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DATE: **April 7, 2023**

TO: Julianne Whitaker, Senior Scientist / Environmental - Olsson

FROM: Evan Mace – Environmental Programs Specialist

SUBJECT: **Approved Traffic Noise Assessment for the proposed reconstruction of I-35 from the SH-74 interchange, extending north 2.75 miles to the Cleveland County line and from 1 mile south of Ladd Road, extending north 4.15 miles to the SH-74 Interchange, McClain County, JP 35588(04) and JP 35589(04); CI-2373.**

Attached is the approved Traffic Noise Assessment prepared for the subject project. A precision sound level meter validated the noise model based on field readings and traffic counts along I-35 within the project limits. The model validation proved that all measured versus predicted levels were within the ±3 dB range; thus, the noise model developed for the study area would provide an acceptably accurate estimate of noise levels for the existing and future conditions. Fifty-five (55) receptors were identified for the noise analysis consisting of forty-eight (48) single-family residential, one (1) park/recreation area), two (2) veterinary hospitals, one (1) place of worship, and three (3) hotels.

Under current conditions, eight (8) residential receptors are impacted with noise levels that approach, meet, or exceed the 67 dB(A) $L_{EQ}$ (h) for Activity Category B. Based on the proposed project and future traffic volumes, sixteen (16) residential receptors would be impacted by noise levels meeting or exceeding the 67 dB(A) $L_{EQ}$ (h) for NAC-B. An interior analysis was conducted for the veterinary clinics, and the place of worship and evaluated as NAC-D, in which no future noise impacts occur. Further, no receivers will experience a substantial increase (15 dB) in future levels over the existing levels, with the highest increase being 3.8 dB exterior and 3.4 dB interior.

Noise abatement in the form of free-standing noise walls was considered for impacted receptors. Seven (7) noise walls were evaluated at various lengths and heights placed within the highway right-of-way. The barrier analyses indicated that walls ranging in various heights up to the maximum allowed 22 feet resulted in a high cost per benefitted receptor or did not achieve the acceptable reduction of future noise levels. In summary, installing noise walls would be ineffective primarily due to long distances between the receptors and the noise wall location or insufficient benefitted receptors. Therefore, noise abatement measures are determined not feasible or reasonable.

Attachment

Copy: Kevin Larios – Senior Noise Specialist
Amanda Alexander – NEPA Project Manager

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# TRAFFIC NOISE ASSESSMENT

I-35

MCCLAIN COUNTY, OKLAHOMA – J/P 35588(04) AND 35589(04)

ODOT CI-2373

**Prepared for:**

OKLAHOMA DEPARTMENT OF TRANSPORTATION
ENVIRONMENTAL PROGRAMS DIVISION
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**Date:**

April 7, 2023

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## Executive Summary

This traffic noise analysis studies the potential noise impacts due to the proposed widening of I-35 from the SH-74 interchange, extending north 2.75 miles to the Cleveland County line and from 1 mile south of Ladd Road, extending north 4.15 miles to the SH-74 interchange.

This analysis is based on preliminary plans developed by the design consultant. Per the Oklahoma Department of Transportation (ODOT) Noise Policy and FHWA 23 CFR 772, the analysis was performed using TNM version 2.5 software. The land uses within the project area consist of residential neighborhoods, commercial businesses, rural residences, agriculture, and undeveloped land.

Fifty-five (55) receptors were identified for the noise analysis consisting of forty-eight (48) single-family residential, one (1) park/recreation area), two (2) veterinary hospitals, one (1) place of worship, and three (3) hotels. Under current conditions, eight (8) residential receptors are impacted with noise levels that approach, meet, or exceed the 67 dB(A) LEQ (h) for Activity Category B. Based on the proposed project and future traffic volumes, sixteen (16) residential receptors would be impacted by noise levels meeting or exceeding the 67 dB(A) LEQ (h) for NAC-B. An interior analysis was conducted for the veterinary clinics, and the place of worship and evaluated as NAC-D, in which no future noise impacts occur. Further, no receivers will experience a substantial increase (15 dB) in future levels over the existing levels, with the highest increase being 3.8 dB exterior and 3.4 dB interior. Noise mitigation in the form of free-standing noise walls within the project right-of-way was considered for the impacted residences; however, none of the walls were deemed feasible or reasonable, as outlined in the ODOT Noise Policy.

## Introduction

The Oklahoma Department of Transportation (ODOT) plans to widen the I-35 from the SH-74 interchange, extending north 2.75 miles to the Cleveland County line and from 1 mile south of Ladd Road, extending north 4.15 miles to the SH-74 interchange. An additional through lane in each direction will be added to I-35, utilizing the existing grass median as much as possible to limit the extent of widening to the outside. For this study, Build and No-Build conditions were analyzed for comparison.

This traffic noise analysis was performed utilizing the directives in the Federal Highway Administration (FHWA) Noise Regulations in Chapter 23 of the Code of Federal Regulations (CFR)

Part 772 and the ODOT Policy Directive on Highway Noise Abatement C-201-3 revised on July 13, 2011. This report designates locations where noise impacts are anticipated and then evaluates the potential need for noise abatement barriers to minimize the sound level impact. This study used information from the Preliminary Design Plans to place representative receiver locations for the evaluation. Additionally, three sound level meter readings were taken in the field and used as validation points to confirm the FHWA noise model calculations from the TNM 2.5 software.

## Fundamentals of Noise and Sound Theory

Noise, defined as unwanted or excessive sound, is an undesirable by-product of our modern way of life. From these known effects of noise, criteria have been established to help protect public health and safety and prevent the disruption of certain human activities. This criterion is based on such known impacts of noise on people as speech interference, sleep interference, physiological responses, hearing loss, and annoyance. Highway traffic noise is a major contributor to overall transportation noise and is considered a line source of energy from which the energy levels dissipate vertically and laterally from the roadway. Traffic noise is not constant. It varies as each vehicle passes a point. The time-varying characteristics of environmental noise are analyzed statistically to determine the duration and intensity of noise exposure. In an urban environment, noise is made up of two distinct parts. One is ambient or background noise. Wind and distant traffic noise make up the project's acoustic environment. These sounds are not readily recognized but combine to produce a nonirritating ambient sound level. This background sound level varies throughout the day, lowest at night and highest during the day. The other component of urban noise is intermittent and louder than the background noise. Transportation noise and local industrial noise are examples of this type of noise. It is for these reasons that environmental noise is analyzed statistically.

