Traffic Noise Technical Report

Kenney Fort Boulevard (Segments 2 & 3)

From Forest Creek Drive

To State Highway (SH) 45

CSJ: 0914-05-195

Williamson County, Texas

August 2020

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried-out by TxDOT pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated December 9, 2019, and executed by FHWA and TxDOT.

Table of Contents

List of Tables

Appendices

1.0 Introduction

Kenney Fort Boulevard (Blvd) is a major arterial roadway in the City of Round Rock's Transportation Master Plan. It was included in the City's first Transportation Master Plan, published in 1994, but has been part of the planning process since 1988. The roadway is being constructed in phases. Phase 1, which extends between Joe DiMaggio Blvd and Forest Creek Drive, was completed during the summer of 2013. The City of Round Rock, in cooperation with the Texas Department of Transportation (TxDOT), now proposes to construct phases 2 and 3 which would extend Kenney Fort Blvd approximately 1.5 miles from its current terminus at Forest Creek Drive south to State Highway (SH) 45.

Kenney Fort Blvd (Segments 2 and 3) would be a 6-lane arterial roadway that will ultimately connect SH 45 to United States Highway (US) 79. The proposed project includes improvements to Gattis School Road in the vicinity of its intersection with Kenney Fort Blvd. The improvements to Gattis School Road would extend from 275 feet east of Meister Lane to 285 feet east of Rolling Ridge Drive. The proposed project also includes improvements at the existing SH 45 grade-separation. The purpose of the proposed Kenney Fort Blvd project is to enhance mobility and provide an additional route for north/south traffic in this rapidly developing quadrant of the City of Round Rock.

2.0 Traffic Noise Analysis

This analysis was accomplished in accordance with TxDOT's (Federal Highway Administration [FHWA] approved) *Guidelines for Analysis and Abatement of Roadway Traffic Noise* (2011).

Sound from highway traffic is generated primarily from a vehicle's tires, engine and exhaust. It is commonly measured in decibels and is expressed as "dB."

Sound occurs over a wide range of frequencies. However, not all frequencies are detectable by the human ear; therefore, an adjustment is made to the high and low frequencies to approximate the way an average person hears traffic sounds. This adjustment is called A-weighting and is expressed as "dB(A)."

Also, because traffic sound levels are never constant due to the changing number, type and speed of vehicles, a single value is used to represent the average or equivalent sound level and is expressed as "Leq."

The traffic noise analysis process includes the following elements:

- Identification of land use activity areas that might be impacted by traffic noise.
- Determination of existing noise levels.
- Prediction of future noise levels.
- Identification of possible noise impacts.
- Consideration and evaluation of measures to reduce noise impacts.

The FHWA has established the following Noise Abatement Criteria (NAC), shown in **Table 1**, for various land use activity areas that are used as one of two means to determine when a traffic noise impact would occur.

Table 1: FHWA Noise Abatement Criteria (NAC)

Activity Category	FHWA dB(A) Leq	Activity Description
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (exterior)	Residential
C	67 (exterior)	Active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or non-profit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52 (interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	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.
Source: *Guidelines for Analysis and Abatement of Roadway Traffic Noise* (TxDOT 2011)		

A noise impact occurs when either the absolute or relative criterion is met:

Absolute criterion - the predicted noise level at the receiver approaches, equals, or exceeds the NAC. "Approach" is defined as one dB(A) below the NAC. For example, a noise impact would occur at a Category B residence if the noise level is predicted to be 66 dB(A) or above.

Relative criterion - the predicted noise level substantially exceeds the existing noise level at a receiver even though the predicted noise level does not approach, equal, or exceed the NAC. "Substantially exceeds" is defined as more than 10 dB(A). For example: a noise impact would occur at a Category B residence if the existing level is 54 dB(A) and the predicted level is 65 dB(A).

When a traffic noise impact occurs, noise abatement measures must be considered. A noise abatement measure is any positive action taken to reduce the impact of traffic noise on an activity area.

2.1 Ambient Noise Level Measurements

Ambient noise measurements were taken in the field during the peak PM traffic hours (4:00 p.m. to 6:00 p.m.) on November 20, 2017 and during the peak AM traffic hours (7:00 a.m. to 9:00 a.m.) on November 21, 2017 using a Larson Davis LxT2 noise meter (see field data sheets in **Appendix C**). The ambient measurements were taken in the same subdivision as R5 and R6 and very near to R10, east of the proposed project (see **Appendix A**).

2.2 Traffic Data

The FHWA traffic noise modeling software was used to calculate existing and predicted traffic noise levels. The model primarily considers the number, type, and speed of vehicles; highway alignment and grade; cuts, fills, and natural berms; surrounding terrain features; and the locations of activity areas likely to be impacted by the associated traffic noise. See **Table 2** and **Appendix B** for the traffic data utilized in the noise models, as approved by the TxDOT Transportation Planning and Program (TPP) Division. A compound annual growth rate was calculated from the TPP traffic data and to grow the 2016 existing conditions traffic numbers for use in the existing model.

Table 2: Traffic Noise Analysis Parameters

Roadway	Speed Limit	Design Hour Volume (K-Factor)*	Average Annual Daily Traffic**		Vehicle Distribution (%)		
			2020	2040	Light Duty	Medium Duty	Heavy Duty
Kenney Fort Blvd	50 mph	10.2	25,000	35,000	97.9	1.7	0.4

Notes:
*Design Hour Volume (K-Factor) is defined as the proportion of annual average daily traffic occurring in an hour, which is used for designing and analyzing highway traffic flow and for weighting average annual daily traffic.
**Average annual daily traffic is the total volume of vehicle traffic of a highway or road for a year divided by 365 days, which is a used to measure how busy the road is.

