	1	4700 W 27th St Apt OO1	41.0	43.1	45.0	4.0
R-2142	Res.	B	1	4700 W 27th St Apt OO2	46.0	48.1	50.6	4.6
R-2143	Res.	B	1	4700 W 27th St Apt OO3	59.7	61.9	62.8	3.1
R-2144	Res.	B	1	4700 W 27th St Apt OO4	62.5	64.8	65.1	2.6
R-2145	Res.	B	1	4700 W 27th St Apt OO5	40.4	42.6	45.5	5.1
R-2146	Res.	B	1	4700 W 27th St Apt OO6	46.5	48.6	51.4	4.9
R-2147	Res.	B	1	4700 W 27th St Apt OO7	58.8	60.9	62.2	3.4
R-2148	Res.	B	1	4700 W 27th St Apt OO8	62.0	64.2	64.6	2.6
R-2149	Res.	B	1	4700 W 27th St Apt PP1	40.4	42.6	44.4	4.0
R-2150	Res.	B	1	4700 W 27th St Apt PP2	46.9	49.0	50.9	4.0
R-2151	Res.	B	1	4700 W 27th St Apt PP3	63.9	65.9	62.6	-1.3
R-2152	Res.	B	1	4700 W 27th St Apt PP4	65.3	67.3	64.6	-0.7
R-2153	Res.	B	1	4700 W 27th St Apt PP5	41.2	43.4	45.4	4.2
R-2154	Res.	B	1	4700 W 27th St Apt PP6	47.7	49.8	51.2	3.5
R-2155	Res.	B	1	4700 W 27th St Apt PP7	64.2	66.2	63.0	-1.2
R-2156	Res.	B	1	4700 W 27th St Apt PP8	65.6	67.6	64.8	-0.8

Table B-2: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (PM Peak Hour) – NSA 2								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-2157	Res.	B	1	4809 W 26th St	48.5	50.6	54.8	6.3
R-2158	Res.	B	1	4813 W 26th St	50.5	52.6	56.3	5.8
R-2159	Res.	B	1	4817 W 26th St	53.7	55.8	58.5	4.8
R-2160	Res.	B	1	4821 W 26th St	56.2	58.3	60.3	4.1
R-2161	Res.	B	1	4825 W 26th St	57.5	59.5	61.5	4.0
R-2162	Res.	B	1	4829 W 26th St	59.0	61.1	62.9	3.9
R-2163	Res.	B	1	4833 W 26th St	60.8	62.8	64.2	3.4
R-2164	Res.	B	1	4837 W 26th St	62.4	64.5	66.0	3.6
R-2165	Res.	B	1	2525 Via Linda Dr	62.8	64.9	66.6	3.8
R-2166	Res.	B	1	2521 Via Linda Dr	63.5	65.5	66.9	3.4
R-2167	Res.	B	1	2517 Via Linda Dr	62.6	64.7	66.3	3.7
R-2168	Res.	B	1	2513 Via Linda Dr	62.1	64.1	66.2	4.1
R-2169	Res.	B	1	2509 Via Linda Dr	62.1	64.2	66.1	4.0
R-2170	Res.	B	1	2505 Via Linda Dr	62.2	64.2	66.3	4.1
R-2171	Res.	B	1	2501 Via Linda Dr	61.9	64.0	66.1	4.2
R-2172	Res.	B	1	4828 McCormick St	52.8	55.0	60.2	7.4
R-2173	Res.	B	1	4824 McCormick St	50.7	52.9	58.4	7.7
R-2174	Res.	B	1	2516 Via Linda Dr	53.8	56.0	60.7	6.9
R-2175	Res.	B	1	2512 Via Linda Dr	53.5	55.7	60.7	7.2
R-2176	Res.	B	1	2508 Via Linda Dr	56.2	58.4	62.3	6.1
R-2177	Res.	B	1	4901 Stoneback Dr	59.0	61.1	65.4	6.4
R-2178	Res.	B	1	4903 Stoneback Dr	57.8	59.9	64.6	6.8
R-2179	Res.	B	1	4905 Stoneback Dr	57.3	59.5	64.3	7.0
R-2180	Res.	B	1	4907 Stoneback Dr	57.5	59.6	64.5	7.0
R-2181	Res.	B	1	4909 Stoneback Dr	57.5	59.7	64.6	7.1
R-2182	Res.	B	1	4911 Stoneback Dr	57.9	60.2	65.1	7.2
R-2183	Res.	B	1	4913 Stoneback Dr	58.8	61.1	66.0	7.2
R-2184	Res.	B	1	4915 Stoneback Dr	59.6	61.8	66.6	7.0
R-2185	Res.	B	1	4917 Stoneback Dr	61.1	63.4	67.7	6.6
R-2186	Res.	B	1	4919 Stoneback Dr	62.3	64.6	68.6	6.3
R-2187	Res.	B	1	4921 Stoneback Dr	65.4	67.7	70.7	5.3
R-2188	Res.	B	1	4923 Stoneback Dr	66.3	68.6	71.1	4.8
R-2189	Res.	B	1	4925 Stoneback Dr	67.2	69.6	71.6	4.4
R-2190	Res.	B	1	4927 Stoneback Dr	67.6	69.9	71.8	4.2
R-2191	Res.	B	1	4929 Stoneback Dr	65.9	68.2	70.6	4.7
R-2192	Res.	B	1	4931 Stoneback Dr	65.7	68.1	70.5	4.8
R-2193	Res.	B	1	4933 Stoneback Dr	67.7	70.1	71.7	4.0
R-2194	Res.	B	1	4935 Stoneback Dr	67.8	70.2	71.8	4.0
R-2195	Res.	B	1	4937 Stoneback Dr	67.9	70.2	71.7	3.8
R-2196	Res.	B	1	4939 Stoneback Dr	67.8	70.2	71.6	3.8
R-2197	Res.	B	1	4941 Stoneback Dr	67.1	69.4	70.9	3.8
R-2198	Res.	B	1	4943 Stoneback Dr	66.6	69.0	70.6	4.0
R-2199	Res.	B	1	4945 Stoneback Dr	66.6	69.0	70.5	3.9
R-2200	Res.	B	1	4947 Stoneback Dr	65.8	68.1	69.7	3.9
R-2201	Res.	B	1	4949 Stoneback Dr	62.0	64.3	66.3	4.3
R-2202	Res.	B	1	4951 Stoneback Dr	61.7	64.1	66.2	4.5
R-2203	Res.	B	1	4953 Stoneback Dr	60.9	63.2	65.0	4.1
R-2204	Res.	B	1	4955 Stoneback Dr	60.0	62.4	63.6	3.6
R-2205	Res.	B	1	4957 Stoneback Dr	59.2	61.6	64.2	5.0
R-2206	Res.	B	1	4959 Stoneback Dr	58.5	60.9	63.5	5.0
R-2207	Res.	B	1	4961 Stoneback Dr	56.1	58.5	60.6	4.5
R-2208	Res.	B	1	4963 Stoneback Dr	56.1	58.5	60.5	4.4
R-2209	Res.	B	1	4965 Stoneback Dr	55.5	57.9	60.1	4.6

Table B-2: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (PM Peak Hour) – NSA 2								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-2210	Res.	B	1	4967 Stoneback Dr	55.1	57.5	59.2	4.1
R-2211	Res.	B	1	4969 Stoneback Dr	55.2	57.6	59.4	4.2
R-2212	Res.	B	1	4971 Stoneback Dr	54.8	57.2	58.6	3.8
R-2213	Res.	B	1	4900 Stoneback Dr	55.6	57.6	61.7	6.1
R-2214	Res.	B	1	4902 Stoneback Dr	53.3	55.4	59.9	6.6
R-2215	Res.	B	1	4912 Stoneback Dr	48.1	50.3	53.9	5.8
R-2216	Res.	B	1	4914 Stoneback Dr	48.1	50.3	54.3	6.2
R-2217	Res.	B	1	4916 Stoneback Dr	49.1	51.4	54.9	5.8
R-2218	Res.	B	1	4918 Stoneback Dr	49.8	52.1	55.9	6.1
R-2219	Res.	B	1	4926 Stoneback Dr	52.4	54.8	58.2	5.8
R-2220	Res.	B	1	4928 Stoneback Dr	52.7	55.0	58.2	5.5
R-2221	Res.	B	1	4913 Stoneback Pl	52.3	54.4	58.0	5.7
R-2222	Res.	B	1	4915 Stoneback Pl	50.4	52.6	55.9	5.5
R-2223	Res.	B	1	4925 Stoneback Pl	49.3	51.5	55.4	6.1
R-2224	Res.	B	1	4927 Stoneback Pl	49.9	52.2	55.8	5.9
R-2225	Res.	B	1	4929 Stoneback Pl	51.1	53.4	57.0	5.9
R-2226	Res.	B	1	4931 Stoneback Pl	53.0	55.4	58.7	5.7
R-2227	Res.	B	1	4933 Stoneback Pl	50.4	52.8	56.5	6.1
R-2228	Res.	B	1	4935 Stoneback Pl	51.9	54.2	57.5	5.6
R-2229	Res.	B	1	4924 Stoneback Pl	48.9	51.1	54.2	5.3
R-2230	Res.	B	1	4926 Stoneback Pl	48.9	51.2	54.2	5.3
R-2231	Res.	B	1	4928 Stoneback Pl	43.3	45.7	47.7	4.4
R-2232	Res.	B	1	4930 Stoneback Pl	44.6	47.2	49.9	5.3
R-2233	Res.	B	1	4932 Stoneback Pl	41.5	44.1	46.2	4.7
R-2234	Res.	B	1	4934 Stoneback Pl	48.2	50.6	53.3	5.1
R-2235	Res.	B	1	4950 Stoneback Dr	50.4	52.8	54.5	4.1
R-2236	Res.	B	1	4952 Stoneback Dr	50.2	52.7	54.3	4.1
R-2237	Res.	B	1	4956 Stoneback Dr	47.6	50.1	52.1	4.5
R-2238	Res.	B	1	4958 Stoneback Dr	47.2	49.8	51.3	4.1
R-2239	Res.	B	1	4962 Stoneback Dr	44.9	47.7	49.3	4.4
R-2240	Res.	B	1	4964 Stoneback Dr	49.9	52.4	53.0	3.1
Predicted NSA 2 Build Alternative 2045 Traffic Noise Impacts							**38**	

Table B-3: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (AM Peak Hour) – NSA 3								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-3001	Sports	C	1	Clinton Lake Youth Sports Complex 1	56.7	59.1	63.4	6.7
R-3002	Sports	C	1	Clinton Lake Youth Sports Complex 2	55.7	58.0	62.9	7.2
R-3003	Sports	C	1	Clinton Lake Youth Sports Complex 3	55.0	57.4	62.1	7.1
R-3004	Sports	C	1	Clinton Lake Youth Sports Complex 4	54.6	56.8	62.1	7.5
R-3005	Sports	C	1	Clinton Lake Youth Sports Complex 5	54.2	56.6	61.6	7.4
R-3006	Sports	C	1	Clinton Lake Youth Sports Complex 6	53.5	56.0	60.9	7.4
R-3007	Sports	C	1	Clinton Lake Youth Sports Complex 7	53.4	55.7	60.9	7.5
R-3008	Sports	C	1	Clinton Lake Youth Sports Complex 8	52.9	55.3	60.4	7.5
R-3009	Sports	C	1	Clinton Lake Youth Sports Complex 9	52.2	54.6	59.9	7.7
R-3010	Trail	C	1	Arboreturn/Sports Complex Trail	59.0	62.1	64.4	5.4
R-3011	Sports	C	1	Clinton Lake Softball Complex 1	55.8	58.5	60.6	4.8
R-3012	Sports	C	1	Clinton Lake Softball Complex 2	54.6	57.3	59.3	4.7
R-3013	Sports	C	1	Clinton Lake Softball Complex 3	55.2	57.9	59.3	4.1
R-3014	Sports	C	1	Clinton Lake Softball Complex 4	53.6	56.3	58.1	4.5
R-3015	Sports	C	1	Clinton Lake Softball Complex 5	54.3	57.0	58.2	3.9
R-3016	Sports	C	1	Clinton Lake Softball Complex 6	54.7	57.4	58.2	3.5
R-3017	Sports	C	1	Clinton Lake Softball Complex 7	53.2	55.9	57.1	3.9
R-3018	Sports	C	1	Clinton Lake Softball Complex 8	53.9	56.6	57.2	3.3
R-3019	Sports	C	1	Clinton Lake Softball Complex 9	52.7	55.4	56.2	3.5
Predicted NSA 3 Build Alternative 2045 Traffic Noise Impacts							**0**	

Table B-4: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (PM Peak Hour) – NSA 4								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-4001	Res.	B	2	5000 Clinton Parkway 103/104	58.2	60.9	61.4	3.2
R-4002	Res.	B	2	5000 Clinton Parkway 105/106	57.5	60.2	60.7	3.2
R-4003	Sports	C	1	Genesis Tennis Court 1	53.3	55.9	56.6	3.3
R-4004	Sports	C	1	Genesis Tennis Court 2	53.5	56.1	57.0	3.5
R-4005	Sports	C	1	Genesis Tennis Court 3	52.1	54.7	54.9	2.8
R-4006	Sports	C	1	Genesis Tennis Court 4	50.7	53.2	53.8	3.1
R-4007	Res.	B	1	5505 Yankee Tank Ct	56.3	58.8	60.7	4.4
R-4008	Trail	C	1	Clinton Pkwy Trail 1	67.6	70.5	**71.0**	3.4
R-4009	Trail	C	1	Clinton Pkwy Trail 2	65.6	69.7	**70.2**	4.6
R-4010	Trail	C	1	Clinton Pkwy Trail 3	67.7	70.7	**71.8**	4.1
R-4011	Trail	C	1	Clinton Pkwy Trail 4	67.0	70.8	**71.3**	4.3
R-4012	Trail	C	1	Clinton Pkwy Trail 5	71.3	73.9	**76.5**	5.2
R-4013	Trail	C	1	Clinton Pkwy Trail 6	66.4	70.4	**71.1**	4.7
Predicted NSA 4 Build Alternative 2045 Traffic Noise Impacts							**6**	