Highway traffic sounds are generated primarily from tires, engines, and exhaust. It is commonly measured in decibels (dB) and is a logarithmic unit and not added arithmetically as with more common linear units such as temperature. The sound pressure level from two equal sources is 3 dB greater than the sound pressure level of just one source. For example, two trucks producing 90 dB each combine to produce 93 dB, not 180 dB. In other words, doubling the noise source produces only a 3 dB increase in the sound pressure level. Studies have shown that this increase is barely perceptible by the human ear. Research indicates that to an average listener, a 10 dB increase is perceived as twice as loud. One dB(A) is the slightest change in sound that an average person can detect. Usually, an observer cannot perceive an increase in noise of three to four dB if the increase occurs over several years.

This analysis will discuss the noise levels as Leq(h), defined as the steady-state sound level containing the same acoustic energy as the time-varying sound level during a stated period. Leq(h) is the hourly value of Leq and is based on the more commonly known decibel (dB) and the "A-weighted" decibel unit or dB(A). Sound comprises different frequencies, each of which is perceived differently by the human ear. Since human hearing is not sensitive to low and very high frequencies, the dB(A) scale approximates the human ear's response by compensating for high and low-end frequency insensitivity and rendering noise level readings more meaningful. The dB(A) unit measures perceptible sound energy and determines the fringe frequencies. All traffic noise levels in this analysis will be expressed in dB(A) Leq(h).

## Analysis Methods

The existing calculated noise from the computer model (validated by field measurements) is compared to the future calculated noise in the project location to analyze traffic noise. The computer model is created using FHWA's Traffic Noise Model version 2.5 (TNM 2.5) with user inputs for the roadway, receivers, traffic data, and terrain lines. The existing and proposed roadway geometry was taken from the Preliminary Engineering Report. The receiver locations were chosen based on exterior areas where frequent human use occurs. The receivers, representing dwelling units, are modeled for noise level increase or potential noise abatement. For this analysis, peak hour conditions were modeled using the peak hour traffic data. Therefore, actual sound levels during peak travel time should not exceed the values presented in this report. In addition, the modeling effort incorporated average pavement surface, terrain lines, and various ground zones (lawn, water, etc.).

FHWA classifies the land use according to the noise abatement criteria (NAC) based on the existing activities, developed lands, and those areas for which local authorities permit the development of this type. **Table 1** lists the different criteria and the corresponding activity category. For noise-sensitive receivers where no frequent exterior human activity area is identifiable, interior noise levels can be determined using adjustment factors and compared to the NAC in determining impacts per the ODOT Noise Policy. This noise study included an internal analysis of two veterinary hospitals and a place of worship where no frequent outside activity area exists. The building type for all three properties consists of metal exteriors with very few small windows facing the project area. No interior sound level meter measurements were conducted; however, per the ODOT Noise Policy, the interior sound level predictions were computed by subtracting a 25 dB(A) noise reduction factor from the

predicted exterior level for the building type involved. If the activity criteria threshold is exceeded, noise abatement mitigation measures must be evaluated. There are two ways in which a noise impact can occur: (1) projected noise levels are within one dB, (A) meet or exceed the threshold noise level for the appropriate activity category, or (2) the projected noise level exceeds the current noise level by 15 dB(A) or more at a specific location. If an impact is found, noise abatement is evaluated for the identified area. The noise abatement measures found to be reasonable and feasible as classified by the ODOT Noise Policy will be proposed for implementation.

**Table 1:** FHWA Noise Abatement Criteria (NAC)
[Hourly A-Weighted Sound Level, decibels dB(A)]

| Activity Category | Activity Criteria[1] Leq(h)[2] | 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, 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, recreational areas, Section 4(f) sites, schools, television studios, trails, and trail crossings. |
| D | 52 (Interior) | Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public 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, |

[1] The Leq(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 Leq(h) being the hourly value of Leq.
[3] Includes undeveloped lands permitted for this activity category.

| | | |
|---|---|---|
| | | mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical) and warehousing |
| G | -- | Undeveloped lands that are not permitted |

## Traffic Noise Data

FHWA Traffic Noise Model (TNM) was used to model the existing traffic noise in 2022 and the projected traffic noise in 2042. ODOT's Traffic Engineering Division provided the existing and future traffic data. Traffic is measured according to the annual average daily traffic (AADT), measured in vehicles per day (vpd), and is an average over 7 days of the week for a given year. The AADT data was used to calculate the hourly design volume (DHV) proportioned into cars, medium trucks, and heavy trucks. TNM 2.5 uses the DHV to calculate the existing noise levels and predict future noise impacts. The greatest impact will occur when the highest traffic goes through at the highest speed. This condition is considered to be "the worst hour for noise."

**Table 2** displays the traffic volume, DHV, and quantities of cars, medium trucks, and heavy trucks used in the existing noise model.

**Table 2:** Existing 2022 Traffic Volumes for I-35

| | AADT | DHV | Cars | Medium Trucks | Heavy Trucks |
|---|---|---|---|---|---|
| I-35 Northbound | 25,500 | 2,550 | 2,064 | 72 | 412 |
| I-35 Southbound | 25,500 | 2,550 | 2,064 | 72 | 412 |

The proposed speed limit throughout the project is 70 mph for I-35. TNM 2.5 uses these speed limits in their respective models.

**Table 3** reflects the traffic volume, DHV, and quantities of cars, medium trucks, and heavy trucks used in the proposed noise models.