2.3 Methodology

Because traffic data for the existing cross streets within the project was included as part of the TPP-approved traffic data, an existing model was created to predict the existing sound levels at R1-R2 and R6-R8 since these receivers are located near an existing traffic source.

However, traffic data for the mainlanes of SH 45 was not available; therefore, the ambient noise reading (AR-1) was used as the baseline, existing sound level for R9-R11. In addition, there is no existing major source of traffic near R3-R5; therefore, the ambient noise reading (AR-2) was used as the baseline, existing sound level for these receivers. For the receivers for which the ambient measurements were used as the baseline, existing sound level, the decibel addition method was used to predict a future, worst-case scenario.

2.4 Model Results

Receiver locations were foremost based on the NAC land use activity areas, described in **Table 1**, adjacent to the roadway right-of-way (ROW). Receiver locations are generally identified as outdoor areas that experience frequent human activity and might be impacted by traffic noise. Receivers were placed closest to the ROW for locations having more than one area of frequent human activity. For the proposed project, existing and predicted traffic noise levels were modeled at 11 representative noise receivers exhibiting similar noise levels, NAC activity categories, and geographic location for mapping and reporting purposes (see **Table 3** and **Appendix A**).

Table 3: Traffic Noise Levels [dB(A) Leq]

Receiver ID	Land Use	NAC Category	NAC Level	Predicted Traffic Noise Level [dB(A) Leq]			Noise Impact
				Existing (2020)	Predicted (2040)	Change (+/-)	
R1	Single-Family Residential	B	67	49*	59	+10	N
R2	Single-Family Residential	B	67	47*	68	+21	Y
R3	Single-Family Residential	B	67	46[2]	57	+11	Y
R4	Single-Family Residential	B	67	46[2]	56‡	+10	N
R5	Single-Family Residential	B	67	46[2]	72	+26	Y

Receiver ID	Land Use	NAC Category	NAC Level	Predicted Traffic Noise Level [dB(A) Leq]			Noise Impact
				Existing (2020)	Predicted (2040)	Change (+/-)	
R6	Single-Family Residential	B	67	65*	70	+5	Y
R7	Single-Family Residential	B	67	63*	66	+3	Y
R8	Place of Worship/Day Care	C	67	49*	57	+8	N
R9	Single-Family Residential	B	67	58[1]	62‡	+4	N
R10	Single-Family Residential	B	67	58[1]	62‡	+4	N
R11	Multi-Family Residential	B	67	58[1]	63‡	+5	N

*Existing model result [1]Ambient measurement (AR-1) [2]Ambient measurement (AR-2)
‡Incorporates decibel additions

3.0 Noise Abatement Measures

The proposed project would result in a traffic noise impact; therefore, the following noise abatement measures were considered: traffic management, alteration of horizontal and/or vertical alignments, acquisition of undeveloped property to act as a buffer zone, and the construction of noise barriers.

Before any abatement measure can be proposed for incorporation into the proposed project, it must be both feasible and reasonable. In order to be "feasible," the abatement measure must be able to reduce the noise level at greater than 50% of impacted, first-row receivers by at least five dB(A); and to be "reasonable," it must not exceed the cost-effectiveness criterion of $25,000 for each receiver that would benefit by a reduction of at least five dB(A) and the abatement measure must be able to reduce the noise level for at least one impacted, first-row receiver by at least seven dB(A).

Traffic management - Control devices could be used to reduce the speed of the traffic; however, the minor benefit of one dB(A) per five mph reduction in speed does not outweigh the associated increase in congestion and air pollution. Other measures such as time or use restrictions for certain vehicles are prohibited on state highways.

Alteration of horizontal and/or vertical alignments - Any alteration of the existing alignment would displace existing businesses and residences, require additional ROW and not be cost effective/reasonable.

Buffer zone - The acquisition of undeveloped property to act as a buffer zone is designed to avoid rather than abate traffic noise impacts and, therefore, is not feasible.

Noise barriers - This is the most commonly used noise abatement measure. Noise barriers were evaluated for each of the impacted receiver locations.

Noise barriers would not be feasible or reasonable for the following impacted receivers and, therefore, are not proposed for incorporation into the proposed project:

R3: This receiver represents two single-family residences on the east side of the proposed project (including R4, which is not impacted). A noise barrier modeled on the ROW line for the extent of both parcel boundaries with dimensions of 998 feet in length and 20 feet in height would not be sufficient to achieve the minimum feasible reduction of five dB(A) at greater than 50% of impacted, first row receivers, and would not be sufficient to achieve the noise reduction design goal of seven dB(A) at one or more receivers; therefore, a barrier at this location is not proposed for incorporation into the project.

R7: This receiver represents the Northfields residential subdivision on the west side of the proposed project. A noise barrier modeled on the ROW line from Gattis School Road to SH 45 with dimensions of 2,717 feet in length and 20 feet in height would not be sufficient to achieve the minimum feasible reduction of five dB(A) at greater than 50% of impacted, first row receivers, and would not be sufficient to achieve the noise reduction design goal of seven dB(A) at one or more receivers; therefore, a barrier at this location is not proposed for incorporation into the project.