Table B-5: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (AM Peak Hour) – NSA 5								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-5001	Trail	C	1	Clinton Pkwy Trail 7	67.4	70.9	73.4	6.0
R-5002	Trail	C	1	Clinton Pkwy Trail 8	67.7	71.4	74.0	6.3
R-5003	Trail	C	1	Clinton Pkwy Trail 9	68.7	72.4	70.1	1.4
R-5004	Trail	C	1	Clinton Pkwy Trail 10	68.9	72.7	69.9	1.0
R-5005	Trail	C	1	Clinton Pkwy Trail 11	67.4	71.4	70.2	2.8
R-5006	Trail	C	1	Clinton Pkwy Trail 12	67.9	71.8	72.9	5.0
R-5007	Res.	B	1	2250 Lake Pointe Dr 304	60.1	63.0	67.4	7.3
R-5008	Res.	B	1	2250 Lake Pointe Dr 302	55.4	58.8	61.9	6.5
R-5009	Res.	B	1	2250 Lake Pointe Dr 300	55.3	58.8	61.8	6.5
R-5010	Res.	B	1	2250 Lake Pointe Dr 208	54.9	58.5	61.5	6.6
R-5011	Res.	B	1	2250 Lake Pointe Dr 206	54.7	58.4	61.6	6.9
R-5012	Res.	B	1	2250 Lake Pointe Dr 104	54.8	58.5	61.5	6.7
R-5013	Res.	B	1	2250 Lake Pointe Dr 101	54.4	58.2	61.2	6.8
R-5014	Res.	B	1	2250 Lake Pointe Dr 701	58.5	61.2	64.7	6.2
R-5015	Res.	B	1	2250 Lake Pointe Dr 702	62.6	65.3	68.3	5.7
R-5016	Res.	B	1	2250 Lake Pointe Dr 703	61.9	64.6	67.5	5.6
R-5017	Res.	B	1	2250 Lake Pointe Dr 704	57.7	60.5	62.6	4.9
R-5018	Res.	B	1	2250 Lake Pointe Dr 801	53.4	56.1	60.8	7.4
R-5019	Res.	B	1	2250 Lake Pointe Dr 802	55.5	58.3	62.6	7.1
R-5020	Res.	B	1	2250 Lake Pointe Dr 803	56.0	58.8	61.0	5.0
R-5021	Res.	B	1	2250 Lake Pointe Dr 804	54.6	57.4	59.8	5.2
R-5022	Res.	B	1	2250 Lake Pointe Dr 901	46.5	49.3	53.1	6.6
R-5023	Res.	B	1	2250 Lake Pointe Dr 902	49.3	52.0	56.1	6.8
R-5024	Res.	B	1	2250 Lake Pointe Dr 903	53.2	56.0	58.5	5.3
R-5025	Res.	B	1	2250 Lake Pointe Dr 904	51.9	54.6	57.3	5.4
R-5026	Res.	B	1	2250 Lake Pointe Dr 1001	44.1	46.9	50.3	6.2
R-5027	Res.	B	1	2250 Lake Pointe Dr 1002	45.0	47.7	51.2	6.2
R-5028	Res.	B	1	2250 Lake Pointe Dr 1003	50.9	53.6	56.4	5.5
R-5029	Res.	B	1	2250 Lake Pointe Dr 1004	50.0	52.7	55.5	5.5
R-5030	Res.	B	1	2250 Lake Pointe Dr 601	50.1	52.9	58.5	8.4
R-5031	Res.	B	1	2250 Lake Pointe Dr 602	52.0	54.9	60.7	8.7
R-5032	Res.	B	1	2250 Lake Pointe Dr 603	51.8	54.6	58.5	6.7
R-5033	Res.	B	1	2250 Lake Pointe Dr 604	49.0	51.7	55.2	6.2
R-5034	Res.	B	1	2250 Lake Pointe Dr 505	48.2	51.0	55.6	7.4
R-5035	Res.	B	1	2250 Lake Pointe Dr 501	49.0	51.8	53.5	4.5
R-5036	Res.	B	1	2250 Lake Pointe Dr 2602	54.5	58.6	61.7	7.2
R-5037	Res.	B	1	2250 Lake Pointe Dr 2600	54.4	58.6	61.5	7.1
R-5038	Res.	B	1	2250 Lake Pointe Dr 2502	54.3	58.5	61.4	7.1
R-5039	Res.	B	1	2250 Lake Pointe Dr 2500	54.3	58.5	61.2	6.9
R-5040	Res.	B	1	2250 Lake Pointe Dr 2402	54.0	58.3	60.6	6.6
R-5041	Res.	B	1	2250 Lake Pointe Dr 2400	54.0	58.2	60.3	6.3
R-5042	Res.	B	1	2250 Lake Pointe Dr 2201	44.3	47.8	52.9	8.6
R-5043	Res.	B	1	2250 Lake Pointe Dr 2202	54.1	58.4	61.0	6.9
R-5044	Res.	B	1	2250 Lake Pointe Dr 2203	54.1	58.4	60.9	6.8
R-5045	Res.	B	1	2250 Lake Pointe Dr 2204	43.6	47.1	52.4	8.8
R-5046	Res.	B	1	2250 Lake Pointe Dr 2101	45.9	49.8	52.2	6.3
R-5047	Res.	B	1	2250 Lake Pointe Dr 2102	53.7	58.1	60.2	6.5
R-5048	Res.	B	1	2250 Lake Pointe Dr 2103	53.8	58.1	60.5	6.7
R-5049	Res.	B	1	2250 Lake Pointe Dr 2104	43.0	46.6	51.1	8.1
R-5050	Res.	B	1	6360 Lakeside Ln	50.7	54.2	61.5	10.8
R-5051	Res.	B	1	6358 Lakeside Ln	51.1	54.5	62.1	11.0
R-5052	Res.	B	1	6356 Lakeside Ln	52.4	55.6	63.3	10.9
R-5053	Res.	B	1	6354 Lakeside Ln	55.0	58.2	65.0	10.0

Table B-5: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (AM Peak Hour) – NSA 5								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-5054	Res.	B	1	6352 Lakeside Ln	57.5	60.8	66.4	8.9
R-5055	Res.	B	1	6350 Lakeside Ln	58.9	62.2	67.1	8.2
R-5056	Res.	B	1	6348 Lakeside Ln	59.4	62.7	67.6	8.2
R-5057	Res.	B	1	6346 Lakeside Ln	59.9	63.1	67.9	8.0
R-5058	Res.	B	1	6344 Lakeside Ln	60.6	63.7	68.9	8.3
R-5059	Res.	B	1	6342 Lakeside Ln	60.9	64.0	69.4	8.5
R-5060	Res.	B	1	6340 Lakeside Ln	60.8	63.7	69.8	9.0
R-5061	Res.	B	1	6338 Lakeside Ln	60.0	62.4	69.2	9.2
R-5062	Res.	B	1	6336 Lakeside Ln	58.6	60.9	67.2	8.6
R-5063	Res.	B	1	6334 Lakeside Ln	57.5	59.7	65.8	8.3
R-5064	Res.	B	1	6332 Lakeside Ln	57.0	59.2	65.0	8.0
R-5065	Res.	B	1	6330 Lakeside Ln	56.3	58.5	64.0	7.7
R-5066	Res.	B	1	6328 Lakeside Ln	55.0	57.2	62.7	7.7
R-5067	Res.	B	1	6326 Lakeside Ln	51.8	54.1	58.6	6.8
R-5068	Res.	B	1	6324 Lakeside Ln	50.9	53.1	58.7	7.8
R-5069	Res.	B	1	6322 Lakeside Ln	50.7	52.8	59.0	8.3
R-5070	Res.	B	1	6341 Lakeside Ln	46.7	49.6	55.1	8.4
R-5071	Res.	B	1	6339 Lakeside Ln	46.8	49.8	54.6	7.8
R-5072	Res.	B	1	6337 Lakeside Ln	46.6	49.4	53.8	7.2
R-5073	Res.	B	1	6335 Lakeside Ln	49.2	51.7	57.2	8.0
R-5074	Res.	B	1	6333 Lakeside Ln	48.0	50.4	55.6	7.6
R-5075	Res.	B	1	6331 Lakeside Ln	45.6	48.0	54.3	8.7
R-5076	Res.	B	1	6329 Lakeside Ln	44.5	46.9	51.9	7.4
R-5077	Res.	B	1	6327 Lakeside Ln	44.4	46.8	52.0	7.6
R-5078	Res.	B	1	6325 Lakeside Ln	43.7	46.1	50.7	7.0
R-5079	Res.	B	1	6323 Lakeside Ln	43.8	46.1	50.6	6.8
R-5080	Res.	B	1	6362 Lakeside Ln	49.2	53.2	55.2	6.0
R-5081	Res.	B	1	6364 Lakeside Ln	49.4	53.4	55.4	6.0
R-5082	Res.	B	1	6300 Lakeside Ln	44.1	46.6	50.4	6.3
R-5083	Res.	B	1	6302 Lakeside Ln	43.2	45.7	49.7	6.5
R-5084	Res.	B	1	6304 Lakeside Ln	43.0	45.4	49.6	6.6
R-5085	Res.	B	1	6306 Lakeside Ln	42.9	45.3	50.2	7.3
R-5086	Res.	B	1	6308 Lakeside Ln	43.1	45.5	50.5	7.4
R-5087	Res.	B	1	6310 Lakeside Ln	43.7	46.1	50.6	6.9
R-5088	Res.	B	1	6312 Lakeside Ln	44.6	46.9	52.1	7.5
R-5089	Res.	B	1	6314 Lakeside Ln	44.7	47.1	53.3	8.6
R-5090	Res.	B	1	6316 Lakeside Ln	46.5	48.8	54.2	7.7
R-5091	Res.	B	1	6318 Lakeside Ln	47.4	49.5	54.5	7.1
R-5092	Res.	B	1	1412 E 902 Rd	61.8	63.9	R/W	N/A
R-5093	Res.	B	1	1416 E 902 Rd	59.1	61.1	70.0	10.9
R-5094	Res.	B	1	1420 E 902 Rd	56.8	58.8	65.8	9.0
R-5095	Res.	B	1	1422 E 902 Rd	55.5	57.4	63.2	7.7
R-5096	Res.	B	1	1428 E 902 Rd	54.1	56.1	60.3	6.2
R-5097	Res.	B	1	1430 E 902 Rd	53.6	55.5	58.5	4.9
R-5098	Res.	B	1	1432 E 902 Rd	53.8	55.7	58.1	4.3
R-5099	Res.	B	1	1434 E 902 Rd	54.9	56.8	58.4	3.5
R-5100	Res.	B	1	1435 E 902 Rd	60.8	62.7	64.5	3.7
R-5101	Res.	B	1	1438 E 902 Rd	53.3	55.2	56.0	2.7
R-5102	Trail	C	1	SLT Trail 6	64.8	67.1	75.1	10.3
R-5103	Trail	C	1	SLT Trail 7	70.0	71.9	76.2	6.2
Predicted NSA 5 Build Alternative 2045 Traffic Noise Impacts							**25**	

Table B-6: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (AM Peak Hour) – NSA 6								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-6001	Trail	C	1	SLT Trail 5	48.2	51.0	52.0	3.8
R-6002	Trail	C	1	SLT Trail 4	53.6	58.7	56.2	2.6
Predicted NSA 6 Build Alternative 2045 Traffic Noise Impacts							**0**	

Table B-7: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (AM Peak Hour) – NSA 7								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-7001	Res.	B	1	1448 E 902 Rd	55.1	57.0	56.6	1.5
R-7002	Res.	B	1	910 N 1452 Rd	51.5	53.5	53.8	2.3
R-7003	Res.	B	1	903 N 1464 Rd	55.8	57.7	53.9	-1.9
R-7004	Res.	B	1	906 N 1464 Rd	60.6	62.4	59.3	-1.3
R-7005	Res.	B	1	907 N 1464 Rd	51.8	53.6	51.4	-0.4
R-7006	Res.	B	1	909 N 1464 Rd	50.1	52.0	50.8	0.7
R-7007	Res.	B	1	911 N 1464 Rd	48.0	49.9	50.3	2.3
R-7008	Res.	B	1	1488 E 902 Rd	54.7	56.5	56.8	2.1
R-7009	Res.	B	1	1490 E 902 Rd	48.2	50.2	51.8	3.6
R-7010	Res.	B	1	1492 E 902 Rd	52.0	54.2	55.5	3.5
R-7011	Trail	C	1	SLT Trail 8	58.7	60.6	57.8	-0.9
R-7012	Trail	C	1	SLT Trail 9	63.7	65.6	61.0	-2.7
R-7013	Trail	C	1	SLT Trail 10	68.4	69.9	69.3	0.9
R-7014	Trail	C	1	SLT Trail 11	51.5	55.6	57.3	5.8
Predicted NSA 7 Build Alternative 2045 Traffic Noise Impacts							**1**	