**Table 3**: Projected 2042 Traffic Volumes for I-35

| | AADT | DHV | Cars | Medium Trucks | Heavy Trucks |
|---|---|---|---|---|---|
| I-35 Northbound | 35,700 | 3,570 | 2,892 | 102 | 576 |
| I-35 Southbound | 35,700 | 3,570 | 2,892 | 102 | 576 |

## Model Validation

The ODOT Sound Level Meter (SLM), a Larson-Davis Sound Track LxT2 (s/n 0004412; Calibration Certificate dated 02/02/2021), was used for field measurements. The microphone on the meter was placed 5 feet above ground level to represent the height of the average person's ear. The manufacturer's windsock was placed on the device for all measurements. Calibration of the SLM took place in the field before taking any measurements.

Model Validation occurred in the field at the project site on November 30, 2022. **Figure 2** depicts three locations selected to measure the noise using the sound meter and concurrently count the traffic. Two sites were residential east of I-35, while the other was rural, agricultural land along I-35. The traffic count included classifying the vehicle as a car, medium truck, or heavy truck. The measurements were taken for 15 minutes each, scaled up by four to equal the hourly traffic, and used as an input in TNM 2.5 for the validation models. The measured noise level was compared to the calculated noise level from TNM 2.5. The model is considered valid when the measured noise is within +/- 3.0 dB(A) of the calculated noise level from TNM 2.5. **Table 4** shows the measured and computed noise levels of the validation models. The validation models were within 3.0 dB(A), indicating that TNM 2.5 accurately reflects the current and future noise conditions along I-35. The field data, sound meter calibration certificate, and modeling results from TNM 2.5 are on file with the ODOT Environmental Programs Division and are available upon request.

**Table 4**: Modeled and Measured Sound Levels

| Date | Location/Receiver | Measured Noise Level *dB(A) Leq(h)* | Calculated Noise Level *dB(A) Leq(h)* | Difference *dB(A)* |
|---|---|---|---|---|
| 11/30/2022 | V1-1 | 74.2 | 73.2 | -1.0 |
| 11/30/2022 | V2-1 | 71.6 | 74.2 | 2.6 |
| 11/30/2022 | V4-1 | 78.6 | 78.2 | -0.4 |

## Existing Conditions

The project area primarily comprises undeveloped, rural land, residential properties, and recreational and commercial developments. Residential neighborhoods are found along the southern portion of the proposed site, near Ladd Road. From Ladd Road to East Center Road is predominantly agricultural land with some commercial properties. The area from East Center Road

to West Lamar Road is mainly undeveloped and agricultural land, with commercial and industrial land. From West Lamar Road to the proposed project's northern boundary consists of agricultural, commercial, and industrial land. Fifty-five (55) receivers were identified for this proposed site. Forty-eight (48) receivers were identified as Activity Category B (residences). These residences occurred on either side of I-35 but are concentrated in the southern portions of the proposed project. One (1) receiver was identified as being Activity Category C (parks/recreation area). Three (3) receivers were identified as Activity Category D (two (2) veterinary hospitals and one (1) place of worship). Three (3) receivers were identified as Activity Category E (Hotels). The remaining land surrounding the project site corresponded to Activity Category F (undeveloped/agricultural) and was excluded from evaluation. **Figure 2** displays the receiver locations.

Existing noise levels were calculated using traffic data from 2022 to create a comparison level for future noise levels. Fifty-five (55) receivers were modeled using the 2022 traffic data, roadway alignment, and terrain conditions. In addition, the modeling assumed all vehicles were traveling 70 mph on I-35. The existing sound level results are recorded with the future results in **Tables 5 and 6**. The TNM data and results of the existing condition are on file with the ODOT Environmental Programs Division and are available upon request.

## Future Conditions

A traffic noise impact occurs when either (1) the predicted noise levels meet or exceed the NAC listed for the specified land use in **Table 1** or (2) the predicted noise level is significantly higher than the existing noise levels by 15 or more decibels. The future noise levels for the same fifty-five receivers were calculated using the predicted traffic data for 2042, proposed roadway alignment, and proposed terrain conditions for each alternative. In addition, the modeling assumed all vehicles were traveling 70 mph on I-35. The future sound level results are compared to those in **Tables 5 and 6** for the Build and No-Build Conditions, respectively. The TNM data and results of the future condition are on file with the ODOT Environmental Programs Division and are available upon request.