Noise barriers would be feasible and reasonable for the following receivers and, therefore are proposed for incorporation into the proposed project (see **Table 4**):

Preserve at Dyer Creek (R2): This receiver represents the Preserve at Dyer Creek residential subdivision on the east side of the proposed project. A noise barrier modeled on the ROW at 855 feet in length and 10 feet in height would reduce noise levels by at least five dB(A) for all 11 first-row, impacted receivers and reduce the noise level at one or more receivers by at least seven dB(A). The total cost of the barrier would be $153,900 or $13,990 per benefitted receiver. Therefore, a barrier at this location is proposed for incorporation into the project.

Rolling Ridge (R5 – R6): These receivers represent the Rolling Ridge residential subdivision on the east side of the proposed project. A noise barrier modeled on the ROW at 2,404 feet in length and 8 feet in height would reduce noise levels by at least five dB(A) for all 29 first-row, impacted receivers and reduce the noise level at one or more receivers by at least seven dB(A). The proposed noise barrier

would benefit 36 total receivers at a cost of $346,176 or $9,616 per benefitted receiver. Therefore, a barrier at this location is proposed for incorporation into the project.

Table 4: Noise Barrier Proposal (preliminary)

Traffic Noise Barrier	Representative Receiver(s)	Total # Benefitted Receivers	Height (feet)	Length (feet)	Total Cost	Cost per Benefitted Receiver
Preserve at Dyer Creek	R2	11	10	855	$153,900	$13,990
Rolling Ridge	R5 – R6	36	8	2,404	$346,176	$9,616

Any subsequent project design changes may require a reevaluation of this preliminary noise barrier proposal. The final decision to construct the proposed noise barriers would not be made until completion of the project design, utility evaluation and polling of adjacent property owners. **Appendix A** depicts the representative noise receivers and the noise barriers that are being proposed for the project.

4.0 Noise Planning

To avoid noise impacts that may result from future development of properties adjacent to the proposed project, local officials responsible for land use control programs must ensure, to the maximum extent possible, no new activities are planned or constructed along or within the following predicted (2040) noise impact contours (see **Table 5**).

Table 5: Traffic Noise Contours [dB(A) Leq]

Location	Distance from ROW	
	NAC Category B & C 66 dB(A)	NAC Category E 71 dB(A)
From SH 45 to Gattis School Road (west side of proposed project)	40 feet	Within ROW
From Gattis School Road to Forest Creek Drive (west side of proposed project)	20 feet	Within ROW

5.0 Conclusion

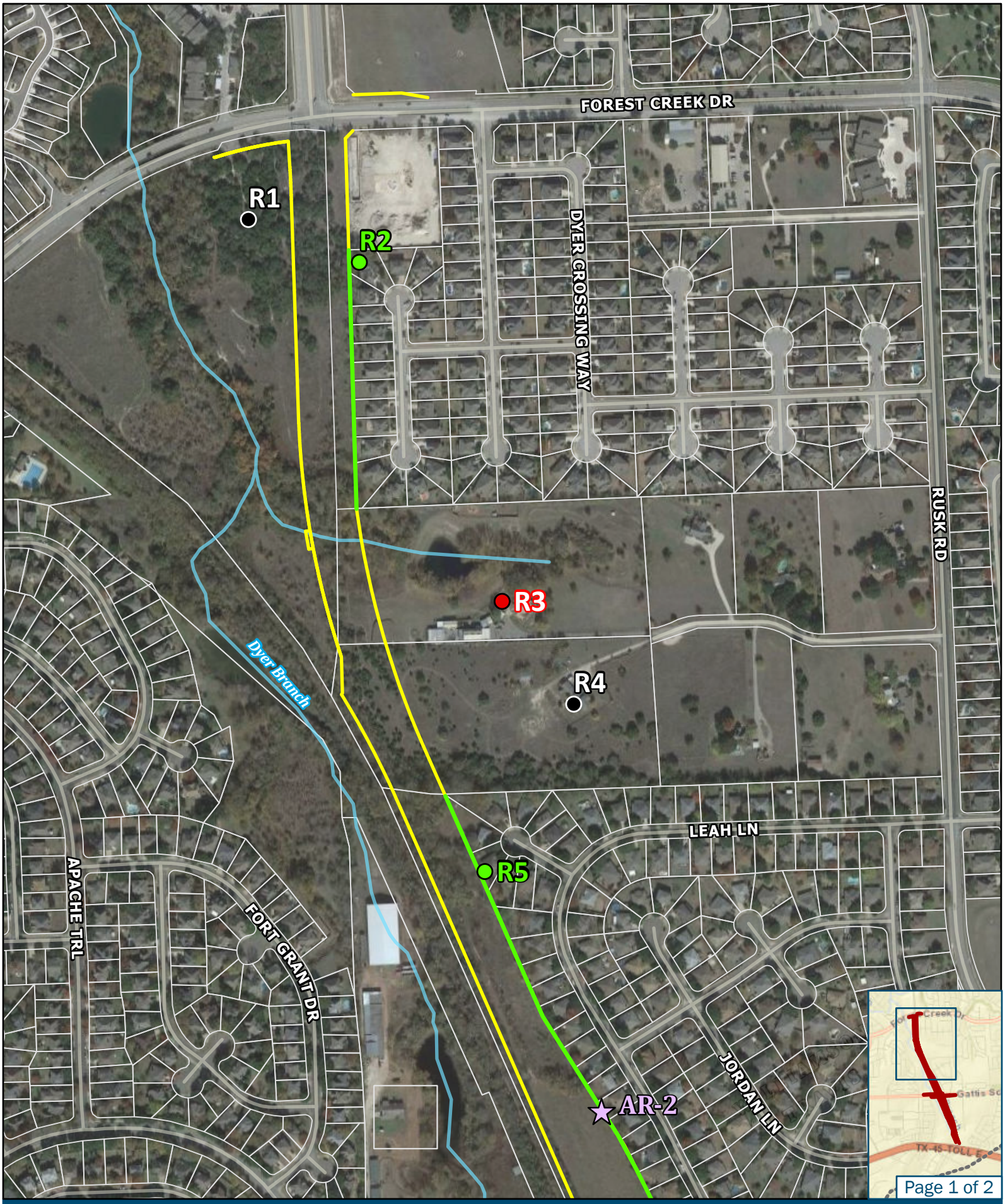
Based on this modeled noise analysis, there are five projected noise impacts within the corridor. Barrier analyses were conducted, and results indicated that barriers would be feasible and reasonable for three of the impacted representative receivers.