Table B-8: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (AM Peak Hour) – NSA 8								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-8001	Trail	C	1	SLT Trail 12	59.2	62.9	65.0	5.8
R-8002	Trail	C	1	SLT Trail 13	66.8	68.4	70.4	3.6
R-8003	Trail	C	1	SLT Trail 14	64.9	66.8	69.0	4.1
R-8004	Trail	C	1	SLT Trail 15	60.2	63.6	65.3	5.1
R-8005	Res.	B	1	1121 Renaissance Dr	50.0	52.3	55.2	5.2
R-8006	Res.	B	1	1115 Renaissance Dr	52.3	54.3	57.8	5.5
R-8007	Res.	B	1	1109 Renaissance Dr	52.6	54.5	58.0	5.4
R-8008	Res.	B	1	1103 Renaissance Dr	53.4	55.4	58.9	5.5
R-8009	Res.	B	1	1031 Renaissance Dr	55.0	56.8	59.9	4.9
R-8010	Res.	B	1	1025 Renaissance Dr	55.3	57.1	59.9	4.6
R-8011	Res.	B	1	1019 Renaissance Dr	55.7	57.6	59.9	4.2
R-8012	Res.	B	1	1013 Renaissance Dr	56.2	58.0	60.3	4.1
R-8013	Res.	B	1	1007 Renaissance Dr	56.4	58.3	60.7	4.3
R-8014	Res.	B	1	1001 Renaissance Dr	56.8	58.7	61.0	4.2
R-8015	Res.	B	1	945 Renaissance Dr	57.3	59.2	61.4	4.1
R-8016	Res.	B	1	941 Renaissance Dr	57.9	59.8	61.9	4.0
R-8017	Res.	B	1	935 Renaissance Dr	57.5	59.4	61.6	4.1
R-8018	Res.	B	1	929 Renaissance Dr	58.0	59.8	62.1	4.1
R-8019	Res.	B	1	923 Renaissance Dr	58.2	60.0	62.3	4.1
R-8020	Res.	B	1	917 Renaissance Dr	58.4	60.3	62.5	4.1
R-8021	Res.	B	1	911 Renaissance Dr	60.5	62.4	64.5	4.0
R-8022	Res.	B	1	905 Renaissance Dr	60.0	61.9	64.4	4.4
R-8023	Res.	B	1	855 Renaissance Dr	61.6	63.5	66.1	4.5
R-8024	Res.	B	1	853 Renaissance Dr	62.4	64.3	67.2	4.8
R-8025	Res.	B	1	849 Renaissance Dr	62.2	64.0	66.9	4.7
R-8026	Res.	B	1	847 Renaissance Dr	61.8	63.7	66.3	4.5
R-8027	Res.	B	1	843 Renaissance Dr	61.3	63.2	66.0	4.7
R-8028	Res.	B	1	841 Renaissance Dr	61.3	63.2	66.0	4.7
R-8029	Res.	B	1	835 Renaissance Dr	61.1	63.0	66.1	5.0
R-8030	Res.	B	1	829 Renaissance Dr	61.5	63.4	66.4	4.9
R-8031	Res.	B	1	823 Renaissance Dr	61.8	63.7	66.6	4.8
R-8032	Res.	B	1	817 Renaissance Dr	62.0	63.9	66.8	4.8
R-8033	Res.	B	1	811 Renaissance Dr	62.3	64.2	66.8	4.5
R-8034	Res.	B	1	805 Renaissance Dr	61.4	63.3	66.1	4.7
R-8035	Res.	B	1	1127 Klein Ct	49.2	51.7	53.4	4.2
R-8036	Res.	B	1	1121 Klein Ct	49.7	52.1	53.8	4.1
R-8037	Res.	B	1	1115 Klein Ct	49.2	51.1	52.9	3.7
R-8038	Res.	B	1	1109 Klein Ct	49.2	51.1	53.2	4.0
R-8039	Res.	B	1	1103 Klein Ct	44.8	47.5	48.6	3.8
R-8040	Res.	B	1	1104 Klein Ct	45.6	48.3	50.0	4.4
R-8041	Res.	B	1	1112 Klein Ct	46.4	48.9	50.5	4.1
R-8042	Res.	B	1	1120 Klein Ct	46.8	49.2	51.0	4.2
R-8043	Res.	B	1	1126 Klein Ct	46.8	49.5	51.5	4.7
R-8044	Res.	B	1	6335 Rockaway Dr	48.4	50.5	52.5	4.1
R-8045	Res.	B	1	6331 Rockaway Dr	48.9	50.9	52.4	3.5
R-8046	Res.	B	1	6327 Rockaway Dr	48.8	50.8	52.4	3.6
R-8047	Res.	B	1	6323 Rockaway Dr	48.8	50.9	52.2	3.4
R-8048	Res.	B	1	6319 Rockaway Dr	48.0	50.0	51.4	3.4
R-8049	Res.	B	1	6315 Rockaway Dr	47.0	49.3	50.7	3.7
R-8050	Res.	B	1	6311 Rockaway Dr	46.0	48.5	49.8	3.8
R-8051	Res.	B	1	6334 Rockaway Dr	50.4	52.3	54.6	4.2
R-8052	Res.	B	1	6330 Rockaway Dr	49.8	51.6	54.4	4.6
R-8053	Res.	B	1	6326 Rockaway Dr	50.1	52.0	54.7	4.6
R-8054	Res.	B	1	6322 Rockaway Dr	49.4	51.4	53.7	4.3

Table B-8: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (AM Peak Hour) – NSA 8								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-8055	Res.	B	1	6318 Rockaway Dr	47.6	49.5	51.1	3.5
R-8056	Res.	B	1	6314 Rockaway Dr	48.7	50.6	53.0	4.3
R-8057	Res.	B	1	6310 Rockaway Dr	48.2	50.1	52.5	4.3
R-8058	Res.	B	1	6306 Rockaway Dr	47.8	49.7	52.0	4.2
R-8059	Res.	B	1	6325 Steeple Chase Ct	52.6	54.4	56.8	4.2
R-8060	Res.	B	1	6323 Steeple Chase Ct	52.4	54.2	56.7	4.3
R-8061	Res.	B	1	6317 Steeple Chase Ct	49.1	51.0	53.0	3.9
R-8062	Res.	B	1	6305 Steeple Chase Ct	51.8	53.7	55.5	3.7
R-8063	Res.	B	1	6304 Steeple Chase Ct	51.3	53.2	54.9	3.6
R-8064	Res.	B	1	6310 Steeple Chase Ct	50.5	52.4	54.7	4.2
R-8065	Res.	B	1	6316 Steeple Chase Ct	52.0	53.8	56.6	4.6
R-8066	Res.	B	1	6322 Steeple Chase Ct	50.8	52.7	55.6	4.8
R-8067	Res.	B	1	916 Renaissance Dr	51.8	53.7	56.8	5.0
R-8068	Res.	B	1	6339 Steeple Chase Dr	52.6	54.6	56.6	4.0
R-8069	Res.	B	1	6335 Steeple Chase Dr	52.1	54.0	56.7	4.6
R-8070	Res.	B	1	6331 Steeple Chase Dr	52.4	54.2	56.3	3.9
R-8071	Res.	B	1	6327 Steeple Chase Dr	52.4	54.2	56.4	4.0
R-8072	Res.	B	1	6323 Steeple Chase Dr	52.6	54.4	56.5	3.9
R-8073	Res.	B	1	6319 Steeple Chase Dr	52.3	54.1	56.3	4.0
R-8074	Res.	B	1	6315 Steeple Chase Dr	51.0	53.0	55.2	4.2
R-8075	Res.	B	1	6340 Steeple Chase Dr	48.6	50.6	52.8	4.2
R-8076	Res.	B	1	6336 Steeple Chase Dr	48.7	50.7	52.9	4.2
R-8077	Res.	B	1	6332 Steeple Chase Dr	49.7	51.7	54.1	4.4
R-8078	Res.	B	1	6328 Steeple Chase Dr	49.6	51.5	53.8	4.2
R-8079	Res.	B	1	6324 Steeple Chase Dr	50.1	52.1	54.3	4.2
R-8080	Res.	B	1	6320 Steeple Chase Dr	49.8	51.8	54.0	4.2
R-8081	Res.	B	1	6316 Steeple Chase Dr	49.7	51.7	54.0	4.3
R-8082	Res.	B	1	6321 Serenade Ct	50.8	52.7	54.8	4.0
R-8083	Res.	B	1	6317 Serenade Ct	51.0	52.9	55.2	4.2
R-8084	Res.	B	1	6313 Serenade Ct	50.9	52.8	55.2	4.3
R-8085	Res.	B	1	6309 Serenade Ct	50.5	52.4	54.6	4.1
R-8086	Res.	B	1	6305 Serenade Ct	51.1	53.1	55.4	4.3
R-8087	Res.	B	1	6324 Serenade Ct	48.1	50.1	53.4	5.3
R-8088	Res.	B	1	6320 Serenade Ct	48.3	50.3	52.9	4.6
R-8089	Res.	B	1	6316 Serenade Ct	48.2	50.1	52.7	4.5
R-8090	Res.	B	1	6312 Serenade Ct	48.4	50.4	52.7	4.3
R-8091	Res.	B	1	6308 Serenade Ct	52.1	54.0	56.2	4.1
R-8092	Res.	B	1	6304 Serenade Ct	51.7	53.6	56.0	4.3
R-8093	Res.	B	1	6339 Serenade Dr	51.9	53.7	56.2	4.3
R-8094	Res.	B	1	6335 Serenade Dr	50.3	52.2	54.4	4.1
R-8095	Res.	B	1	6331 Serenade Dr	48.6	50.6	52.8	4.2
R-8096	Res.	B	1	6327 Serenade Dr	50.9	52.9	55.1	4.2
R-8097	Res.	B	1	6323 Serenade Dr	51.5	53.5	55.7	4.2
R-8098	Res.	B	1	6319 Serenade Dr	47.1	49.1	51.0	3.9
R-8099	Res.	B	1	6315 Serenade Dr	50.6	52.5	54.8	4.2
R-8100	Res.	B	1	6336 Serenade Dr	55.0	56.5	59.5	4.5
R-8101	Res.	B	1	6332 Serenade Dr	50.7	52.3	53.7	3.0
R-8102	Res.	B	1	6328 Serenade Dr	52.2	53.8	56.3	4.1
R-8103	Res.	B	1	6324 Serenade Dr	52.0	53.7	56.1	4.1
R-8104	Res.	B	1	6320 Serenade Dr	51.5	53.2	55.7	4.2
R-8105	Res.	B	1	6316 Serenade Dr	51.2	53.0	55.2	4.0
Predicted NSA 8 Build Alternative 2045 Traffic Noise Impacts							**14**	

Table B-9: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (PM Peak Hour) – NSA 9								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-9001	Res.	B	1	1543 E 900 Rd	55.5	57.6	61.2	5.7
R-9002	Res.	B	1	894 N 1549 Rd	55.8	57.9	61.6	5.8
R-9003	Res.	B	1	1571 E 900 Rd	57.4	59.8	62.7	5.3
Predicted NSA 9 Build Alternative 2045 Traffic Noise Impacts							**0**	

Table B-10: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (AM Peak Hour) – NSA 10								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-10001	Trail	C	1	SLT Trail 16	65.8	68.8	**69.9**	4.1
R-10002	Trail	C	1	SLT Trail 17	72.6	74.0	**75.4**	2.8
R-10003	Trail	C	1	SLT Trail 18	67.2	68.2	**68.1**	0.9
R-10004	Trail	C	1	SLT Trail 19	72.2	73.3	**74.1**	1.9
R-10005	Trail	C	1	SLT Trail 20	70.2	71.3	**71.7**	1.5
R-10006	Trail	C	1	SLT Trail 21	71.7	72.7	**74.2**	2.5
R-10007	Trail	C	1	SLT Trail 22	70.4	71.4	**73.0**	2.6
R-10008	Hospital	D	1	Lawrence Memorial Hospital	40.0	40.0	40.0	0.0
R-10009	Trail	C	1	Rock Chalk Dr Rec Path	61.7	62.9	64.7	3.0
R-10010	Sports	C	1	Jayhawk Tennis Center	48.9	50.4	53.0	4.1
R-10011	Trail	C	1	Rock Chalk Park Trails 1	59.1	60.2	61.2	2.1
R-10012	Trail	C	1	Rock Chalk Park Trails 2	58.5	59.6	60.2	1.7
R-10013	Sports	C	1	Rock Chalk Park Track	52.6	53.8	55.9	3.3
R-10014	Res.	B	1	1691 E 902 Rd	52.1	53.2	54.7	2.6
R-10015	Res.	B	1	873 N 1750 Rd	54.2	55.3	56.3	2.1
Predicted NSA 10 Build Alternative 2045 Traffic Noise Impacts							**7**	

Table B-11: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (PM Peak Hour) – NSA 11								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-11001	Res.	B	1	891 N 1663 Rd	59.7	61.1	63.3	3.6
R-11002	Res.	B	1	892 N 1663 Rd	58.0	59.3	61.5	3.5
R-11003	Res.	B	1	875 N 1684 Rd	54.4	55.7	55.6	1.2
R-11004	Res.	B	1	1692 E 872 Rd	56.6	57.8	58.8	2.2
R-11005	Res.	B	1	861 N 1710 Rd	56.7	58.0	59.4	2.7
R-11006	Res.	B	1	866 N 1710 Rd	58.1	59.4	60.9	2.8
R-11007	Res.	B	1	839 N 1750 Rd	61.6	62.8	65.4	3.8
Predicted NSA 11 Build Alternative 2045 Traffic Noise Impacts							**0**	

Table B-12: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (AM Peak Hour) – NSA 12								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-12001	Res.	B	1	878 N 1750 Rd	57.3	59.7	57.1	-0.2
R-12002	Res.	B	1	898 N 1750 Rd	53.9	56.7	55.8	1.9
R-12003	Res.	B	1	1762 E 936 Rd	56.1	59.1	59.1	3.0
R-12004	Res.	B	1	1761 E 960 Rd	55.0	58.0	58.8	3.8
Predicted NSA 12 Build Alternative 2045 Traffic Noise Impacts							0	

Table B-13: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (PM Peak Hour) – NSA 13								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-13001	Res.	B	1	844 N 1750 Rd	64.4	65.9	R/W	N/A
R-13002	Res.	B	1	818 N 1750 Rd	63.3	65.2	65.5	2.2
R-13003	Res.	B	1	1770 E 800 Rd	66.5	68.4	66.5	0.0
R-13004	Res.	B	1	1772 E 800 Rd	69.5	71.3	70.7	1.2
R-13005	Res.	B	1	1767 E 800 Rd	57.9	59.8	59.6	1.7
Predicted NSA 13 Build Alternative 2045 Traffic Noise Impacts							2	

Table B-14: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (PM Peak Hour) – NSA 14								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-14001	Res.	B	1	867 N 1800 Rd	58.0	60.0	57.5	-0.5
R-14002	Res.	B	1	885 N 1800 Rd	58.4	60.6	57.4	-1.0
R-14003	Res.	B	1	899 N 1800 Rd	58.1	60.3	57.6	-0.5
R-14004	Res.	B	1	901 N 1800 Rd	56.2	58.4	57.1	0.9
R-14005	Res.	B	1	933 N 1800 Rd	57.3	59.5	60.3	3.0
R-14006	Res.	B	1	939 N 1800 Rd	61.3	63.5	63.9	2.6
R-14007	Res.	B	1	943 N 1800 Rd	66.6	69.0	69.2	2.6
Predicted NSA 14 Build Alternative 2045 Traffic Noise Impacts							1	

Table B-15: Noise Sensitive Receptors and Hourly Equivalent Noise Levels Build Alternative (AM Peak Hour) – NSA 15								
Receptors					Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID #	Use	NAC	ERs	Address	Existing	2045 No-Build	2045 Build	Build - Existing (Change)
R-15001	Church	C	1	1781 E 800 Rd	73.7	75.8	75.9	2.2
R-15002	Res.	B	1	802 N 1800 Rd	60.2	62.8	62.9	2.7
R-15003	Res.	B	1	1789 E 770 Rd	68.7	70.8	72.1	3.4
R-15004	Res.	B	1	1793 E 770 Rd	60.0	61.9	63.0	3.0
Predicted NSA 15 Build Alternative 2045 Traffic Noise Impacts							2	