| **Table 5:** Comparison of Existing and Future Noise Levels, Build Condition | | | | | |
|---|---|---|---|---|---|
| **Receiver** | Description | Existing Noise Level *dB(A) Leq (h)* | Future Noise Level *db(A) Leq (h)* | Change *dB(A)* | Noise Impact? |
| SE-1 | Residential | 59.5 | 60.3 | 0.8 | No |
| SE-2 | Residential | 59.9 | 61.6 | 1.7 | No |
| SE-3 | Residential | 64.3 | 65.3 | 1 | No |
| **SE-4** | **Residential** | **68.7** | **69.7** | **1** | **Yes** |
| **SE-5** | **Residential** | **76.9** | **76.9** | **0** | **Yes** |
| SE-6 | Residential | 61.9 | 63.4 | 1.5 | No |
| **SE-7** | **Residential** | **64.7** | **66** | **1.3** | **Yes** |
| **SE-8** | **Residential** | **68.2** | **70.9** | **2.7** | **Yes** |
| SE-9 | Residential | 61.9 | 63.9 | 2 | No |
| **SE-10** | **Residential** | **64.6** | **66.8** | **2.2** | **Yes** |
| **SE-11** | **Residential** | **67.3** | **68.7** | **1.4** | **Yes** |
| SE-12 | Residential | 60.4 | 62.8 | 2.4 | No |
| SE-13 | Residential | 62.6 | 64.7 | 2.1 | No |
| **SE-14** | **Residential** | **65.1** | **66.6** | **1.5** | **Yes** |
| SE-15 | Residential | 61.8 | 64.2 | 2.4 | No |
| SE-16 | Residential | 63 | 64.9 | 1.9 | No |
| **SE-17** | **Residential** | **66.3** | **67.2** | **0.9** | **Yes** |
| **SE-18** | **Residential** | **64.8** | **66.3** | **1.5** | **Yes** |
| SE-19 | Residential | 60.7 | 63.5 | 2.8 | No |
| SE-20 | Residential | 61.7 | 64.2 | 2.5 | No |
| SE-21 | Residential | 57.9 | 61.7 | 3.8 | No |
| **SE-22** | **Residential** | **66.9** | **69.3** | **2.4** | **Yes** |
| SE-23 | Residential | 54.7 | 54.9 | 0.2 | No |
| SE-24 | Residential | 55.4 | 56 | 0.6 | No |
| SE-25 | Residential | 54.9 | 55.6 | 0.7 | No |
| SE-26 | Residential | 54.8 | 55.4 | 0.6 | No |
| **SE-27** | **Residential** | **66.6** | **67.6** | **1** | **Yes** |
| SE-28 | Residential | 57.9 | 58.2 | 0.3 | No |
| SE-29 | Residential | 55.1 | 57 | 1.9 | No |
| SW-1 | Residential | 52.1 | 54 | 1.9 | No |
| SW-2 | Residential | 54.7 | 56.6 | 1.9 | No |
| SW-3 | Residential | 58.6 | 61.2 | 2.6 | No |
| SW-4 | Residential | 59.4 | 61.4 | 2 | No |
| **SW-5** | **Residential** | **62.7** | **66.1** | **3.4** | **Yes** |
| SW-6 (Interior) | Veterinarian | 40.7 | 43.4 | 2.7 | No |
| SW-7 | Residential | 55.6 | 57.9 | 2.3 | No |
| SW-8 | Residential | 57 | 59.5 | 2.5 | No |
| SW-9 | Residential | 58.7 | 61.3 | 2.6 | No |
| SW-10 (Interior) | Place of Worship | 37.2 | 40.6 | 3.4 | No |
| SW-11 | Residential | 54.9 | 55.2 | 0.3 | No |

| **Table 5:** Comparison of Existing and Future Noise Levels, Build Condition | | | | | |
|---|---|---|---|---|---|
| **Receiver** | Description | Existing Noise Level *dB(A) Leq (h)* | Future Noise Level *db(A) Leq (h)* | Change *dB(A)* | Noise Impact? |
| SW-12 | Residential | 54.7 | 55.9 | 1.2 | No |
| SW-13 | Park | 53.9 | 55.9 | 2 | No |
| NE-1 | Residential | 58.7 | 61.3 | 2.6 | No |
| NE-2 | Residential | 56.8 | 59.8 | 3 | No |
| NE-3 | Residential | 61.4 | 63.8 | 2.4 | No |
| NE-4 | Residential | 60.1 | 62.4 | 2.3 | No |
| **NE-5** | **Residential** | **65.2** | **67.9** | **2.7** | **Yes** |
| NE-6 | Casino/Hotel | 61.3 | 63.6 | 2.3 | No |
| **NW-1** | **Residential** | **64.1** | **67.5** | **3.4** | **Yes** |
| **NW-2** | **Residential** | **70.4** | **71.5** | **1.1** | **Yes** |
| **NW-3** | **Residential** | **65.3** | **68.7** | **3.4** | **Yes** |
| NW-4 | Residential | 55.1 | 58.2 | 3.1 | No |
| NW-5 (Interior) | Veterinarian | 49.9 | 50 | 0.1 | No |
| NW-6 | Hotel | 53.6 | 54.7 | 1.1 | No |
| NW-7 | Casino/Hotel | 52.6 | 54 | 1.4 | No |

| **Table 6:** Comparison of Existing and Future Noise Levels, No-Build Conditions | | | | | |
|---|---|---|---|---|---|
| **Receiver** | Description | Existing Level *dB(A) Leq (h)* | Future Noise Level *db(A) Leq (h)* | Change *dB(A)* | Noise Impact? |
| SE-1 | Residential | 59.5 | 61 | 1.5 | No |
| SE-2 | Residential | 59.9 | 61.4 | 1.5 | No |
| SE-3 | Residential | 64.3 | 65.8 | 1.5 | No |
| **SE-4** | **Residential** | **68.7** | **70.2** | **1.5** | **Yes** |
| **SE-5** | **Residential** | **76.9** | **78.4** | **1.5** | **Yes** |
| SE-6 | Residential | 61.9 | 63.4 | 1.5 | No |
| **SE-7** | **Residential** | **64.7** | **66.2** | **1.5** | **Yes** |
| **SE-8** | **Residential** | **68.2** | **69.7** | **1.5** | **Yes** |
| SE-9 | Residential | 61.9 | 63.5 | 1.6 | No |
| **SE-10** | **Residential** | **64.6** | **66.1** | **1.5** | **Yes** |
| **SE-11** | **Residential** | **67.3** | **68.7** | **1.4** | **Yes** |
| SE-12 | Residential | 60.4 | 62.1 | 1.7 | No |
| SE-13 | Residential | 62.6 | 64.2 | 1.6 | No |
| **SE-14** | **Residential** | **65.1** | **66.6** | **1.5** | **Yes** |
| SE-15 | Residential | 61.8 | 63.5 | 1.7 | No |
| SE-16 | Residential | 63 | 64.8 | 1.8 | No |
| **SE-17** | **Residential** | **66.3** | **68.4** | **2.1** | **Yes** |
| **SE-18** | **Residential** | **64.8** | **67.2** | **2.4** | **Yes** |