Noise associated with the construction of the proposed project is difficult to predict. Heavy machinery, the major source of noise in construction, is constantly moving in unpredictable patterns. However, construction normally occurs during daylight hours when occasional loud noises are more tolerable. None of the receivers are expected to be exposed to construction noise for a long duration; therefore, any extended disruption of normal activities is expected. Provisions would be included in the plans and specifications that require the contractor to make every reasonable effort to minimize construction noise through abatement measures such as work-hour controls and proper maintenance of muffler systems.

A copy of this traffic noise analysis would be made available to local officials. On the date of approval of this document (Date of Public Knowledge), FHWA and TxDOT are no longer responsible for providing noise abatement for new development adjacent to the proposed project.

APPENDIX A

REPRESENTATIVE NOISE RECEIVERS EXHIBIT



Representative Receivers

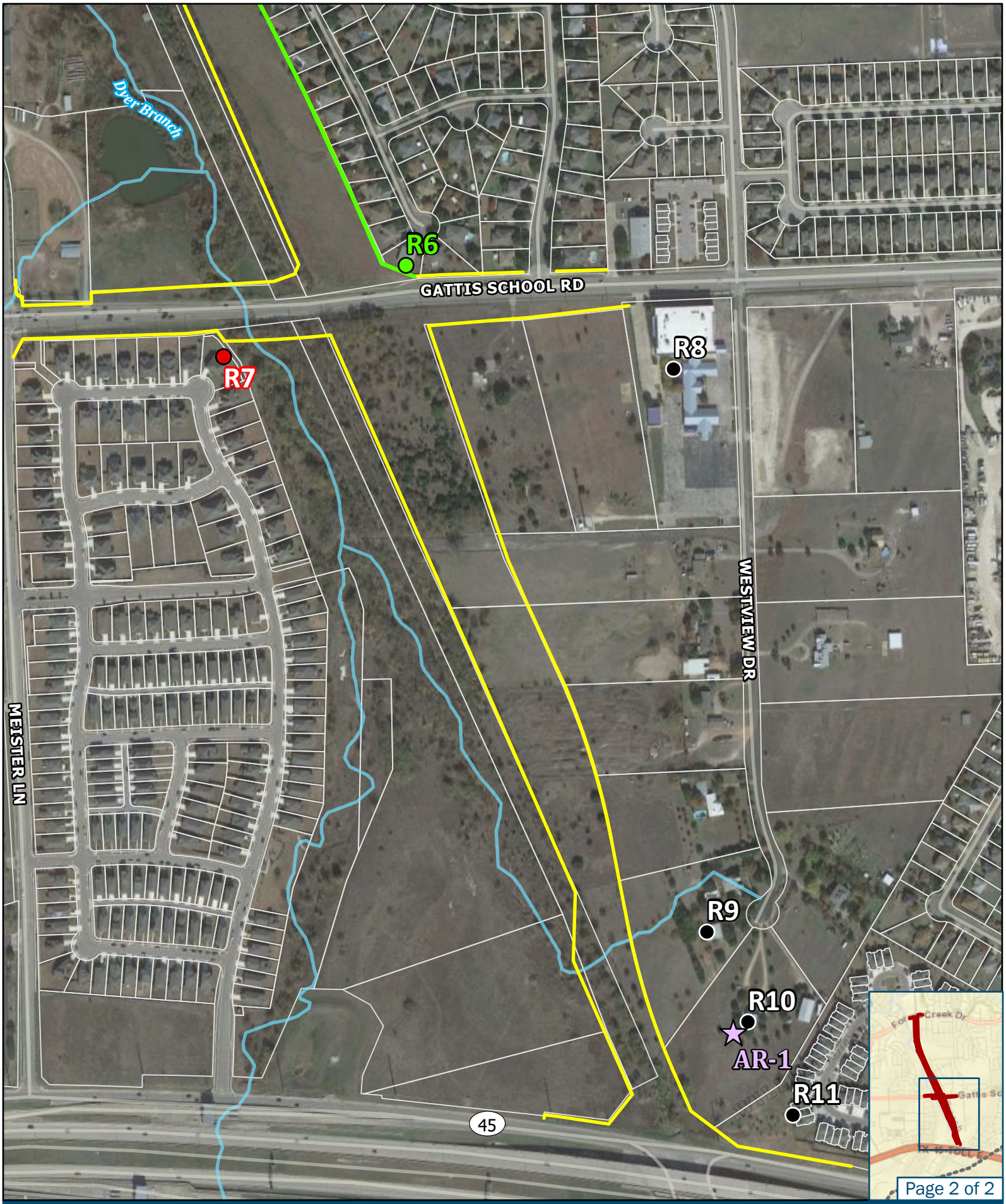
Kenney Fort Blvd (Segments 2 & 3)
From Forest Creek Dr to SH 45
CSJ: 0914-05-195
Williamson County