Appendix C
Noise Barrier Feasibility and Reasonableness Analysis

Table C-1: NW1 Performance	
Feasibility:	
An acoustically feasible noise barrier must have a minimum of three 1st row impacted receptors and must achieve at least a five dB(A) traffic noise reduction for 80% of 1st row impacted receptors.	
Total 1st row impacted receptors:	2
Minimum of three 1st row impacted receptors?	No
Feasible?	**No**

Table C-2: NW2A Performance Without Barrier and With Barrier Noise Levels Build Alternative - PM Peak Hour						
Receptors				Predicted Noise Levels, $L_{eq(h)}$ (dB(A))		
ID#	Use	NAC	Address	Build	With Barrier	NLR
R-2002	Trail	C	KANZA Soutwhind Nature Preserve Trails 2	70.9	62.4	8.5
R-2018	Res.	B	2714 Larkspur Ct	50.9	50.8	0.1
R-2019	Res.	B	2716 Larkspur Ct	51.2	51.3	-0.1
R-2020	Res.	B	2718 Larkspur Ct	52.5	52.3	0.2
R-2021	Res.	B	2720 Larkspur Ct	52.9	52.5	0.4
R-2022	Res.	B	2722 Larkspur Ct	56.3	55.0	1.3
R-2023	Res.	B	2724 Larkspur Ct	59.5	56.2	3.3
R-2024	Res.	B	2725 Larkspur Ct	63.4	57.6	5.8
R-2025	Res.	B	2723 Larkspur Ct	64.2	57.8	6.4
R-2026	Res.	B	2721 Larkspur Ct	63.3	55.6	7.7
R-2027	Res.	B	2719 Larkspur Ct	61.5	54.0	7.5
R-2028	Res.	B	2717 Larkspur Ct	57.2	49.5	7.7
R-2029	Res.	B	2715 Larkspur Ct	56.0	49.1	6.9
R-2030	Res.	B	2713 Larkspur Ct	53.7	48.1	5.6
R-2031	Res.	B	2711 Larkspur Ct	53.3	48.3	5.0
R-2032	Res.	B	4701 Larkspur Cir	44.7	44.1	0.6
R-2033	Res.	B	4705 Larkspur Cir	45.5	44.1	1.4
R-2034	Res.	B	4709 Larkspur Cir	48.2	45.3	2.9
R-2035	Res.	B	4713 Larkspur Cir	53.8	48.8	5.0
R-2036	Res.	B	4717 Larkspur Cir	55.5	50.3	5.2
R-2037	Res.	B	4721 Larkspur Cir	56.6	51.5	5.1
R-2038	Res.	B	4725 Larkspur Cir	58.2	53.1	5.1
R-2039	Res.	B	4729 Larkspur Cir	60.1	54.3	5.8
R-2040	Res.	B	4733 Larkspur Cir	67.4	57.4	10.0
R-2041	Res.	B	4737 Larkspur Cir	68.5	58.5	10.0
R-2042	Res.	B	4741 Larkspur Cir	67.5	58.4	9.1
R-2043	Res.	B	4745 Larkspur Cir	66.9	58.3	8.6
R-2044	Res.	B	4749 Larkspur Cir	66.9	58.6	8.3
R-2045	Res.	B	4753 Larkspur Cir	66.8	58.8	8.0
R-2046	Res.	B	4757 Larkspur Cir	66.7	59.2	7.5
R-2047	Res.	B	4761 Larkspur Cir	67.0	59.9	7.1
R-2048	Res.	B	4765 Larkspur Cir	67.7	60.8	6.9
R-2049	Res.	B	4702 Larkspur Cir	58.9	58.0	0.9
R-2050	Res.	B	4706 Larkspur Cir	56.6	53.0	3.6
R-2051	Res.	B	4712 Larkspur Cir	56.1	51.9	4.2
R-2052	Res.	B	4746 Larkspur Cir	54.8	51.5	3.3
R-2053	Res.	B	4750 Larkspur Cir	54.8	51.8	3.0
R-2054	Res.	B	4756 Larkspur Cir	57.7	55.9	1.8
R-2055	Res.	B	4764 Larkspur Cir	60.6	59.7	0.9
				Predicted Build Alternative With Barrier Benefits		23
				Noise Impact		Benefited Receptor

NW2A					
Feasibility:					
An acoustically feasible noise barrier must have a minimum of three 1st row impacted receptors and must achieve at least a five dB(A) traffic noise reduction for 80% of 1st row impacted receptors.					
Total 1st row impacted receptors	10	Percentage of 1st row impacted receptors receiving 5 dB(A) reduction or more:	100%	Is the barrier Feasible?	Yes
1st row impacted receptors receiving >= 5 dB(A) reduction	10				
Reasonableness:					
The noise barrier must achieve a minimum of seven (7) dB(A) insertion loss for the majority of benefitted receptors or a minimum of an eight (8) dB(A) insertion lost for at least one Activity Category B receptor. Benefitted receptor >= 5 dB(A). It must also have a maximum barrier square footage per benefitted receptor of 1,200.					
Number of benefitted receptors	23	A majority of benefitted receptors achieve a 7 dB(A) reduction or an eight (8) dB(A) insertion lost for at least one Activity Category B receptor			Yes

Length (Ft)	Average Height (Ft)	Sq Ft	Square Footage per Benefitted Receptor	
1,056	14.1	14,910	648	
			Is the barrier less than 1,200 square feet per benefitted receptor?	Yes
			Is the barrier preliminarily Reasonable?	**Yes**

Table C-3: NW2B Performance Without Barrier and With Barrier Noise Levels Build Alternative - PM Peak Hour						
Receptors				Predicted Noise Levels, $L_{eq(h)}$ (dB(A))		
ID#	Use	NAC	Address	Build	With Barrier	NLR
R-2164	Res.	B	4837 W 26th St	66.0	64.5	1.5
R-2165	Res.	B	2525 Via Linda Dr	66.6	65.4	1.2
R-2166	Res.	B	2521 Via Linda Dr	66.9	66.0	0.9
R-2167	Res.	B	2517 Via Linda Dr	66.3	65.5	0.8
R-2168	Res.	B	2513 Via Linda Dr	66.2	65.3	0.9
R-2169	Res.	B	2509 Via Linda Dr	66.1	65.4	0.7
R-2170	Res.	B	2505 Via Linda Dr	66.3	65.7	0.6
R-2171	Res.	B	2501 Via Linda Dr	66.1	65.5	0.6
				Predicted Build Alternative With Barrier Benefits		0
				Noise Impact		Benefited Receptor

NW2B					
Feasibility:					
An acoustically feasible noise barrier must have a minimum of three 1st row impacted receptors and must achieve at least a five dB(A) traffic noise reduction for 80% of 1st row impacted receptors.					
Total 1st row impacted receptors	8	Percentage of 1st row impacted receptors receiving 5 dB(A) reduction or more:	0%	Is the barrier Feasible?	**No**
1st row impacted receptors receiving >= 5 dB(A) reduction	0				

Table C-4: NW2C Performance Without Barrier and With Barrier Noise Levels Build Alternative - PM Peak Hour						
Receptors				Predicted Noise Levels, $L_{eq(h)}$ (dB(A))		
ID#	Use	NAC	Address	Build	With Barrier	NLR
R-2177	Res.	B	4901 Stoneback Dr	65.4	64.4	1.0
R-2178	Res.	B	4903 Stoneback Dr	64.6	63.1	1.5
R-2179	Res.	B	4905 Stoneback Dr	64.3	62.0	2.3
R-2180	Res.	B	4907 Stoneback Dr	64.5	61.7	2.8
R-2181	Res.	B	4909 Stoneback Dr	64.6	60.9	3.7
R-2182	Res.	B	4911 Stoneback Dr	65.1	60.9	4.2
R-2183	Res.	B	4913 Stoneback Dr	66.0	60.9	5.1
R-2184	Res.	B	4915 Stoneback Dr	66.6	61.1	5.5
R-2185	Res.	B	4917 Stoneback Dr	67.7	61.3	6.4
R-2186	Res.	B	4919 Stoneback Dr	68.6	61.7	6.9
R-2187	Res.	B	4921 Stoneback Dr	70.7	62.6	8.1
R-2188	Res.	B	4923 Stoneback Dr	71.1	62.8	8.3
R-2189	Res.	B	4925 Stoneback Dr	71.6	62.6	9.0
R-2190	Res.	B	4927 Stoneback Dr	71.8	62.5	9.3
R-2191	Res.	B	4929 Stoneback Dr	70.6	58.8	11.8
R-2192	Res.	B	4931 Stoneback Dr	70.5	59.0	11.5
R-2193	Res.	B	4933 Stoneback Dr	71.7	60.4	11.3
R-2194	Res.	B	4935 Stoneback Dr	71.8	60.1	11.7
R-2195	Res.	B	4937 Stoneback Dr	71.7	59.6	12.1
R-2196	Res.	B	4939 Stoneback Dr	71.6	59.5	12.1
R-2197	Res.	B	4941 Stoneback Dr	70.9	59.4	11.5
R-2198	Res.	B	4943 Stoneback Dr	70.6	59.3	11.3
R-2199	Res.	B	4945 Stoneback Dr	70.5	60.1	10.4
R-2200	Res.	B	4947 Stoneback Dr	69.7	60.1	9.6
R-2201	Res.	B	4949 Stoneback Dr	66.3	59.3	7.0
R-2202	Res.	B	4951 Stoneback Dr	66.2	59.4	6.8
R-2203	Res.	B	4953 Stoneback Dr	65.0	59.2	5.8
R-2204	Res.	B	4955 Stoneback Dr	63.6	58.4	5.2
R-2205	Res.	B	4957 Stoneback Dr	64.2	59.4	4.8
R-2206	Res.	B	4959 Stoneback Dr	63.5	59.0	4.5
R-2207	Res.	B	4961 Stoneback Dr	60.6	58.2	2.4
R-2208	Res.	B	4963 Stoneback Dr	60.5	57.9	2.6
R-2209	Res.	B	4965 Stoneback Dr	60.1	57.5	2.6
R-2210	Res.	B	4967 Stoneback Dr	59.2	56.7	2.5
R-2211	Res.	B	4969 Stoneback Dr	59.4	57.0	2.4
R-2212	Res.	B	4971 Stoneback Dr	58.6	56.5	2.1
R-2213	Res.	B	4900 Stoneback Dr	61.7	61.6	0.1
R-2214	Res.	B	4902 Stoneback Dr	59.9	59.8	0.1
R-2215	Res.	B	4912 Stoneback Dr	53.9	52.8	1.1
R-2216	Res.	B	4914 Stoneback Dr	54.3	53.1	1.2
R-2217	Res.	B	4916 Stoneback Dr	54.9	53.1	1.8
R-2218	Res.	B	4918 Stoneback Dr	55.9	53.5	2.4
R-2219	Res.	B	4926 Stoneback Dr	58.2	53.2	5.0
R-2220	Res.	B	4928 Stoneback Dr	58.2	53.1	5.1
R-2221	Res.	B	4913 Stoneback Pl	58.0	57.7	0.3
R-2222	Res.	B	4915 Stoneback Pl	55.9	54.8	1.1
R-2223	Res.	B	4925 Stoneback Pl	55.4	53.9	1.5
R-2224	Res.	B	4927 Stoneback Pl	55.8	53.4	2.4
R-2225	Res.	B	4929 Stoneback Pl	57.0	53.1	3.9
R-2226	Res.	B	4931 Stoneback Pl	58.7	54.1	4.6
R-2227	Res.	B	4933 Stoneback Pl	56.5	49.7	6.8
R-2228	Res.	B	4935 Stoneback Pl	57.5	50.3	7.2

Table C-4: NW2C Performance Without Barrier and With Barrier Noise Levels Build Alternative - PM Peak Hour						
Receptors				Predicted Noise Levels, $L_{eq(h)}$ (dB(A))		
ID#	Use	NAC	Address	Build	With Barrier	NLR
R-2229	Res.	B	4924 Stoneback Pl	54.2	51.4	2.8
R-2230	Res.	B	4926 Stoneback Pl	54.2	50.6	3.6
R-2231	Res.	B	4928 Stoneback Pl	47.7	47.5	0.2
R-2232	Res.	B	4930 Stoneback Pl	49.9	47.7	2.2
R-2233	Res.	B	4932 Stoneback Pl	46.2	45.1	1.1
R-2234	Res.	B	4934 Stoneback Pl	53.3	49.0	4.3
R-2235	Res.	B	4950 Stoneback Dr	54.5	52.0	2.5
R-2236	Res.	B	4952 Stoneback Dr	54.3	51.7	2.6
R-2237	Res.	B	4956 Stoneback Dr	52.1	50.0	2.1
R-2238	Res.	B	4958 Stoneback Dr	51.3	48.2	3.1
R-2239	Res.	B	4962 Stoneback Dr	49.3	47.0	2.3
R-2240	Res.	B	4964 Stoneback Dr	53.0	52.4	0.6
					Predicted Build Alternative With Barrier Benefits	26
					Noise Impact	Benefited Receptor

NW2C

Feasibility:

An acoustically feasible noise barrier must have a minimum of three 1st row impacted receptors and must achieve at least a five dB(A) traffic noise reduction for 80% of 1st row impacted receptors.

Total 1st row impacted receptors	20	Percentage of 1st row impacted receptors receiving 5 dB(A) reduction or more:	100%	Is the barrier Feasible?	Yes
1st row impacted receptors receiving >= 5 dB(A) reduction	20				

Reasonableness:

The noise barrier must achieve a minimum of seven (7) dB(A) insertion loss for the majority of benefitted receptors or a minimum of an eight (8) dB(A) insertion lost for at least one Activity Category B receptor. Benefitted receptor >= 5 dB(A). It must also have a maximum barrier square footage per benefitted receptor of 1,200.