| **Table 6:** Comparison of Existing and Future Noise Levels, No-Build Conditions | | | | | |
|---|---|---|---|---|---|
| **Receiver** | Description | Existing Level *dB(A) Leq (h)* | Future Noise Level *db(A) Leq (h)* | Change *dB(A)* | Noise Impact? |
| SE-19 | Residential | 60.7 | 63.4 | 2.7 | No |
| SE-20 | Residential | 61.7 | 64.8 | 3.1 | No |
| SE-21 | Residential | 57.9 | 62.1 | 4.2 | No |
| **SE-22** | **Residential** | **66.9** | **68.4** | **1.5** | **Yes** |
| SE-23 | Residential | 54.7 | 56.2 | 1.5 | No |
| SE-24 | Residential | 55.4 | 56.8 | 1.4 | No |
| SE-25 | Residential | 54.9 | 56.4 | 1.5 | No |
| SE-26 | Residential | 54.8 | 56.3 | 1.5 | No |
| **SE-27** | **Residential** | **66.6** | **68** | **1.4** | **Yes** |
| SE-28 | Residential | 57.9 | 59.4 | 1.5 | No |
| SE-29 | Residential | 55.1 | 56.5 | 1.4 | No |
| SW-1 | Residential | 52.1 | 53.5 | 1.4 | No |
| SW-2 | Residential | 54.7 | 56.2 | 1.5 | No |
| SW-3 | Residential | 58.6 | 60.1 | 1.5 | No |
| SW-4 | Residential | 59.4 | 60.8 | 1.4 | No |
| SW-5 | Residential | 62.7 | 64.1 | 1.4 | No |
| SW-6 (Interior) | Veterinarian | 40.7 | 42.2 | 1.5 | No |
| SW-7 | Residential | 55.6 | 57 | 1.4 | No |
| SW-8 | Residential | 57 | 58.5 | 1.5 | No |
| SW-9 | Residential | 58.7 | 60.1 | 1.4 | No |
| SW-10 (Interior) | Place of Worship | 37.2 | 38.7 | 1.5 | No |
| SW-11 | Residential | 54.9 | 56.4 | 1.5 | No |
| SW-12 | Residential | 54.7 | 56.1 | 1.4 | No |
| SW-13 | Park | 53.9 | 55.4 | 1.5 | No |
| NE-1 | Residential | 58.7 | 60.1 | 1.4 | No |
| NE-2 | Residential | 56.8 | 58.3 | 1.5 | No |
| NE-3 | Residential | 61.4 | 62.8 | 1.4 | No |
| NE-4 | Residential | 60.1 | 61.5 | 1.4 | No |
| **NE-5** | **Residential** | **65.2** | **66.7** | **1.5** | **Yes** |
| NE-6 | Casino/Hotel | 61.3 | 62.7 | 1.4 | No |
| NW-1 | Residential | 64.1 | 65.6 | 1.5 | No |
| **NW-2** | **Residential** | **70.4** | **71.9** | **1.5** | **Yes** |
| **NW-3** | **Residential** | **65.3** | **66.7** | **1.4** | **Yes** |
| NW-4 | Residential | 55.1 | 56.6 | 1.5 | No |
| **NW-5 (Interior)** | **Veterinarian** | **49.9** | **51.3** | **1.4** | **Yes** |
| NW-6 | Hotel | 53.6 | 55 | 1.4 | No |
| NW-7 | Casino/Hotel | 52.6 | 54.1 | 1.5 | No |

## Traffic Noise Impacts

As shown in **Table 5**, the future conditions resulted in 16 impacted receiver sites for the Build Condition, representing 16 receptors. The impacted receptors were all single-family residential dwellings.

The future build and the no-build noise levels were similar and produced results within +/- 2.0 dB(A). The no-build condition resulted in 15 impacted receiver sites representing 15 receptors. Based upon these results, the I-35 widening (build condition) causes minimal increased impact over the no-build condition, and the higher noise levels for the future vs. existing are predominantly the result of the inflating traffic data for 2042.

## Consideration of Abatement

Noise abatement was considered for this project due to the future traffic noise impacts. Noise mitigation must be “reasonable” and “feasible” to be recommended for design and construction.

Feasibility combines acoustic and engineering factors in evaluating a noise abatement measure. Some of the considerations that determine the feasibility of a noise barrier include the following:

a. Noise abatement measures will achieve at least a five dB(A) highway traffic noise reduction to be considered feasible.
b. Consider other noise sources in the area if identified during existing noise surveys.
c. The determination is that designing and constructing the noise abatement measure is possible.
d. American Association of State Highway and Transportation Officials (AASHTO) adopted publications, including the Green Book, which governs design requirements for highways and streets regarding engineering feasibility concerns like safety for the location of noise barriers.

Noise mitigation measures must also be reasonable. The following criteria were used to evaluate whether the noise barrier design would be reasonable.

a. The property owners’ and residents’ desire for mitigation. Benefited receptors' viewpoints shall receive priority consideration.
b. Cost/Benefit ratio of $30,000.00 per benefited receptor or less, based on historical unit costs of $25 per square foot of wall height required to achieve a feasible reduction. As increased

barrier height required a disproportionate increase in foundation costs (up to two times the "standard" wall), the maximum wall height considered for noise abatement is 22 feet.

1) A benefited receptor is any receptor that achieves at least a five (5) dB(A) reduction. This calculation is made per Barrier basis, including the total number of benefited receptors, not just modeled receivers.
2) This allowable cost/benefit ratio will be reanalyzed at a regular interval not to exceed five (5) years from the effective date of this policy. This cost/benefit ratio will be applied statewide.

c. Noise Reduction Design Goal: The optimum desired dB(A) noise reduction is determined by calculating the difference between future build noise levels with abatement and future build noise levels without abatement. The ODOT noise reduction design goal is 7 dB(A) and must be achieved for at least 75 percent of the benefited receptors identified within the first row of receptors for the abatement measure to meet ODOT reasonableness criteria.