- Proposed Noise Barrier
- Benefitted Receiver
- Impacted Receiver
- Non-Impacted Receiver
- Ambient Measurement Location
- Project ROW
- Parcel Boundary
- Creek or Stream (NHD)

NORTH

Feet
0 200 400 800

Basemap: Google Imagery (2019)



Representative Receivers

Kenney Fort Blvd (Segments 2 & 3)
From Forest Creek Dr to SH 45
CSJ: 0914-05-195
Williamson County

- Proposed Noise Barrier
- Benefitted Receiver
- Impacted Receiver
- Non-Impacted Receiver
- Ambient Measurement Location
- Project ROW
- Parcel Boundary
- Creek or Stream (NHD)

NORTH

Feet

0 200 400 800

Basemap: Google Imagery (2019)

APPENDIX B

TRAFFIC DATA

Texas Department of Transportation

MEMO

June 22, 2020

To: Harold L. Ferguson, Jr., P.E., District Engineer
Attention: Marisabel Ramthun, P.E., Director of TPD

Through: William E. Knowles, P.E.
Traffic Analysis Section Director, TPP

From: Tammye A. Fontenot
Planner, TPP

Subject: Traffic Data
CSJ: 0914-05-195
Kenney Fort Boulevard
From: Forest Creek
To: SH 45

Williamson County

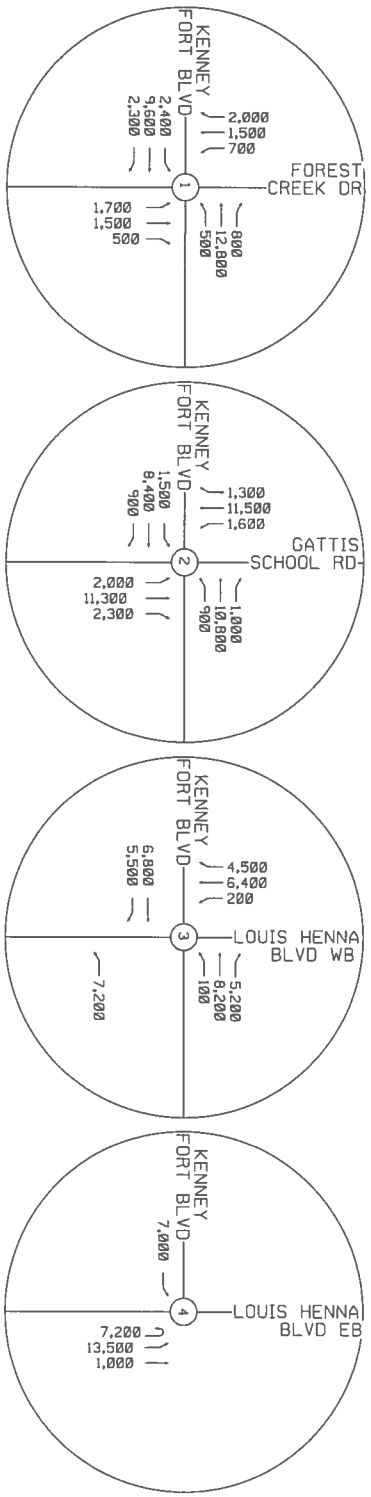
Attached are consultant provided diagrams depicting forecasted 2020 and 2040 average daily traffic volumes and turning movements along Kenney Fort Blvd. for Build Conditions. Also attached is a tabulation showing traffic analysis for highway design for the 2020 to 2040 twenty-year period for the described limits of the route. Included is a tabulation showing data for use in air and noise analysis.

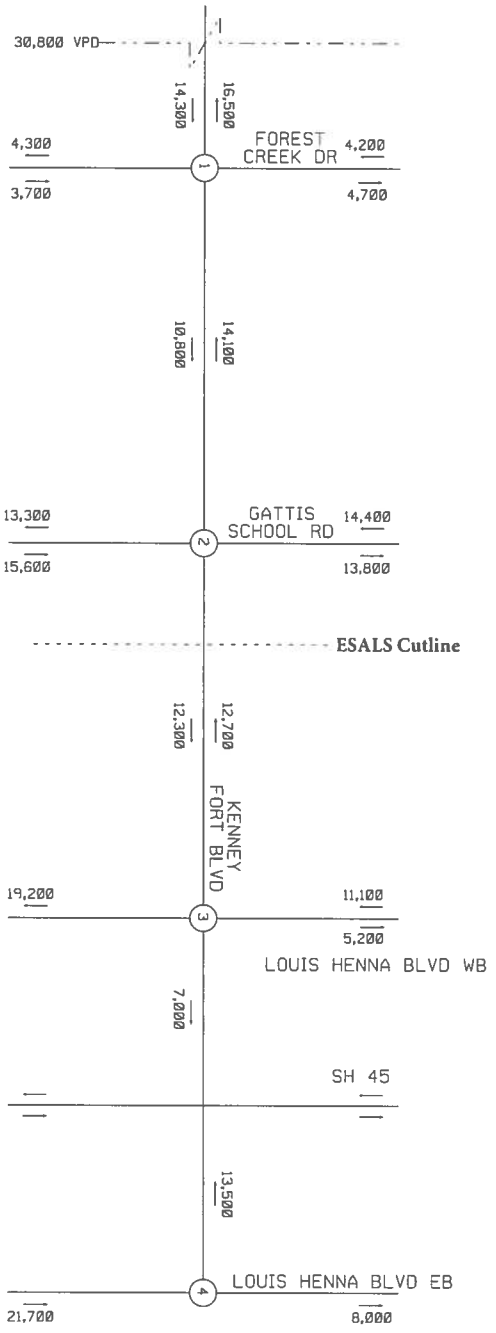
Please refer to your request of February 6, 2020.