Number of benefitted receptors	26	A majority of benefitted receptors achieve a 7 dB(A) reduction or an eight (8) dB(A) insertion lost for at least one Activity Category B receptor	Yes

Length (Ft)	Average Height (Ft)	Sq Ft	Square Footage per Benefitted Receptor
1,523	18.5	28,229	1,086

Is the barrier less than 1,200 square feet per benefitted receptor?	Yes
Is the barrier preliminarily Reasonable?	**Yes**

Table C-5: NW4 Performance Without Barrier and With Barrier Noise Levels Build Alternative - PM Peak Hour						
Receptors				Predicted Noise Levels, $L_{eq(h)}$ (dB(A))		
ID#	Use	NAC	Address	Build	With Barrier	NLR
R-4008	Trail	C	Clinton Pkwy Trail 1	71.0	70.1	0.9
R-4009	Trail	C	Clinton Pkwy Trail 2	70.2	69.7	0.5
R-4010	Trail	C	Clinton Pkwy Trail 3	71.8	69.9	1.9
R-4011	Trail	C	Clinton Pkwy Trail 4	71.3	70.1	1.2
R-4012	Trail	C	Clinton Pkwy Trail 5	76.5	70.5	6.0
R-4013	Trail	C	Clinton Pkwy Trail 6	71.1	70.3	0.8
					Predicted Build Alternative With Barrier Benefits	1
					Noise Impact	Benefited Receptor

NW4					
Feasibility:					
An acoustically feasible noise barrier must have a minimum of three 1st row impacted receptors and must achieve at least a five dB(A) traffic noise reduction for 80% of 1st row impacted receptors.					
Total 1st row impacted receptors	6	Percentage of 1st row impacted receptors receiving 5 dB(A) reduction or more:	17%	Is the barrier Feasible?	**No**

Table C-6: NW5A Performance Without Barrier and With Barrier Noise Levels Build Alternative - PM Peak Hour						
Receptors				Predicted Noise Levels, $L_{eq(h)}$ (dB(A))		
ID#	Use	NAC	Address	Build	With Barrier	NLR
R-5001	Trail	C	Clinton Pkwy Trail 7	74.1	72.1	1.3
R-5002	Trail	C	Clinton Pkwy Trail 8	73.9	73.0	1.0
R-5003	Trail	C	Clinton Pkwy Trail 9	70.7	69.7	0.4
R-5004	Trail	C	Clinton Pkwy Trail 10	69.5	69.4	0.5
R-5007	Res.	B	2250 Lake Pointe Dr 304	67.6	61.6	5.8
R-5008	Res.	B	2250 Lake Pointe Dr 302	62.0	58.2	3.7
R-5009	Res.	B	2250 Lake Pointe Dr 300	62.0	58.4	3.4
R-5010	Res.	B	2250 Lake Pointe Dr 208	61.7	58.5	3.0
R-5011	Res.	B	2250 Lake Pointe Dr 206	61.8	59.0	2.6
R-5012	Res.	B	2250 Lake Pointe Dr 104	61.9	59.4	2.1
R-5013	Res.	B	2250 Lake Pointe Dr 101	61.5	59.3	1.9
R-5014	Res.	B	2250 Lake Pointe Dr 701	64.9	58.5	6.2
R-5015	Res.	B	2250 Lake Pointe Dr 702	68.5	60.7	7.6
R-5016	Res.	B	2250 Lake Pointe Dr 703	67.7	59.5	8.0
R-5017	Res.	B	2250 Lake Pointe Dr 704	62.8	55.5	7.1
R-5018	Res.	B	2250 Lake Pointe Dr 801	60.9	52.3	8.5
R-5019	Res.	B	2250 Lake Pointe Dr 802	62.8	54.2	8.4
R-5020	Res.	B	2250 Lake Pointe Dr 803	61.1	54.5	6.5
R-5021	Res.	B	2250 Lake Pointe Dr 804	60.0	53.6	6.2
R-5022	Res.	B	2250 Lake Pointe Dr 901	53.2	46.9	6.2
R-5023	Res.	B	2250 Lake Pointe Dr 902	56.3	48.1	8.0
R-5024	Res.	B	2250 Lake Pointe Dr 903	58.7	52.7	5.8
R-5025	Res.	B	2250 Lake Pointe Dr 904	57.5	51.7	5.6
R-5026	Res.	B	2250 Lake Pointe Dr 1001	50.4	46.7	3.6
R-5027	Res.	B	2250 Lake Pointe Dr 1002	51.3	46.7	4.5
R-5028	Res.	B	2250 Lake Pointe Dr 1003	56.6	51.0	5.4
R-5029	Res.	B	2250 Lake Pointe Dr 1004	55.7	50.3	5.2
R-5030	Res.	B	2250 Lake Pointe Dr 601	58.7	51.6	6.9
R-5031	Res.	B	2250 Lake Pointe Dr 602	60.9	52.5	8.2
R-5032	Res.	B	2250 Lake Pointe Dr 603	58.7	49.3	9.2
R-5033	Res.	B	2250 Lake Pointe Dr 604	55.3	47.1	8.1
R-5034	Res.	B	2250 Lake Pointe Dr 505	55.7	50.3	5.3
R-5035	Res.	B	2250 Lake Pointe Dr 501	53.6	48.5	5.0
R-5036	Res.	B	2250 Lake Pointe Dr 2602	62.1	60.5	1.2
R-5037	Res.	B	2250 Lake Pointe Dr 2600	61.9	60.4	1.1
R-5038	Res.	B	2250 Lake Pointe Dr 2502	61.7	60.5	0.9
R-5039	Res.	B	2250 Lake Pointe Dr 2500	61.5	60.4	0.8
R-5040	Res.	B	2250 Lake Pointe Dr 2402	60.9	60.0	0.6
R-5041	Res.	B	2250 Lake Pointe Dr 2400	60.6	59.8	0.5
R-5042	Res.	B	2250 Lake Pointe Dr 2201	52.8	52.8	0.1
R-5043	Res.	B	2250 Lake Pointe Dr 2202	61.3	60.5	0.5
R-5044	Res.	B	2250 Lake Pointe Dr 2203	61.2	60.4	0.5
R-5045	Res.	B	2250 Lake Pointe Dr 2204	52.4	52.3	0.1
R-5046	Res.	B	2250 Lake Pointe Dr 2101	52.2	51.9	0.3
R-5047	Res.	B	2250 Lake Pointe Dr 2102	60.5	59.7	0.5
R-5048	Res.	B	2250 Lake Pointe Dr 2103	60.8	60.0	0.5
R-5049	Res.	B	2250 Lake Pointe Dr 2104	51.0	50.9	0.2
					Predicted Build Alternative With Barrier Benefits	21
				Noise Impact		Benefited Receptor

NW5A					
Feasibility:					
An acoustically feasible noise barrier must have a minimum of three 1st row impacted receptors and must achieve at least a five dB(A) traffic noise reduction for 80% of 1st row impacted receptors.					
Total 1st row impacted receptors	3	Percentage of 1st row impacted receptors receiving 5 dB(A) reduction or more:	100%	Is the barrier Feasible?	Yes
1st row impacted receptors receiving >= 5 dB(A) reduction	3				
Reasonableness:					
The noise barrier must achieve a minimum of seven (7) dB(A) insertion loss for the majority of benefitted receptors or a minimum of an eight (8) dB(A) insertion lost for at least one Activity Category B receptor. Benefitted receptor >= 5 dB(A). It must also have a maximum barrier square footage per benefitted receptor of 1,200.					
Number of benefitted receptors	21	A majority of benefitted receptors achieve a 7 dB(A) reduction or an eight (8) dB(A) insertion lost for at least one Activity Category B receptor			Yes
Length (Ft)	Average Height (Ft)	Sq Ft	Square Footage per Benefitted Receptor		
1,495	15.9	23,757	1,131		
Is the barrier less than 1,200 square feet per benefitted receptor?					Yes
Is the barrier preliminarily Reasonable?					**Yes**

Table C-7: NW5B Performance Without Barrier and With Barrier Noise Levels Build Alternative - AM Peak Hour							
Receptors				Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID#	Use	NAC	Address	Build	Increase	With Barrier	NLR
R-5005	Trail	C	Clinton Pkwy Trail 11	70.2	2.8	57.1	13.1
R-5006	Trail	C	Clinton Pkwy Trail 12	72.9	5.0	59.3	13.6
R-5050	Res.	B	6360 Lakeside Ln	61.5	10.8	57.8	3.7
R-5051	Res.	B	6358 Lakeside Ln	62.1	11.0	57.7	4.4
R-5052	Res.	B	6356 Lakeside Ln	63.3	10.9	58.3	5.0
R-5053	Res.	B	6354 Lakeside Ln	65.0	10.0	59.5	5.5
R-5054	Res.	B	6352 Lakeside Ln	66.4	8.9	60.2	6.2
R-5055	Res.	B	6350 Lakeside Ln	67.1	8.2	60.6	6.5
R-5056	Res.	B	6348 Lakeside Ln	67.6	8.2	61.6	6.0
R-5057	Res.	B	6346 Lakeside Ln	67.9	8.0	62.2	5.7
R-5058	Res.	B	6344 Lakeside Ln	68.9	8.3	62.5	6.4
R-5059	Res.	B	6342 Lakeside Ln	69.4	8.5	61.1	8.3
R-5060	Res.	B	6340 Lakeside Ln	69.8	9.0	61.1	8.7
R-5061	Res.	B	6338 Lakeside Ln	69.2	9.2	60.9	8.3
R-5062	Res.	B	6336 Lakeside Ln	67.2	8.6	60.1	7.1
R-5063	Res.	B	6334 Lakeside Ln	65.8	8.3	59.6	6.2
R-5064	Res.	B	6332 Lakeside Ln	65.0	8.0	59.4	5.6
R-5065	Res.	B	6330 Lakeside Ln	64.0	7.7	58.8	5.2
R-5066	Res.	B	6328 Lakeside Ln	62.7	7.7	56.9	5.8
R-5067	Res.	B	6326 Lakeside Ln	58.6	6.8	53.6	5.0
R-5068	Res.	B	6324 Lakeside Ln	58.7	7.8	56.2	2.5
R-5069	Res.	B	6322 Lakeside Ln	59.0	8.3	56.1	2.9
R-5070	Res.	B	6341 Lakeside Ln	55.1	8.4	53.4	1.7
R-5071	Res.	B	6339 Lakeside Ln	54.6	7.8	53.1	1.5
R-5072	Res.	B	6337 Lakeside Ln	53.8	7.2	53.1	0.7
R-5073	Res.	B	6335 Lakeside Ln	57.2	8.0	53.2	4.0
R-5074	Res.	B	6333 Lakeside Ln	55.6	7.6	52.5	3.1
R-5075	Res.	B	6331 Lakeside Ln	54.3	8.7	53.1	1.2
R-5076	Res.	B	6329 Lakeside Ln	51.9	7.4	51.9	0.0
R-5077	Res.	B	6327 Lakeside Ln	52.0	7.6	52.0	0.0
R-5078	Res.	B	6325 Lakeside Ln	50.7	7.0	49.7	1.0
R-5079	Res.	B	6323 Lakeside Ln	50.6	6.8	49.8	0.8
R-5080	Res.	B	6362 Lakeside Ln	55.2	6.0	54.8	0.4
R-5081	Res.	B	6364 Lakeside Ln	55.4	6.0	55.0	0.4
R-5082	Res.	B	6300 Lakeside Ln	50.4	6.3	50.3	0.1
R-5083	Res.	B	6302 Lakeside Ln	49.7	6.5	49.6	0.1
R-5084	Res.	B	6304 Lakeside Ln	49.6	6.6	49.5	0.1
R-5085	Res.	B	6306 Lakeside Ln	50.2	7.3	50.1	0.1
R-5086	Res.	B	6308 Lakeside Ln	50.5	7.4	49.6	0.9
R-5087	Res.	B	6310 Lakeside Ln	50.6	6.9	50.3	0.3
R-5088	Res.	B	6312 Lakeside Ln	52.1	7.5	51.6	0.5
R-5089	Res.	B	6314 Lakeside Ln	53.3	8.6	51.6	1.7
R-5090	Res.	B	6316 Lakeside Ln	54.2	7.7	52.4	1.8
R-5091	Res.	B	6318 Lakeside Ln	54.5	7.1	53.0	1.5
R-5093	Res.	B	1416 E 902 Rd	70.0	10.9	69.2	0.8
R-5094	Res.	B	1420 E 902 Rd	65.8	9.0	65.8	0.0
R-5095	Res.	B	1422 E 902 Rd	63.2	7.7	63.2	0.0
R-5096	Res.	B	1428 E 902 Rd	60.3	6.2	60.3	0.0
R-5097	Res.	B	1430 E 902 Rd	58.5	4.9	58.4	0.1
R-5098	Res.	B	1432 E 902 Rd	58.1	4.3	57.9	0.2
R-5099	Res.	B	1434 E 902 Rd	58.4	3.5	58.2	0.2
R-5100	Res.	B	1435 E 902 Rd	64.5	3.7	64.5	0.0

Table C-7: NW5B Performance Without Barrier and With Barrier Noise Levels Build Alternative - AM Peak Hour							
Receptors				Predicted Noise Levels, $L_{eq(h)}$ (dB(A))			
ID#	Use	NAC	Address	Build	Increase	With Barrier	NLR
R-5101	Res.	B	1438 E 902 Rd	56.0	2.7	55.7	0.3
R-5102	Trail	C	SLT Trail 6	75.1	10.3	61.6	13.5
						Predicted Build Alternative With Barrier Benefits	19
					Noise Impact		Benefited Receptor

NW5B					
Feasibility:					
An acoustically feasible noise barrier must have a minimum of three 1st row impacted receptors and must achieve at least a five dB(A) traffic noise reduction for 80% of 1st row impacted receptors.					
Total 1st row impacted receptors	13	Percentage of 1st row impacted receptors receiving 5 dB(A) reduction or more:	100%	Is the barrier Feasible?	Yes
1st row impacted receptors receiving >= 5 dB(A) reduction	13				
Reasonableness:					
The noise barrier must achieve a minimum of seven (7) dB(A) insertion loss for the majority of benefitted receptors or a minimum of an eight (8) dB(A) insertion lost for at least one Activity Category B receptor. Benefitted receptor >= 5 dB(A). It must also have a maximum barrier square footage per benefitted receptor of 1,200.					
Number of benefitted receptors	19	A majority of benefitted receptors achieve a 7 dB(A) reduction or an eight (8) dB(A) insertion lost for at least one Activity Category B receptor			Yes