The placement of noise walls for this project was complicated by either steep back slopes within the right-of-way or large drainage structures. Due to these constraints, the walls were placed directly adjacent to the highway instead of possibly more effective locations near the right-of-way line. The seven impacted areas of concern are summarized below:

1. A single-family residential dwelling (receiver NE-5) located northeast of Meredith Avenue and Lauren Circle and east of I-35. Noise mitigation, in the form of one continuous noise wall, was considered in the area west of the impacted area. The noise wall was evaluated, consisting of 800 feet in length and an average height of 21.5 feet, and achieved a 7 dB(A) reduction in the noise level. While the Noise Reduction Design Goal was met, the cost-benefit ratio was not. The total cost for the noise wall would be $845,575, resulting in a cost-benefit ratio of $845,575 per benefitted receiver. Based upon these results, constructing a noise wall in this location is not recommended as it has been determined not to be reasonable per ODOT Noise Policy.

2. Two single-family residential dwellings (receivers NW-2 and NW-3) are located east of NW 12th Avenue and west of I-35. Noise mitigation was considered one continuous noise wall east of the impacted area. A noise wall of 606 feet long and a constant height of 22 feet could only achieve a 4.6 dB(A) reduction for receiver

NW-2. Based on the inability of this wall to acoustically reduce noise for these receptors, constructing a noise wall in this location is not recommended as it has been determined not feasible per ODOT Noise Policy.

3. For a single-family residential dwelling (receiver NW-1) located east of NW 12th Avenue and west of I-35, noise mitigation was considered as one continuous noise wall east of the impacted area. A noise wall of 801 feet long and a constant height of 22 feet could only achieve a 2.5 dB(A) reduction for receiver NW-1. Based on the inability of this wall to acoustically reduce noise for this receptor, constructing a noise wall in this location is not recommended as it has been determined not feasible per ODOT Noise Policy.
4. A single-family residential dwelling (receiver SE-27) at the corner of E. Center Road and Ray Goldsby Avenue and east of I-35 was considered one continuous noise wall west of the impacted area. Noise mitigation, in the form of one continuous noise wall, was considered in the area west of the impacted area. A noise wall consisting of 700 feet in length and a maximum height of 22 feet provided only a 4.2 dB(A) reduction for receiver SE-27 and an average of 0.56 dB(A) reduction for five other receivers. Based on the inability of this wall to acoustically reduce noise for these receptors, constructing a noise wall in this location is not recommended as it has been determined not feasible per ODOT Noise Policy.
5. One impacted single-family residential dwelling (receiver SE-22) is located south of Ladd Road and east of I-35. Noise mitigation, in the form of one continuous noise wall, was considered in the area west of the impacted area. An existing retaining wall within the right-of-way limited the length of this wall. A noise wall of 1,500 feet long and a continuous height of 22 feet could only achieve a 3.6 dB(A) reduction for receiver SE-22. Based on the inability of this wall to acoustically reduce noise for this receptor, constructing a noise wall in this location is not recommended as it has been determined not feasible per ODOT Noise Policy.
6. A residential subdivision south of Mini Farms Drive and east of I-35. Nine single-family residential dwellings (receiver SE-4, 5, 7, 8, 10, 11, 14, 17, and 18) were modeled to represent the neighborhood's first- and second-row dwellings. Noise mitigation, in the form of one continuous noise wall, was considered in the area west of the impacted area. A noise wall consisting of 1,200 feet in length and an

average height of 19.5 feet achieved a 7 dB(A) reduction in the noise level for 75 percent of the first-row receivers SE-4, SE-5, and SE-8 (7.3, 11.4, and 7.0 dB(A) reduction, respectively). The noise barrier's total estimated cost is $999,868 resulting in a cost-benefit ratio of about $333,289 per benefitted receptor. Based upon these results, constructing a noise wall in this location is not recommended as it has been determined not to be reasonable per ODOT Noise Policy. Table 6 reflects the noise levels and insertion loss with the Barrier for the affected receivers.

7. A single-family residential dwelling (receiver SW-5) west of Ladd Road and west of I-35. Noise mitigation was considered one continuous noise wall east of the impacted area. An existing retaining wall within the right-of-way limited the length of this wall. A noise wall consisting of 525 feet long and a constant height of 22 feet did not achieve a 7dB(A) reduction in the noise level. Based on the inability of this wall to acoustically reduce noise for this and other receptors, constructing a noise wall in this location is not recommended as it has been determined not feasible per ODOT Noise Policy.

## Construction Noise

Construction noise related to highway projects is not a major issue. Noise sources include heavy machinery like backhoes and scrapers, cranes, pile drivers, and trucks transporting materials. Construction noise can be minimized by implementing time-of-day restrictions for construction operations adjacent to noise-sensitive areas. ODOT is concerned with any special noise-sensitive land uses or activities affected by construction noise from the proposed project. Any special measures that are feasible and reasonable will be added to the project plans and specifications. No special noise-sensitive land uses, or activities that may be affected by construction noise are in proximity to the project.