If you have any questions or need additional information, please contact Tammye Fontenot at (512) 486-5108.

Attachments

CC: Troy Olney, Environmental Specialist, Austin District
Design Division





NOT TO SCALE

LEGEND
1,000 - FORECASTED 2020 ADT

HDR
Firm Registration No. F-754
504 Lavaca Street, Suite 900
Austin, Texas 78701

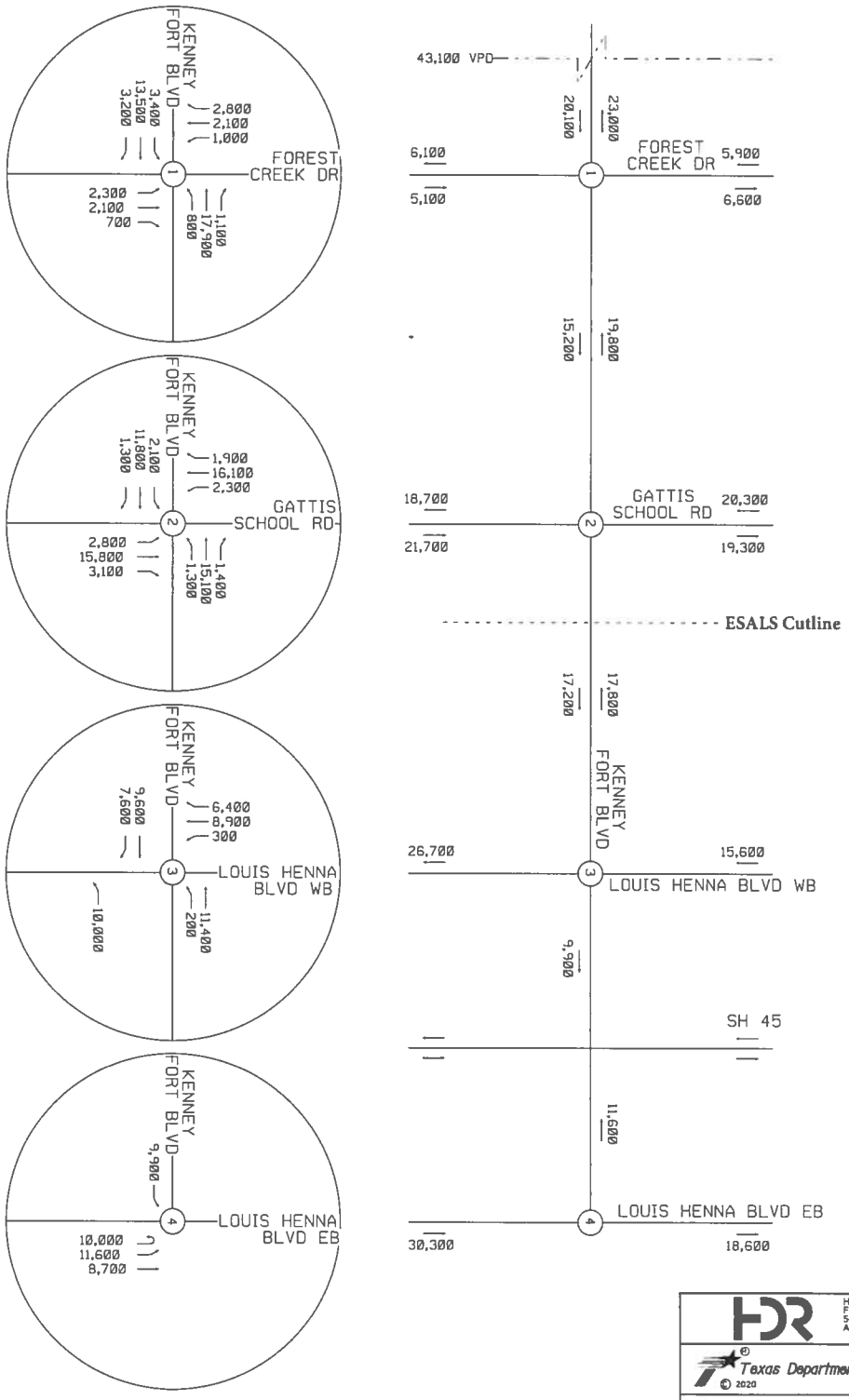
Texas Department of Transportation
© 2020

KENNEY FORT BOULEVARD (SEGMENTS 2 & 3)

FORECASTED
2020 ADT VOLUMES

SHEET 1 OF 1

FED RD DIV NO	STATE PROJECT NO		HIGHWAY NO
STATE	DISTRICT	COUNTY	SHEET NO
TEXAS	AUS	WILLIAMSON	
CONTROL	SECTION	JOB	



HDR
Firm Registration No. F-754
504 Lavaca Street, Suite 900
Austin, Texas 78701

Texas Department of Transportation
© 2020

KENNEY FORT BOULEVARD (SEGMENTS 2 & 3)