Length (Ft)	Average Height (Ft)	Sq Ft	Square Footage per Benefitted Receptor
1,236	17.3	21,410	1,127
		Is the barrier less than 1,200 square feet per benefitted receptor?	Yes
		Is the barrier preliminarily Reasonable?	**Yes**

Table C-8: NW7 Performance	
Feasibility:	
An acoustically feasible noise barrier must have a minimum of three 1st row impacted receptors and must achieve at least a five dB(A) traffic noise reduction for 80% of 1st row impacted receptors.	
Total 1st row impacted receptors:	1
Minimum of three 1st row impacted receptors?	No
Feasible?	**No**

Table C-9: NW8 Performance Without Barrier and With Barrier Noise Levels Build Alternative - AM Peak Hour						
Receptors				Predicted Noise Levels, $L_{eq(h)}$ (dB(A))		
ID#	Use	NAC	Address	Build	With Barrier	NLR
R-8001	Trail	C	SLT Trail 12	65.0	64.7	0.3
R-8002	Trail	C	SLT Trail 13	70.4	63.2	7.2
R-8003	Trail	C	SLT Trail 14	69.0	60.2	8.8
R-8004	Trail	C	SLT Trail 15	65.3	64.8	0.5
R-8005	Res.	B	1121 Renaissance Dr	55.2	54.5	0.7
R-8006	Res.	B	1115 Renaissance Dr	57.8	55.2	2.6
R-8007	Res.	B	1109 Renaissance Dr	58.0	55.3	2.7
R-8008	Res.	B	1103 Renaissance Dr	58.9	56.4	2.5
R-8009	Res.	B	1031 Renaissance Dr	59.9	57.4	2.5
R-8010	Res.	B	1025 Renaissance Dr	59.9	57.4	2.5
R-8011	Res.	B	1019 Renaissance Dr	59.9	58.0	1.9
R-8012	Res.	B	1013 Renaissance Dr	60.3	58.3	2.0
R-8013	Res.	B	1007 Renaissance Dr	60.7	58.6	2.1
R-8014	Res.	B	1001 Renaissance Dr	61.0	58.8	2.2
R-8015	Res.	B	945 Renaissance Dr	61.4	59.3	2.1
R-8016	Res.	B	941 Renaissance Dr	61.9	59.6	2.3
R-8017	Res.	B	935 Renaissance Dr	61.6	58.8	2.8
R-8018	Res.	B	929 Renaissance Dr	62.1	58.9	3.2
R-8019	Res.	B	923 Renaissance Dr	62.3	58.6	3.7
R-8020	Res.	B	917 Renaissance Dr	62.5	58.4	4.1
R-8021	Res.	B	911 Renaissance Dr	64.5	58.8	5.7
R-8022	Res.	B	905 Renaissance Dr	64.4	58.2	6.2
R-8023	Res.	B	855 Renaissance Dr	66.1	59.1	7.0
R-8024	Res.	B	853 Renaissance Dr	67.2	59.3	7.9
R-8025	Res.	B	849 Renaissance Dr	66.9	59.1	7.8
R-8026	Res.	B	847 Renaissance Dr	66.3	58.9	7.4
R-8027	Res.	B	843 Renaissance Dr	66.0	58.7	7.3
R-8028	Res.	B	841 Renaissance Dr	66.0	58.6	7.4
R-8029	Res.	B	835 Renaissance Dr	66.1	57.8	8.3
R-8030	Res.	B	829 Renaissance Dr	66.4	58.3	8.1
R-8031	Res.	B	823 Renaissance Dr	66.6	58.4	8.2
R-8032	Res.	B	817 Renaissance Dr	66.8	58.6	8.2
R-8033	Res.	B	811 Renaissance Dr	66.8	59.0	7.8
R-8034	Res.	B	805 Renaissance Dr	66.1	59.1	7.0
R-8035	Res.	B	1127 Klein Ct	53.4	52.9	0.5
R-8036	Res.	B	1121 Klein Ct	53.8	53.2	0.6
R-8037	Res.	B	1115 Klein Ct	52.9	51.3	1.6
R-8038	Res.	B	1109 Klein Ct	53.2	50.8	2.4
R-8039	Res.	B	1103 Klein Ct	48.6	48.6	0.0
R-8040	Res.	B	1104 Klein Ct	50.0	50.0	0.0
R-8041	Res.	B	1112 Klein Ct	50.5	50.2	0.3
R-8042	Res.	B	1120 Klein Ct	51.0	50.6	0.4
R-8043	Res.	B	1126 Klein Ct	51.5	51.5	0.0
R-8044	Res.	B	6335 Rockaway Dr	52.5	50.7	1.8
R-8045	Res.	B	6331 Rockaway Dr	52.4	50.7	1.7
R-8046	Res.	B	6327 Rockaway Dr	52.4	50.8	1.6
R-8047	Res.	B	6323 Rockaway Dr	52.2	50.4	1.8
R-8048	Res.	B	6319 Rockaway Dr	51.4	49.4	2.0
R-8049	Res.	B	6315 Rockaway Dr	50.7	49.1	1.6
R-8050	Res.	B	6311 Rockaway Dr	49.8	48.5	1.3
R-8051	Res.	B	6334 Rockaway Dr	54.6	51.4	3.2

Table C-9: NW8 Performance Without Barrier and With Barrier Noise Levels Build Alternative - AM Peak Hour						
Receptors				Predicted Noise Levels, $L_{eq(h)}$ (dB(A))		
ID#	Use	NAC	Address	Build	With Barrier	NLR
R-8052	Res.	B	6330 Rockaway Dr	54.4	50.4	4.0
R-8053	Res.	B	6326 Rockaway Dr	54.7	50.2	4.5
R-8054	Res.	B	6322 Rockaway Dr	53.7	49.3	4.4
R-8055	Res.	B	6318 Rockaway Dr	51.1	47.6	3.5
R-8056	Res.	B	6314 Rockaway Dr	53.0	48.8	4.2
R-8057	Res.	B	6310 Rockaway Dr	52.5	48.4	4.1
R-8058	Res.	B	6306 Rockaway Dr	52.0	48.1	3.9
R-8059	Res.	B	6325 Steeple Chase Ct	56.8	52.3	4.5
R-8060	Res.	B	6323 Steeple Chase Ct	56.7	51.9	4.8
R-8061	Res.	B	6317 Steeple Chase Ct	53.0	50.2	2.8
R-8062	Res.	B	6305 Steeple Chase Ct	55.5	51.8	3.7
R-8063	Res.	B	6304 Steeple Chase Ct	54.9	51.7	3.2
R-8064	Res.	B	6310 Steeple Chase Ct	54.7	49.1	5.6
R-8065	Res.	B	6316 Steeple Chase Ct	56.6	49.9	6.7
R-8066	Res.	B	6322 Steeple Chase Ct	55.6	50.0	5.6
R-8067	Res.	B	916 Renaissance Dr	56.8	50.7	6.1
R-8068	Res.	B	6339 Steeple Chase Dr	56.6	51.2	5.4
R-8069	Res.	B	6335 Steeple Chase Dr	56.7	50.8	5.9
R-8070	Res.	B	6331 Steeple Chase Dr	56.3	51.3	5.0
R-8071	Res.	B	6327 Steeple Chase Dr	56.4	52.1	4.3
R-8072	Res.	B	6323 Steeple Chase Dr	56.5	51.7	4.8
R-8073	Res.	B	6319 Steeple Chase Dr	56.3	51.6	4.7
R-8074	Res.	B	6315 Steeple Chase Dr	55.2	50.9	4.3
R-8075	Res.	B	6340 Steeple Chase Dr	52.8	47.5	5.3
R-8076	Res.	B	6336 Steeple Chase Dr	52.9	47.6	5.3
R-8077	Res.	B	6332 Steeple Chase Dr	54.1	48.5	5.6
R-8078	Res.	B	6328 Steeple Chase Dr	53.8	48.7	5.1
R-8079	Res.	B	6324 Steeple Chase Dr	54.3	49.3	5.0
R-8080	Res.	B	6320 Steeple Chase Dr	54.0	49.7	4.3
R-8081	Res.	B	6316 Steeple Chase Dr	54.0	50.3	3.7
R-8082	Res.	B	6321 Serenade Ct	54.8	49.7	5.1
R-8083	Res.	B	6317 Serenade Ct	55.2	49.9	5.3
R-8084	Res.	B	6313 Serenade Ct	55.2	50.0	5.2
R-8085	Res.	B	6309 Serenade Ct	54.6	49.6	5.0
R-8086	Res.	B	6305 Serenade Ct	55.4	51.0	4.4
R-8087	Res.	B	6324 Serenade Ct	53.4	48.0	5.4
R-8088	Res.	B	6320 Serenade Ct	52.9	47.9	5.0
R-8089	Res.	B	6316 Serenade Ct	52.7	47.2	5.5
R-8090	Res.	B	6312 Serenade Ct	52.7	48.3	4.4
R-8091	Res.	B	6308 Serenade Ct	56.2	52.5	3.7
R-8092	Res.	B	6304 Serenade Ct	56.0	51.6	4.4
R-8093	Res.	B	6339 Serenade Dr	56.2	50.1	6.1
R-8094	Res.	B	6335 Serenade Dr	54.4	49.1	5.3
R-8095	Res.	B	6331 Serenade Dr	52.8	48.7	4.1
R-8096	Res.	B	6327 Serenade Dr	55.1	51.0	4.1
R-8097	Res.	B	6323 Serenade Dr	55.7	51.4	4.3
R-8098	Res.	B	6319 Serenade Dr	51.0	47.8	3.2
R-8099	Res.	B	6315 Serenade Dr	54.8	50.1	4.7
R-8100	Res.	B	6336 Serenade Dr	59.5	55.0	4.5
R-8101	Res.	B	6332 Serenade Dr	53.7	51.7	2.0
R-8102	Res.	B	6328 Serenade Dr	56.3	53.2	3.1
R-8103	Res.	B	6324 Serenade Dr	56.1	53.2	2.9

Table C-9: NW8 Performance Without Barrier and With Barrier Noise Levels Build Alternative - AM Peak Hour						
Receptors				Predicted Noise Levels, $L_{eq(h)}$ (dB(A))		
ID#	Use	NAC	Address	Build	With Barrier	NLR
R-8104	Res.	B	6320 Serenade Dr	55.7	53.0	2.7
R-8105	Res.	B	6316 Serenade Dr	55.2	52.6	2.6
					Predicted Build Alternative With Barrier Benefits	37
				Noise Impact		Benefited Receptor

NW8					
Feasibility:					
An acoustically feasible noise barrier must have a minimum of three 1st row impacted receptors and must achieve at least a five dB(A) traffic noise reduction for 80% of 1st row impacted receptors.					
Total 1st row impacted receptors	14	Percentage of 1st row impacted receptors receiving 5 dB(A) reduction or more:	100%	Is the barrier Feasible?	Yes
1st row impacted receptors receiving >= 5 dB(A) reduction	14				
Reasonableness:					
The noise barrier must achieve a minimum of seven (7) dB(A) insertion loss for the majority of benefitted receptors or a minimum of an eight (8) dB(A) insertion lost for at least one Activity Category B receptor. Benefitted receptor >= 5 dB(A). It must also have a maximum barrier square footage per benefitted receptor of 1,200.					
Number of benefitted receptors	37	A majority of benefitted receptors achieve a 7 dB(A) reduction or an eight (8) dB(A) insertion lost for at least one Activity Category B receptor			Yes

Length (Ft)	Average Height (Ft)	Sq Ft	Square Footage per Benefitted Receptor
2,301	10.1	23,208	627
		Is the barrier less than 1,200 square feet per benefitted receptor?	Yes
		Is the barrier preliminarily Reasonable?	**Yes**

Table C-10: NW10 Performance Without Barrier and With Barrier Noise Levels Build Alternative - AM Peak Hour						
Receptors				Predicted Noise Levels, $L_{eq(h)}$ (dB(A))		
ID#	Use	NAC	Address	Build	With Barrier	NLR
R-10001	Trail	C	SLT Trail 16	69.9	67.5	2.4
R-10002	Trail	C	SLT Trail 17	75.4	68.4	7.0
R-10003	Trail	C	SLT Trail 18	68.1	61.1	7.0
R-10004	Trail	C	SLT Trail 19	74.1	65.4	8.7
R-10005	Trail	C	SLT Trail 20	71.7	64.3	7.4
R-10006	Trail	C	SLT Trail 21	74.2	66.0	8.2
R-10007	Trail	C	SLT Trail 22	73.0	65.3	7.7
R-10008	Hospital	D	Lawrence Memorial Hospital	40.0	40.0	0.0
R-10009	Trail	C	Rock Chalk Dr Rec Path	64.7	64.7	0.0
R-10010	Sports	C	Jayhawk Tennis Center	53.0	52.4	0.6
R-10011	Trail	C	Rock Chalk Park Trails 1	61.2	59.9	1.3
R-10012	Trail	C	Rock Chalk Park Trails 2	60.2	59.6	0.6
R-10013	Sports	C	Rock Chalk Park Track	55.9	55.9	0.0
R-10014	Res.	B	1691 E 902 Rd	54.7	53.2	1.5
R-10015	Res.	B	873 N 1750 Rd	56.3	56.0	0.3
					Predicted Build Alternative With Barrier Benefits	6
					Noise Impact	Benefited Receptor

NW10

Feasibility:

An acoustically feasible noise barrier must have a minimum of three 1st row impacted receptors and must achieve at least a five dB(A) traffic noise reduction for 80% of 1st row impacted receptors.

Total 1st row impacted receptors	6	Percentage of 1st row impacted receptors receiving 5 dB(A) reduction or more:	100%	Is the barrier Feasible?	Yes
1st row impacted receptors receiving >= 5 dB(A) reduction	6				

Reasonableness:

The noise barrier must achieve a minimum of seven (7) dB(A) insertion loss for the majority of benefitted receptors or a minimum of an eight (8) dB(A) insertion lost for at least one Activity Category B receptor. Benefitted receptor >= 5 dB(A). It must also have a maximum barrier square footage per benefitted receptor of 1,200.