## Coordination with Local Officials

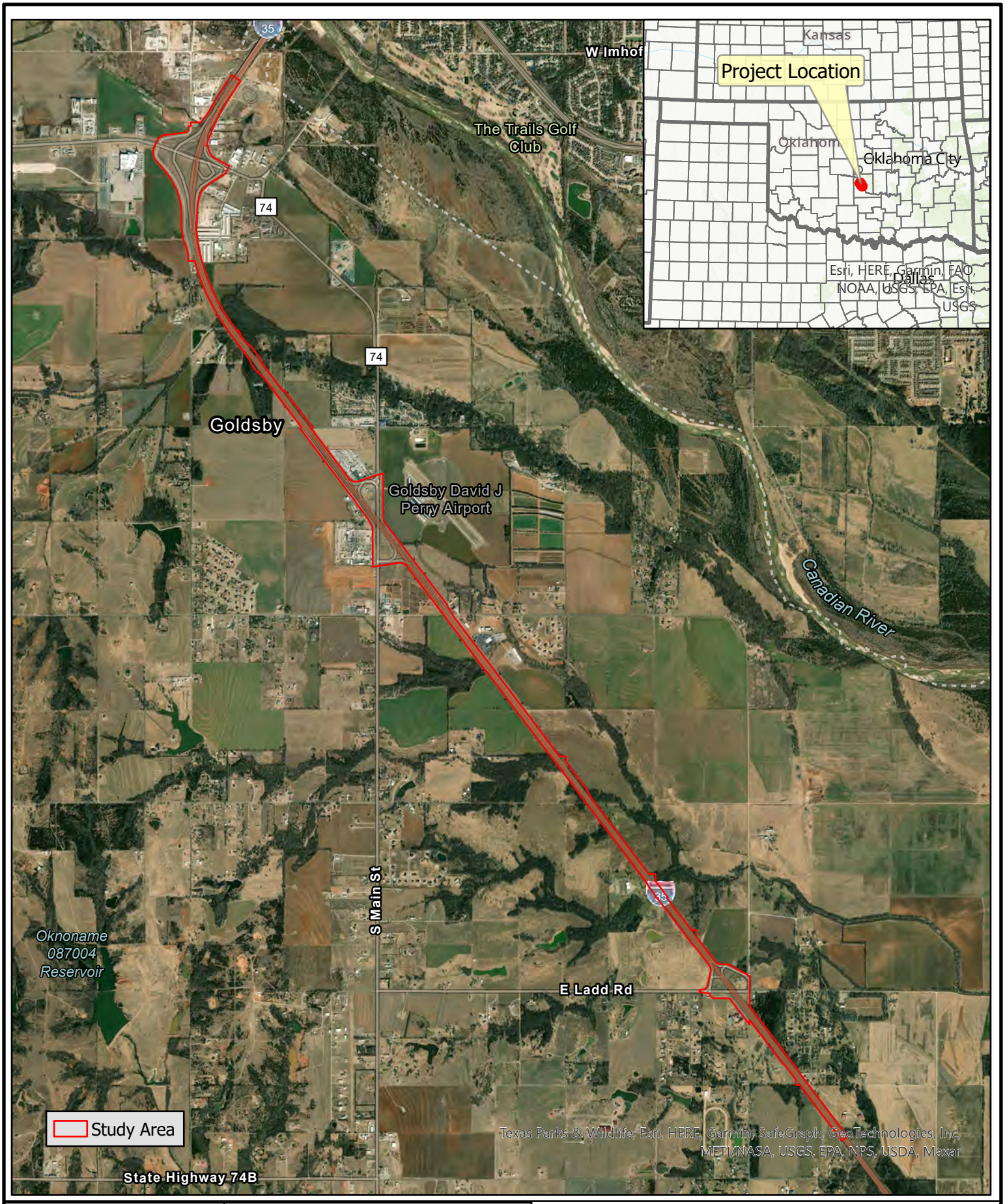
Traffic noise approaching and exceeding the sound levels specified in the ODOT Noise Policy resulting from the proposed I-35 facility has been identified. To aid in noise-compatible land use planning, using the TNM model, the approximate distance from the centerline of the proposed roadway was used to determine the 66 dB(A) and 71 dB(A) future contour lines for each alternative and are summarized in **Table 7** and depicted in

**Figure 2**. The distances vary due to variations in topography; **Figure 2** displays the contours for reference. Development within these respective zones on either side of the proposed reconstructed roadway facility will likely have elevated traffic noise levels. Residential and all NAC Activity Category C land use is discouraged in these zones due to anticipated future noise levels.

**Table 7:** Noise Contour Impact Zones

| Roadway Section | 66 dB(A)* | 71 dB(A)* |
|---|---|---|
| I-35 | 237 ft | 450 ft |

*Distance from the centerline of I-35

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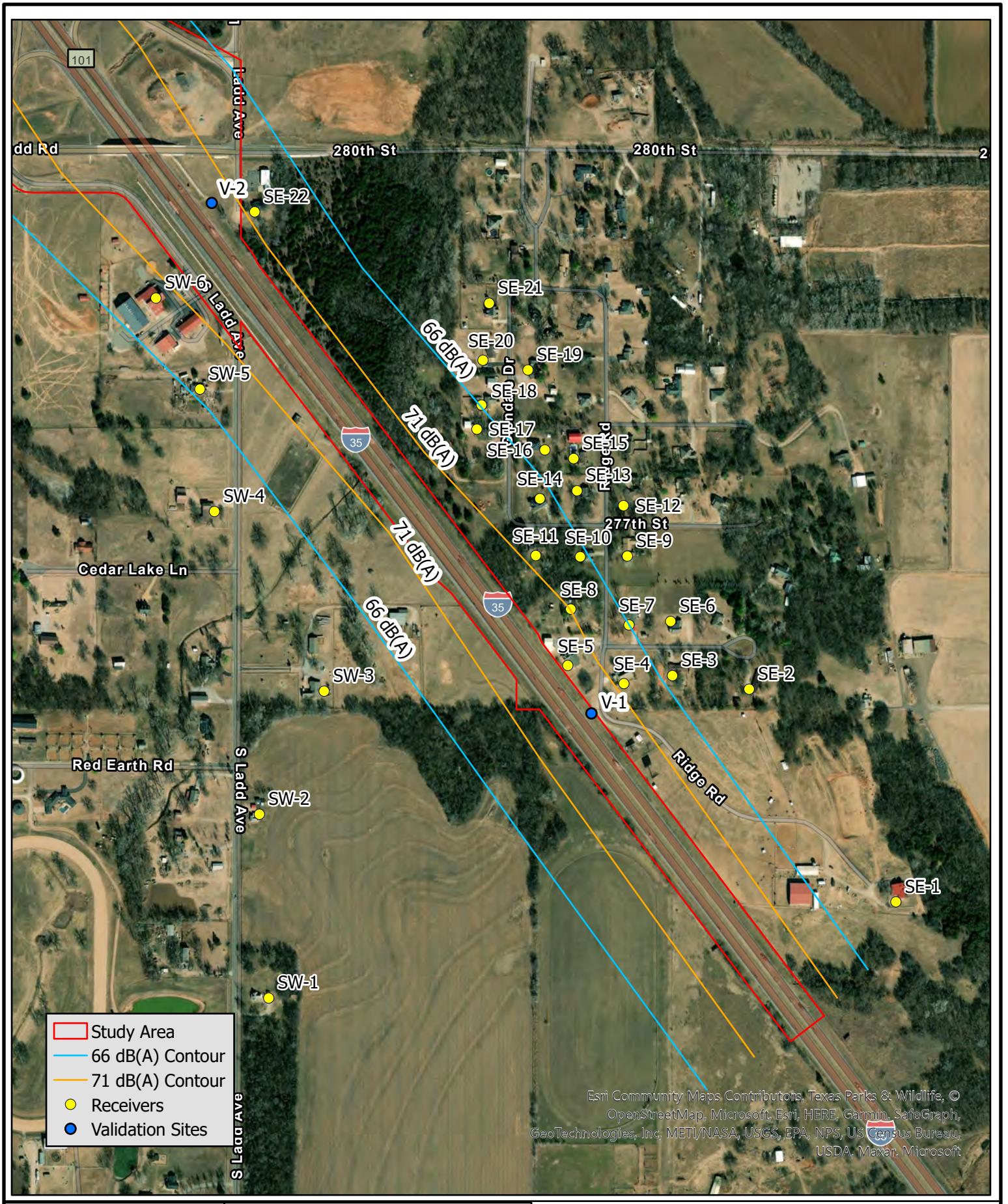
N

0 0.35 0.7 1.4

Miles

JP 35588(04) and 35589(04)
McClain County
Noise Study - Location Map

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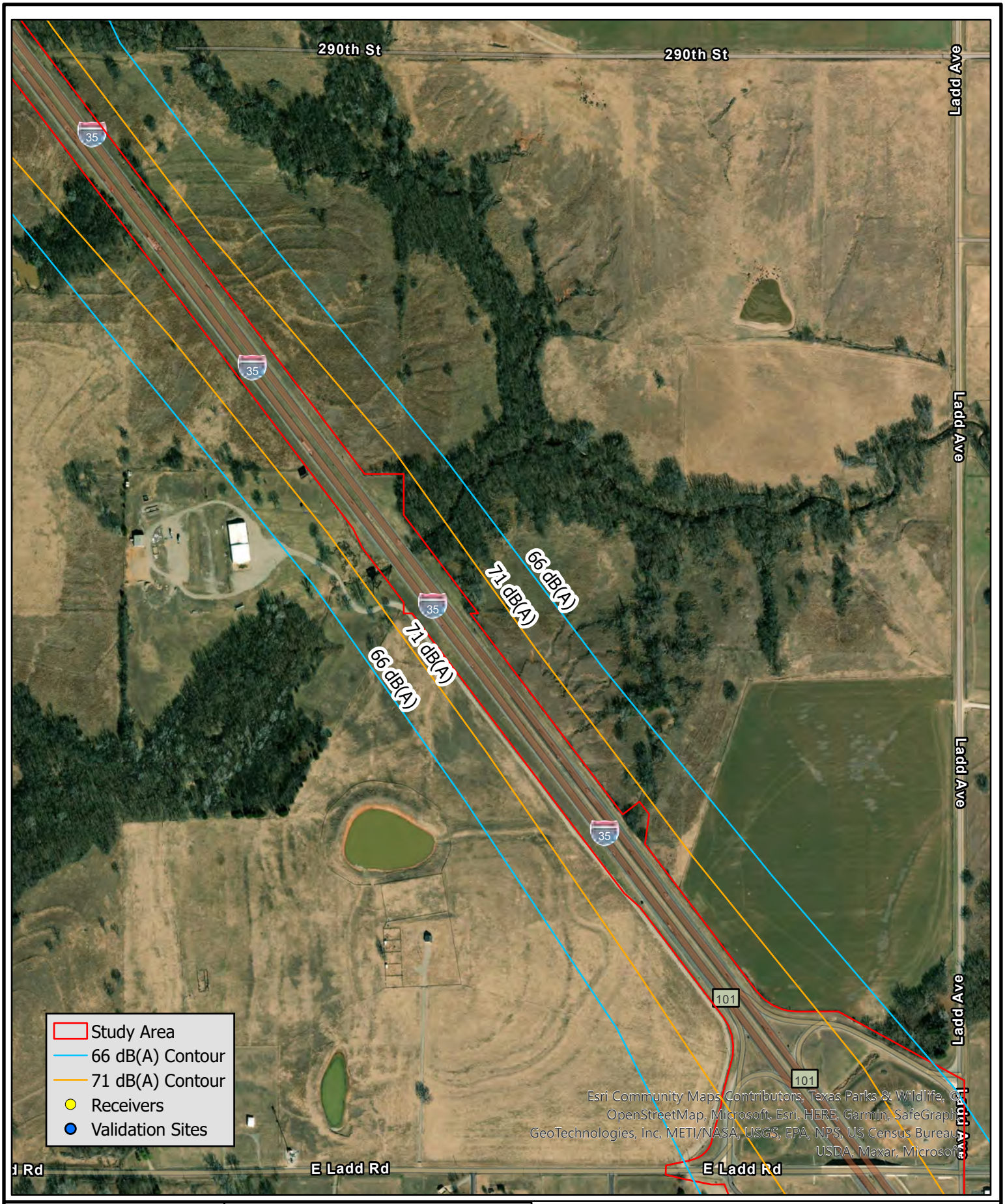
JP 35588(04) and 35589(04)
McClain County
Noise Study - Figure 2.1

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McClain County
Noise Study - Figure 2.2


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McClain County
Noise Study - Figure 2.3


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Noise Study - Figure 2.4


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Noise Study - Figure 2.5


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McClain County
Noise Study - Figure 2.6