FORECASTED
2040 ADT VOLUMES

SHEET 1 OF 1

FED RD DIV NO	STATE PROJECT NO		HIGHWAY NO.
STATE	DISTRICT	COUNTY	SHEET NO
TEXAS	AUS	WILLIAMSON	
CONTROL	SECTION	JOB	

LEGEND
1,000 - FORECASTED 2040 ADT

NOT TO SCALE

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

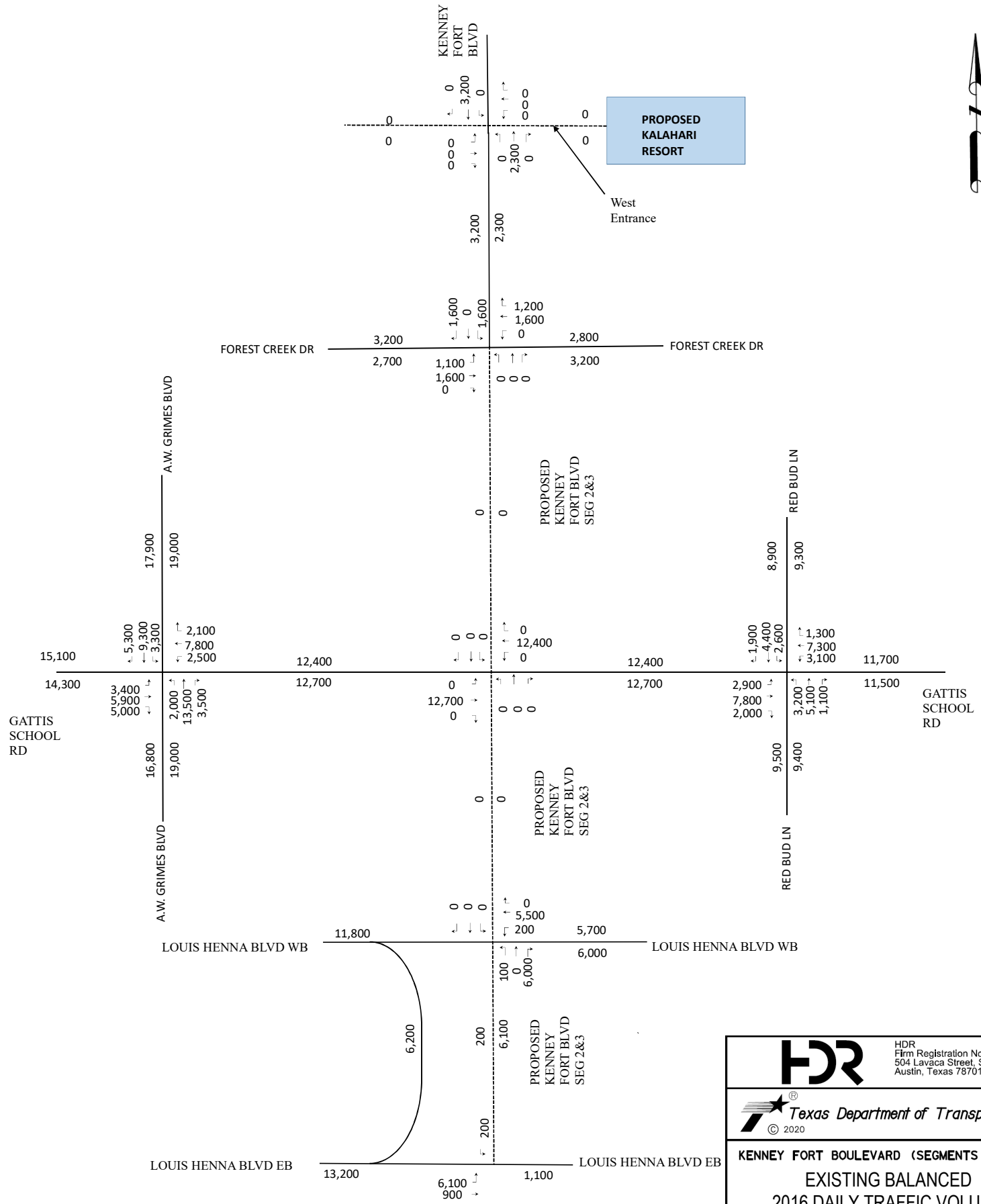
Austin District **June 18, 2020**

Description of Location	Average Daily Traffic 2020	Average Daily Traffic 2040	Base Year Dir Dist %	Base Year K Factor	Base Year Percent Trucks ADT	Base Year Percent Trucks DHV	ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040) Flexible Pavement	S N	Rigid Pavement	SLAB
Kenney Fort Blvd.												
From Forest Creek To SH 45	25,000	35,000	54 - 46	10.2	2.8	2.1	11,000	20	1,640,000	3	1,693,000	8"
Williamson County												

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year % of ADT	Base Year % of DHV
Light Duty	97.2	97.9
Medium Duty	2.3	1.7
Heavy Duty	0.5	0.4

NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES
William Erick Knowles, P.E
Serial Number 84704



HDR
Firm Registration No. F-754
504 Lavaca Street, Suite 900
Austin, Texas 78701

Texas Department of Transportation
© 2020

KENNEY FORT BOULEVARD (SEGMENTS 2 & 3)