Number of benefitted receptors	6	A majority of benefitted receptors achieve a 7 dB(A) reduction or an eight (8) dB(A) insertion lost for at least one Activity Category B receptor	Yes

Length (Ft)	Average Height (Ft)	Sq Ft	Square Footage per Benefitted Receptor
7,571	6.9	52,037	8,673
		Is the barrier less than 1,200 square feet per benefitted receptor?	No
		Is the barrier preliminarily Reasonable?	**No**

Table C-11: NW13 Performance	
Feasibility:	
An acoustically feasible noise barrier must have a minimum of three 1st row impacted receptors and must achieve at least a five dB(A) traffic noise reduction for 80% of 1st row impacted receptors.	
Total 1st row impacted receptors:	2
Minimum of three 1st row impacted receptors?	No
Feasible?	**No**

Table C-12: NW14 Performance	
Feasibility:	
An acoustically feasible noise barrier must have a minimum of three 1st row impacted receptors and must achieve at least a five dB(A) traffic noise reduction for 80% of 1st row impacted receptors.	
Total 1st row impacted receptors:	1
Minimum of three 1st row impacted receptors?	No
Feasible?	**No**

Table C-13: NW15 Performance	
Feasibility:	
An acoustically feasible noise barrier must have a minimum of three 1st row impacted receptors and must achieve at least a five dB(A) traffic noise reduction for 80% of 1st row impacted receptors.	
Total 1st row impacted receptors:	2
Minimum of three 1st row impacted receptors?	No
Feasible?	**No**

Appendix D
Kansas Department of Transportation
Highway Traffic Noise Policy and Guidance

Kansas Department of Transportation
Highway Traffic Noise Policy and Guidance
Effective June 23, 2022

Table of Contents

1.0 Introduction

1.1 Purpose

This document contains State of Kansas Department of Transportation (KDOT) Highway Traffic Noise Policy and Guidance, also referred to as the *KDOT Highway Noise Policy*. The guidelines contained within this document have been reviewed and approved by Federal Highway Administration (FHWA). These guidelines provide information about how traffic noise impacts are determined and how noise abatement is considered, pursuant with requirements of Title 23 United States Code of Federal Regulations, part 772 (23 CFR 772). This policy supersedes all previous State of Kansas Highway Traffic Noise Polices/Guidance, effective June 23, 2022.

1.2 Background

During the rapid expansion of the Interstate Highway System and other roadways in the 20th century, communities began to recognize that highway traffic noise and construction noise were environmental impacts. In the 1972 Federal-aid Highway Act, Congress required the FHWA to develop a noise standard for new Federal-aid highway projects. The FHWA Noise Standard provides national criteria and requirements for highway agencies, but also allows flexibility in approaching the problem of highway traffic and construction noise. Under NEPA, impacts and measures to mitigate adverse impacts must be identified, including identification of impacts for which no or only partial mitigation is possible.

1.3 Fundamentals

In order to understand this document, some knowledge about the attributes of sound is necessary. The following is a basic synopsis of sound and noise.

Sound is created when an object moves, causing vibration or waves in air molecules. When vibrations reach our ears, we hear sound. Sound levels are measured in units called decibels (dB). Sound levels cannot be added with simple arithmetic because the decibel is a representation of a larger value measured on the logarithmic scale. Addition of sound from different sources is based on the relative difference of sound level of the two sources. In general, if two sources of sound differ by:

- 0 – 1 dB, add 3 dB to the higher level (example 60 dB + 60 dB = 63 dB);
- 2 – 3 dB, add 2 dB to the higher level (example 60 dB + 62 dB = 64 dB);
- 4 – 9 dB, add 1 dB to the higher level (example 60 dB + 70 dB = 71 dB);
- 10 dB or more, add 0 dB (example 60 dB + 70 dB = 70 dB).

Adjustment for high- and low-pitched sounds an average person can hear is called "A-weighted levels" or dBA. Highway traffic noise is assessed using dBA measurements. Noise is further described by its average level over time. For highway traffic noise analysis, an hourly equivalent sound level, or Leq(h), is the constant, average sound level that contains the same amount of sound energy over the time period as does the varying levels of actual traffic noise. Generally, the human ear perceives changes in sound levels as follows:

- 1 dBA – no perceptible change;
- 3 dBA – barely perceptible change;
- 5 dBA – readily perceptible change;
- 10 dBA – perceived as twice as loud.

The primary sources of highway traffic sound are tires, engines and exhaust. These sources are further influenced by the overall number of vehicles, type of vehicles, distance between traffic and receptor(s),

speed, and topography. Additional more complicated factors affecting traffic sound may include elevated or depressed highway / terrain, dense vegetation, and shielding from buildings and walls. For example, sound will be greater from any vehicle laboring up a steep incline; however, this may not be problematic if there is low-volume traffic, with virtually no heavy trucks. The following provides approximate changes in sound levels for cause-and-effect relationships:

- If traffic count is doubled: increase of 3 dBA;
- If speed limit is lowered by 5 miles per hour: decrease of 1 dBA;
- If distance is doubled over pavement: decrease of 3 dBA;
- If distance is doubled over grass: decrease of 4.5 dBA.

In addition to understanding sound attributes, there are many unique terms relative to highway traffic noise analysis that are contained within this document. The following table provides a list of terms and their definitions.

Definitions

absolute criterion	One of the two FHWA criteria for determining noise impacts. The absolute criterion deals with the actual or predicted sound level. – see Section 2.3.
activity category	Classification of different types of property usage adjacent to a project. See FHWA Noise Abatement Criteria.
Average Daily Traffic (ADT)	The average 24-hour traffic count (vehicles per day). Typically, the total amount of traffic during a stated period (usually one year) divided by the number of days in that period. The ADT is used to calculate the Design Hourly Volume (DHV).
benefited receptor	Recipient of an abatement measure receiving at or above 5 dB insertion loss.
date of public knowledge	The date of approval Categorical Exclusion (CE), the Finding of No Significant Impact (FONSI), or the Record of Decision (ROD), as defined in 23 CFR 771.
design year	The future year that a highway is designed, usually 20 years.
design hourly volume	Forecasted traffic count reflecting "worst hour" conditions by design year.
equivalent receptor	Representative locations for receptors - See Table 2.
existing noise or sound levels	The "worst hour" sound level resulting from the combination of natural and mechanical sources and human activity usually in a particular area.
feasibility	The combination of acoustical and engineering factors considered in the evaluation of a noise abatement measure.
impacted receptor	A recipient that is predicted for traffic noise impact to be above the absolute and/or relative criteria in the design year.
insertion loss	Actual acoustical benefit resulting from a noise abatement measure, measured as a predicted change in sound level (dBA).
Ldn	Day-night noise levels.
Leq	The equivalent steady state sound level which in a stated period of time contains the same acoustic energy as the time varying sound level during the same time period, with Leq(h) being the hourly value of Leq. This measurement is utilized by KDOT for highway traffic noise analysis.
low volume highways	A highway with ADT of 1,200 vehicles per day or less in the design year.
multi family dwelling	A residential structure containing more than one residence. Each residence in a multifamily dwelling shall be counted as one receptor when determining impacted and benefited receptors.

Noise Abatement Criteria (NAC)	FHWA Noise Abatement Criteria – Federal Highway Administration, thresholds of sound levels according to different land uses. See Table 1.
noise berm	An earthen embankment used as a noise barrier.
Noise Sensitive Area (NSA)	Grouping of receptors exposed to similar noise sources and levels, traffic volumes, traffic mix and speed, and topographic features.
noise reduction design goal	Optimum desired noise reduction determined from calculating the difference between future build noise levels with abatement, to future build sound levels without abatement. KDOT's noise reduction design goal is to achieve a minimum of seven (7) dBA insertion loss for the majority (>50%) of benefited receptors or a minimum of an eight (8) dBA insertion loss for at least one impacted Activity Category B receptor that will benefit from the noise barrier.
permitted	A commitment to develop land as evidenced by issuance of a building permit.
property owner	An individual or group of individuals that holds a title, deed, or other legal documentation of ownership of a property or a residence.
reasonableness	The combination of economic, environmental and social factors considered in the evaluation of a noise abatement measure.
receiver	A modeled point in the Traffic Noise Model, representative of more than one receptor(s).
receptor	A discrete or representative location of a noise sensitive area(s), for any of the land uses listed in Table 1, FHWA Noise Abatement Criteria.
relative criterion	One of the two criteria from the FHWA Noise Abatement Criteria for determining noise impacts. The relative criterion deals with the change in predicted sound level. – see Section 2.3
residence	A dwelling unit, either single or each dwelling unit in a multi-family dwelling.
statement of likelihood	A statement provided in the environmental clearance document based on the feasibility and reasonableness analysis completed at the time the environmental document is being approved.
substantial noise increase	For a Type I project, an increase of *more than* 10 dBA.
traffic noise impacts	As result of a highway transportation project, sound levels will approach or exceed FHWA Noise Abatement Criteria (NAC) for absolute impact and/or existing sound levels are forecast for substantial increase for relative impact.
Type I Project	See Section 1.4
Type II Project	A Federal, Federal aid or State funded project proposed to provide acoustic protection for receptors that were in existence prior to the construction of the roadway. This program is voluntary for state participation; KDOT does not currently have a program for Type II Projects.

1.4 Applicability

This KDOT Highway Traffic Noise Policy is not applicable to projects on toll roads (unless the toll road is under KDOT's jurisdiction); local, state and federal projects not subject to FHWA approval, and results from highway traffic noise analysis made public under previous KDOT Highway Traffic Noise Policies.

Type I

The KDOT Highway Traffic Noise Policy applies to Type I transportation improvements that require FHWA approval regardless of funding sources or is funded with Federal-aid highway funds. A transportation improvement with any Type I work is a Type I Project and a traffic noise analysis is required for the entire project. The criteria are as follows:

1) Construction of a highway on new location; or,

2) physical alteration of an existing highway where there is either:

    a) Substantial horizontal alteration – a project that halves the distance between the traffic noise and the closest receptor between the existing conditions to the future build conditions; or,
    b) Substantial vertical alteration – a project that removes shielding therefore exposing the line-of-sight between receptor and traffic noise sources. This is done by either altering the vertical alignment of the highway or by altering the topography between the highway traffic noise sources and receptor; or

3) addition of a through-traffic lane(s) described as follows:
    a) High-Occupancy Vehicle Lane (HOV), High-Occupancy Toll (HOT) lane, bus lane or truck climbing lane;
    b) auxiliary lane, except for when the auxiliary lane is a turn lane;
    c) addition or relocation of interchange lanes or ramps added to a quadrant for completion of an existing partial interchange;
    d) restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane; or

4) addition of a new or substantial alteration of a weight station, rest stop, ride share lot or toll plaza.

Type I Projects with undeveloped land require noise analysis if a building permit has been issued by the local agency with jurisdiction by the date of public knowledge.

Type I Projects with undeveloped land that is not "permitted", by date of public knowledge do not require noise analysis, however future noise levels pursuant to 23 CFR 772.16(a), must be determined and provided to the local jurisdictions.

A traffic noise analysis is required for all build alternatives under detailed study in the National Environmental Policy Act (NEPA) process. That is, all reasonable alternatives that have been retained for detailed analysis in the Categorical Exclusion (CE) documentation, Environmental Assessment (EA) or Environmental Impact Statement (EIS) and NOT rejected as unreasonable during the alternatives screening process. For Tier I Environmental Impact Statements or other studies that will examine broad corridors, the appropriate scope and methodology of the noise analysis should be discussed with FHWA.

Projects that involve noise emanating from more than one mode of transportation require noise analysis. Failure to evaluate these other sources of noise may result in ineffective noise abatement. The use of the

Ldn noise descriptor to combine all noise levels is required. The following models are required for calculation:

- **aircraft noise** – Federal Aviation Administration's Aviation Environmental Design Tool (AEDT)
- **highway project includes a rail line** – FHWA Noise Measurement Handbook, June 2018
- **railroad project**- Federal Railroad Administration's Guidance on Assessing Noise and Vibration Impacts
- **transit noise** – Federal Transit Administration's Transit Noise and Vibration Impact Assessment Manual, September 2018
- **construction noise** - Calculation is usually not necessary for highway traffic noise analysis, due to construction noise being temporary in nature. For large urban transportation improvements, the FHWA Roadway Construction Noise Model (RCNM) may be incorporated into the project, if there is project specific input. However, for the majority of KDOT transportation improvements, low-cost easy-to-implement measures for abating noise are incorporated into the plans and specifications of a project. These may include limiting times of construction, muffler requirements of equipment, location of haul roads, eliminating tail gate banging, ambient sensitive back-up alarms, community rapport, and mechanisms for bringing forth concerns about a project.

Type II

This program is voluntary for state participation; KDOT does not participate in Type II of retrofitting highways for noise barriers.

1.5 Three-Part Approach to Highway Traffic Noise Abatement

Effective control of the undesirable effects of highway traffic noise requires (l) noise compatible planning, (2) source control through less-loud vehicles, (3) and when feasible and reasonable, abatement of highway traffic noise for individual projects. The first component is traditionally an area of local responsibility. The other components are the joint responsibility of private industry and / or Federal, State, and local governments. As part of the environmental review process for transportation projects, Kansas Department of Transportation is required to determine if predicted noise levels could result in noise impacts. If there are impacts, methods are considered for noise abatement. If the methods are deemed feasible and reasonable then noise abatement measures are implemented.

2.0 Noise Analysis

2.1 FHWA Computer Software Model

Pursuant with 23 CFR 772.9, the current FHWA Traffic Noise Model (FHWA TNM) or any other computer software model acceptable to FHWA, is required for predicting sound levels and for designing noise barriers.

Receptors are grouped within their respective Noise Sensitive Area (NSA), and then assessed for noise impacts by activity category.

Average pavement type shall be used for prediction of noise levels unless another pavement type is approved by FHWA.

Model validation is required to confirm its accuracy, in order to proceed with analysis. Sound level measurements are performed adjacent to the project with simultaneous traffic counts. When the results of the model are within +/- 3 dBA of the measured sound levels in the field, the model may then be utilized for predicting sound levels. If there are differences, explanations must be provided.

Not every receptor needs sound levels measured, however enough measurements (whether it be number of repetitions or site locations) must be collected for computer modeling to validate the results. Existing sound levels are measured for fifteen minutes. For low volume highways, measurements are conducted for thirty minutes.

The validated traffic noise model may divide the overall transportation improvement into many separate roadways representing different traffic flow patterns and changes in traffic volume. Traffic is concentrated along the centerline of each roadway. These collectively influence the model's calculation of noise levels.

Site characteristics specific to the transportation improvement are represented in the model. Some factors include dense vegetation, shielding from building rows, depressed or elevated terrain and other variables affecting the transmission of sound between the source and receptor.

Sound levels are calculated to a tenth of a decibel. KDOT does not round up results from TNM modeling. For example, a result of 65.6 dBA is not rounded up to 66 dBA, and an insertion loss of 4.6 dBA is not rounded up to 5 dBA.

The cost index factor for input into the FHWA computer software model of a preliminary noise barrier represents actual unit cost of noise barriers constructed in Kansas.

2.2 Determining Conditions and Predictions

Receptors and Site Selection

All those within project limits must be identified, including receptors on permitted land. Receptors are classified according to their activity category as defined in the FHWA Noise Abatement Criteria (NAC), see Table 1. Sound levels are modeled at sites that represent the area(s) of frequent use. A site may be selected to represent other receptors that share an NSA. For projects on new alignment, sites are selected at representative receptor locations. Primary consideration is for exterior areas of human use.

Equivalent Receptors

In some cases, receptors cannot be represented as a residence. Therefore, different types of frequent human use (as described within the NAC) are defined as receptors with representative locations, see Table 2. Other circumstances with different interpretations for equivalent receptors must be within the intent of FHWA regulations, and the reasons shall be fully documented in the report. In all cases, the corresponding activity category Leq(h) applies.

Worst-case Existing Conditions

This is the first of three steps towards determining highway traffic noise impacts for receptors. The same FHWA computer software highway traffic noise model from validation is again utilized. The receptors and existing highway geometry remain in original locations, and the traffic data from the field measurements is replaced with worst-case existing traffic data. This step is necessary because field measurements only represent a "snapshot" in time. If the validation effort indicated adjustments, those values are applied. Transportation improvements on new alignment do not have traffic data so ambient sound levels are measured adjacent to the project and those are used for representing existing conditions.

Future No-Build Conditions

In accordance with NEPA requirements, sound levels are required to be compared in Future No-Build and Future-Build scenarios associated with transportation improvements. Therefore, the same computer software noise model with receptors and existing highway geometry in original locations is again utilized, and traffic data is replaced with the design year traffic volume without the transportation improvement.

Future Build Condition

The results from modeling Future Build Conditions are used for assessing all receptors with traffic noise impacts. In this scenario, the actual geometry of the project is input into FHWA computer software model, including design year traffic volume, and posted speed limit. All traffic noise impacts must be identified; therefore, the receptors remain in their original positions unless they are right-of-way takes. Because this model represents the transportation improvement, it is also used for preliminary noise barriers if traffic noise impacts are identified, and noise abatement is considered.

Interior Sound Levels

Typically, sites are areas where outdoor activity is limited to a brief transit from a parking facility to an interior activity area such as a library, temple, office building, etc. Interior sound levels are calculated by subtracting a noise reduction factor according to the following:

Interior Noise Reduction Factors (activity category D)		
Building Type	Window Condition	Noise Reduction
All	open	10 dBA
Light Frame	ordinary sash	20 dBA
	storm windows	25 dBA
Masonry	single glazed	25 dBA
	double glazed	35 dBA

2.3 Identifying Highway Traffic Noise Impacts

FHWA defines a noise impact as occurring when either or both of the following criteria are met:

1) **absolute** – noise levels approach or exceed the NAC.
2) **relative** – future noise levels substantially exceed existing sound levels.

The NAC (Table 1) strikes a balance between noise levels that are desirable and feasible. Traffic noise levels do not normally reach levels that result in hearing damage, and what constitutes an "annoyance" or hindrance to sleep is difficult to quantify on a large scale. Speech impairment however was usefully applied as a condition that reflects a compromise between noise levels that are desirable and those that are achievable and was found not to be arbitrary and capricious.

The values from the NAC are only to determine impacts and are not used as a design goal for considering noise abatement measures.

An impacted receptor is one in which the sound levels approach or substantially exceed the NAC criteria. FHWA allows each individual state transportation agency to define “approach” and “substantially exceed”. KDOT’s definition of these terms is as follows:

1) **approach** – one (1) dBA below the levels shown for the activity category in question.
2) **substantially exceed** – equal to or greater than ten (10) dBA.

For example, a noise impact would occur at a residence (Activity Category B) if the existing sound level is 53 dBA and the predicted noise level is 64 dBA because the increase of 11 dBA meets relative criterion.

Activity Category A receptors are rare and must be approved by FHWA. Activity Category F does not warrant noise abatement consideration.

If traffic noise impacts are identified, noise abatement measures must then be considered for all impacted receptors.

A noise analysis may be more in-depth when noise impacts are detected or when a project has many additional lanes, receptors, interchanges, and other variables. Conversely, a noise analysis will have little detail when the project is simple and noise impacts are not predicted. If traffic noise impacts are not identified, the traffic noise analysis is considered complete. This determination, if applicable, shall be stated in the Noise Study Report.

Although the level of evaluation varies among transportation improvements, performing a noise analysis in and of itself does not imply that other future actions such as noise abatement are inevitable. If the analysis predicts traffic noise impacts, then the analysis proceeds for considering measures to abate traffic noise. Only those measures for noise abatement deemed feasible and reasonable, may be incorporated into project plans and specifications.

2.4 Feasible and Reasonable

Noise compatible planning is traditionally an area of local responsibility. KDOT encourages local government officials to review documentation about future noise levels when regulating land development If noise abatement measures are considered, they must be both feasible and reasonable. Feasibility pertains to acoustical and engineering consideration of the project, such as topography, access, drainage, safety, and maintenance. Reasonable criteria imply common sense and judgment in consideration of overall benefits and adverse social, economic and environmental effects.

Traffic noise abatement measures may include altering the horizontal and/or vertical alignments, using traffic management measures such as modifying speed limits, traffic control devices, time-use restrictions for certain vehicles, and prohibition of certain vehicle types, purchasing buffering zones if the land is undeveloped, and constructing noise barriers or noise berms within the highway project right-of-way. A noise barrier provides abatement for approximately 200' from a highway. The following are not considered for noise abatement measures: quieter pavements unless approved by FHWA and planting of vegetation or landscaping. KDOT will not participate in the evaluation of construction of traffic noise barriers for a project where development was not permitted prior to the date of public knowledge of the transportation project.

2.5 Noise Barriers

A noise barrier incorporated into a project requires specific evaluation of feasible and reasonable criteria.

A third party may contribute funds to make functional or aesthetic enhancements to a noise barrier already determined to be feasible and reasonable.

The *Feasibility Criteria* represent initial assessment for a noise barrier. If the design meets feasibility criteria, then *Reasonable Criteria* will be evaluated. Reasonable criteria pertain to social, economic and environmental factors. If any conditions for feasible or reasonable criteria do not comply, the barrier design is deemed not feasible or reasonable, whichever applies. *Optional Reasonable Criterion* (f) is subjective but could influence decision-making.

Feasibility Criteria

a) Safety and Maintenance
The barrier shall not excessively restrict sight distance, restrict drainage or exacerbate potential flooding. If snow and ice remain in the driving lanes of the shadow zone of a noise barrier, the height of the barrier may be considered not feasible. For maintenance reasons, access is needed to both sides of the barrier. Maintenance agreements may be required with other public authorities or private individuals. Construction of a noise barrier shall not cause extensive maintenance to maintain the safety on the roadway.

b) Acoustical
If significant non-highway noise sources exist in the project area (such as major rail line or airports) the acoustical effectiveness of the noise barrier may be compromised. Barriers will not be constructed when other noise sources result in the noise barrier not being acoustically feasible for the highway traffic noise impacts. An acoustically feasible noise barrier must have a minimum of three first row impacted receptors and must achieve at least a five (5) dBA highway traffic noise reduction for 80% of first row impacted receptors. Receptors that achieve the 5 dBA are then considered benefited by the barrier.

Reasonable Criteria

a) Insertion Loss (Definition of Benefited Receptor)
A minimum of five (5) dBA insertion loss per receptor is counted as one benefited receptor. Other receptors not impacted but receiving a five (5) dBA benefit are counted in the evaluation (non-impacted benefited receptors). The benefited receptors are utilized in calculations for cost-effectiveness.

b) Noise Reduction Design Goal
The noise barrier must achieve a minimum of seven (7) dBA insertion loss for the majority (>50%) of benefited receptors or a minimum of an eight (8) dBA insertion loss for at least one impacted Activity Category B receptor that will benefit from the noise barrier.

c) Cost effectiveness
KDOT will utilize the square footage per receptor (sf/r) criteria for determining cost-effectiveness. Barrier cost-effectiveness is defined as area of noise barrier per benefited receptor and shall be calculated by taking the total area of a proposed noise wall divided by the number of benefited receptors determined for the noise wall. For a noise barrier to meet the cost effectiveness criteria, barrier cost effectiveness shall not exceed 1,200 square feet per benefited receptor. Barrier cost information, in dollars per square foot of wall, will be analyzed and submitted to FHWA every five years.

d) Public Notification
The benefited receptors of a proposed noise barrier design are required to be notified by any reasonable and easily verifiable means. The notification should include dimensions and location of the proposed noise barrier and a ballot. The ballot will indicate a set deadline to be returned and indicate how ballots will be scored for approval/denial of a noise barrier. The notification

shall also indicate that after construction of a noise barrier, KDOT will not consider perceived damages or loss of visibility to properties.

e) Public Approval
The presence of a noise barrier may present certain concerns such as excessive shading, constricting airflow, safety risks for exterior activities, and creating a tunnel-like environment for benefited receptors. Therefore, in order to move forward with construction of a noise barrier, viewpoints are solicited in the form of ballots. One ballot is assigned to each property with the following weighted points:

- Benefited property owner per residence / unit = 1 point
- Benefited tenant per residence / unit = 1 point

A noise barrier shall be permitted when the majority of the points indicate approval of the barrier. Support for or opposition of a noise barrier is based on responses received, provided that 50 percent or more of the points available are returned from benefited owners and tenants by the deadline. If a majority of points are not returned, then a reminder by any reasonable and easily verifiable means will be sent extending the deadline as appropriate. If a majority of benefited receptors still do not respond, KDOT will make a final determination on the noise abatement.

f) Optional Reasonable Criterion
Because noise abatement is for areas of frequent human use where lowered noise would be of benefit, it is acceptable to give less consideration for abatement to areas of mixed zoning or development and to areas where existing local plans call for zoning changes to a less noise sensitive use.

3.0 Documentation and Notification

3.1 Noise Study

The Noise Study Report should include information presented in the following outline. The intent is to provide statewide uniformity and consistency. However, contingent upon project specifics, other relevant information and variations may be included.

1. Project Description overview with regional map; Purpose; Statement of Compliance with FHWA 23 CFR 772
2. Sound \ Traffic noise fundamentals including brief paragraph about noise analysis
3. FHWA Noise Abatement Criteria (NAC); land use/activity categories from NAC associated with the project
4. Existing sound level measurements, statement that sound level meter is calibrated yearly, and certification is stored in Environmental Services at KDOT
5. Name of FHWA traffic noise computer software model, model validation, origin of traffic data for input into of the FHWA computer software model, presentation in tabular form of receptors' existing sound levels and their predicted noise levels with respective activity category
6. Discussion about receptors with traffic noise impacts and local map of receptors with traffic noise impacts
7. If necessary, consideration of possible abatement measures; noise barrier discussion of feasibility and reasonableness
8. Construction noise paragraph (page 7)

9. Local Officials' Statement – Indicate a copy is being provided to local officials in affected jurisdictions
10. Summary, including an abatement proposal and a Statement of Likelihood

The sketches of sites where field measurements were taken and printouts from sound level meter field measurements will be stored in the project files.

3.2 Local Public Officials Notification

The local jurisdiction shall be provided a copy of the Noise Study Report. If traffic noise impacts were not identified, this information shall be stated in an abbreviated final Noise Study Report.

For transportation improvements meeting Type I criteria with undeveloped land that is not permitted, the local jurisdiction shall be informed that:

- The information is being provided as an effort to minimize future traffic noise impacts on currently undeveloped lands.
- Three-Part Approach to Highway Traffic Noise Abatement and noise compatible planning at the local level.
- The best estimation for design year noise levels from the edge of the nearest travel lane to where noise impacts would occur. At a minimum, the distances to the noise impacts shall represent residential and commercial activity categories. The information may be presented in a tabular form or alternatively as contours on a map.

Table 1: Federal Highway Adminstration Noise Abatement Criteria (NAC)

[Hourly A-Weighted Sound Level—decibels (dB(A)) (1)]				
Activity Category	**Activity Criteria** (2) Leq(h)	L10(h)	**Evaluation Location**	**Activity Description**
A	57	60	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 (3)	67	70	Exterior	Residential
C (3)	67	70	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	55	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 (3)	72	75	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) Either Leq(h) or L10(h) (but not both) may be used on a project. (2) The Leq(h) and L10(h) Activity Criteria values are for impact determination only and are not design standards for noise abatement measures. (3) Includes undeveloped lands permitted for this activity category.				

Table 2: Equivalent Receptors to Residence

Description	**Method**
Residences and Multi-Family Dwellings	Primary consideration is for exterior areas of frequent human use, usually back yards of single-family homes. For multi-family dwellings, a receptor shall be placed at individual exterior activity areas that face the noise source, such as balconies. If no exterior areas of frequent human use are present, no further noise analysis is required.
campgrounds	one receptor = MML for each year-round formal site one receptor = each formal site
day care centers and schools	one receptor = MML
parks	one receptor = each formal outdoor activity within boundary one receptor = MML if no outdoor activity areas
picnic areas	one receptor = cluster of tables
trails	one receptor = MML
trail crossings	one receptor = each formal trail crossing
amphitheaters and auditoriums active sports areas and recreation areas	one receptor = MML If utilized primarily in late hours, use appropriate traffic volume.
cemeteries (area for memorial services, not individual gravesites)	Each exterior area distinctly recognized for human activity is counted as one receptor if the area is adjacent to the highway.
hospitals and medical facilities	
libraries	
playgrounds	
places of worship, public or nonprofit institutional structures, and public meeting rooms	
radio studios, recording studios, television studios	
hotels and motels	
offices	
restaurants / bars	
Because noise abatement is for areas of frequent use where lowered noise would be of benefit, seasonal use and hours of usage may be necessary. Primary consideration is for exterior areas of frequent human use.	
MML – Midwest Median Lot = 12,000 square feet, round from 0.28 acre per U.S. Census Bureau, Current Housing Reports, Series H150109, American Housing Survey for United States	