EXISTING BALANCED 2016 DAILY TRAFFIC VOLUME

SHEET 1 OF 1

FED. RD. DIV. NO.	STATE PROJECT NO.		HIGHWAY NO.
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	AUS	WILLIAMSON	
CONTROL	SECTION	JOB	

APPENDIX C

AMBIENT NOISE FIELD DATA SHEETS

FIELD NOISE MEASUREMENT DATA

Site ID: AR-1 R066481 11 Westview Dr Date: 11/20/18
Address or Location: Westview Additions Observer: AJB / MLG

ID

Temperature: 57° F Relative Humidity: 39 %
Wind speed (sustained): 12.7 mph Wind speed (gusts): 16.1 mph Wind direction: NNE
Sky: **Overcast** **Part Cldy** **Clear** **Sunny** **Fog** **Rain** **Other:**

Weather

Instrument: Larson Davis SoundTrack LxT2 Serial #: 0002940
Calibrator: Larson Davis CAL 150 0.22 Serial #: 4794

Count #1: Time 4PM Leq 58.6 dB Count #2: Time 4:17PM Leq 58.2

Comments: AMBIENT TRAFFIC NOISE FROM SH 45 to South, light aircraft

Acoustic Measurements

Primary Noise Source(s): **Traffic** **Aircraft** **Rail** **Industrial** **Other:**
Roadway Name:

Count #1: Count Duration ____min Traffic Speed: ____mph

Autos	Medium Trucks	Large Trucks

NEW LOCATION

Count #2: Count Duration ____min Traffic Speed: ____mph

Autos	Medium Trucks	Large Trucks

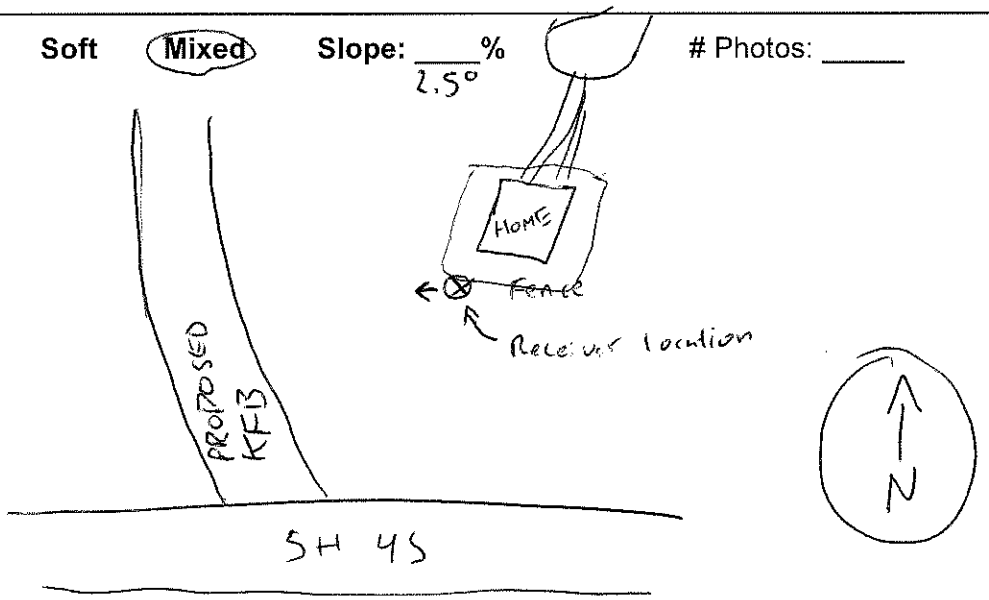
Other Noise Source(s): **Traffic** **Aircraft** **Rail** **Industrial** **Birds** **Landscaping** **Barking Dogs** **Other:** light chirping

Comments:

Noise Source and Traffic Counts

Terrain: ~~Hard~~ **Soft** **Mixed** **Slope:** 2.5° % # Photos: ____

Comments/Sketch:



Site Description and Sketch

FIELD NOISE MEASUREMENT DATA

ID

Site ID: AR-2 Date: 11/21/2018

Address or Location: Rolling Ridge subdivision Observer: AJB

Weather

Temperature: 39° F Relative Humidity: 91 %

Wind speed (sustained): 8.1 mph Wind speed (gusts): _____ mph Wind direction: NE

Sky: **Overcast** **Part Cldy** **Clear** **Sunny** **Fog** **Rain** **Other:** _____

Acoustic Measurements

Instrument: Larson Davis SoundTrack LxT2 Serial #: 0002940

Calibrator: Larson Davis CAL 150 0.35 Serial #: 4794

Count #1:	Time	Leq	Count #2:	Time	Leq
	9:20a	46.2 db(A)		9:38a	45.9 db(A)

Comments: Bird chirping, light aircraft, Dogs barking in distance

Noise Source and Traffic Counts

Primary Noise Source(s): **Traffic** **Aircraft** **Rail** **Industrial** **Other:** Birds

Roadway Name: _____

Count #1: Count Duration _____ min Traffic Speed: _____ mph

Autos	Medium Trucks	Large Trucks

Count #2: Count Duration _____ min Traffic Speed: _____ mph

Autos	Medium Trucks	Large Trucks

N/A NEW LOCATION

Other Noise Source(s): **Traffic** **Aircraft** **Rail** **Industrial** **Birds** **Landscaping** **Barking Dogs** **Other:** _____

Comments: _____

Site Description and Sketch

Terrain: **Hard** **Soft** **Mixed** **Slope:** ____ % # Photos: _____

Comments/Sketch: