I-270 Corridor Improvements

TRAFFIC NOISE TECHNICAL REPORT

NEPA Environmental Assessment

CDOT Project Number STU 2706-043

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LIST OF ABBREVIATIONS AND ACRONYMS

CDOT	Colorado Department of Transportation
CFR	Code of Federal Regulations
dB	decibels
dBA	A-weighted decibels
E	east
EB	eastbound
EL	express lane
FHWA	Federal Highway Administration
ft^2	square feet
GP	general purpose
Guidance	FHWA's Highway Traffic Noise: Analysis and Abatement Guidance
I-	Interstate-
ID	identification
Jacobs	Jacobs Engineering Group Inc.
Leq	one-hour equivalent sound level
mph	miles per hour
NAC	Noise Abatement Criterion
NAAG	Noise Analysis and Abatement Guidelines
NB	northbound
NEPA	National Environmental Policy Act
ROW	right-of-way
SH	State Highway
SB	southbound
TNM	FHWA's Traffic Noise Model
US-36	U.S. Route 36
WB	westbound

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1.0 EXECUTIVE SUMMARY

This traffic noise technical report has been prepared in support of the Interstate 270 (I-270) Corridor Improvements project. An overview of this project's traffic noise analysis and abatement evaluation is shown in Table 1.

Table 1 Project Overview

Project Location	This project is on I-270 and is located in Commerce City, unincorporated Adams County, and the City and County of Denver, Colorado (see Figure 1).
Type I Status Explanation	This project is Type I because it would include widening I-270 between Interstate 25 (I-25) and Interstate 70 (I-70) from two to three lanes in each direction.

Noise Level and Impact Overview	• Existing condition (2016) modeled noise levels range from 50.9 to 76.9 A-weighted decibels (dBA) at 117 receivers,[1] which represent 129 receptors.
	• Design year (2040) modeled noise levels for the No Action Alternative range from 51.8 dBA to 78.0 dBA at 117 receivers, which represent 129 receptors.
	• Design year (2040) modeled noise levels for the Proposed Action General Purpose Lane Operating Option range from 52.9 dBA to 77.9 dBA at 117 receivers, which represent 129 receptors. The Proposed Action General Purpose Lane Operating Option is expected to impact the following receivers and receptors:
	  • 20 Activity Category B receivers/20 receptors
	  • 12 Activity Category C receivers/12 receptors
	  • 0 Activity Category E receivers/0 receptors
	• Design year (2040) modeled noise levels for the Proposed Action Express Lane Operating Option range from 52.9 dBA to 77.9 dBA at 117 receivers, which represent 129 receptors. The Proposed Action Express Lane Operating Option is expected to impact the following receivers and receptors:
	  • 20 Activity Category B receivers/20 receptors
	  • 12 Activity Category C receivers/12 receptors
	  • 0 Activity Category E receivers/0 receptors

Noise Abatement Considerations and Commitments Overview	Two noise barriers were evaluated, as shown on Figures 6A and 6B. Noise barriers were found to be feasible, but not reasonable, as shown in Table 9. Therefore, noise barriers are not recommended.
Information for Local Officials	This project's Noise Study Zone includes land that is unpermitted and undeveloped (i.e., Activity Category G). Therefore, Part 772.17 of Title 23 of the *Code of Federal Regulations* (23 CFR 772.17) is applicable and information needs to be provided to local officials, as described in Chapter 9.

[1] A receiver is a modeled point that represents one or more receptors. Receptor types are listed in Table 3, in the column titled, "Activity Description." A receiver that represents more than one receptor must represent receptors of the same Activity Category.

2.0 PROJECT INTRODUCTION

Colorado Department of Transportation (CDOT), in cooperation with the Federal Highway Administration (FHWA), is preparing an Environmental Assessment (EA) for this project. The improvements, which are described in Table 2 and hereafter called the Proposed Action (General Purpose Lane and Express Lane operating options), constitute a Type I project because there would be an addition of a through-traffic lane in each direction on I-270 between I-25 and I-70. Auxiliary lanes also would be added between interchanges to help accelerating and decelerating traffic. A 12-foot auxiliary lane would extend in both directions of I-270 for approximately 1.8 miles between the I-270/York Street and I-270/Vasquez Boulevard interchanges.

Because the project is Type I and because there is at least one Activity Category A, B, C, D, and/or E receptor within the Noise Study Zone, a noise analysis is needed to determine if receptors will be impacted as a result of building the project. Jacobs Engineering Group Inc. (Jacobs), acting on behalf of CDOT, conducted a noise analysis for the project and prepared this report using the CDOT noise report template. Table 2 includes information about this project and provides context for this traffic noise analysis.

Table 2 Project Background

Project Location	Commerce City, unincorporated Adams County, and the City and County of Denver, Colorado (See Figure 1)
Affected Roadways	• I-270 mainlines and ramps • I-76 interchange • York Street • Vasquez Boulevard interchange • Quebec Street interchange
Project Purpose	The purpose of the I-270 Corridor Improvements project is to implement transportation solutions that modernize the I-270 corridor to accommodate transportation demands.
Project Need	The project is needed to: • Improve safety by reducing the rate of vehicle crashes • Improve travel time reliability and reduce delays • Update obsolete and deficient bridges and highway infrastructure • Improve truck freight movement efficiency
Proposed Action Description	This project would include: • Adding one lane in each direction of travel with full-width shoulders. • Operation of a new lane as either a general-purpose lane for a total of three general-purpose lanes or as an express lane resulting in two general-purpose lanes and one express lane. • Auxiliary lanes in between interchanges to help accelerating and decelerating traffic. A 12-foot auxiliary lane would extend in both directions of I-270 for approximately 1.8 miles between the I-270/York Street and I-270/Vasquez Boulevard interchanges. • In the eastbound direction of I-270 at its interchange with I-76, a new collector road is formed that consolidates the ramps from both directions of I-76 and the eastbound on-ramp at York Street. The collector road is barrier separated from I-76 and transitions into an auxiliary lane.

Table 2 Project Background

	• Paving grassy medians to accommodate widening to the inside. • Acquisition of right-of-way (ROW) and easements for some outside widening. • Replacing the following I-270 bridge structures over: South Platte River, Burlington Ditch/O'Brien Canal, Brighton Boulevard/Burlington Northern Santa Fe (BNSF) Railway Company and Union Pacific Railroad (UPRR), East 60th Avenue/BNSF, and 56th Avenue. Other bridge structures to be replaced include: York Street over I-270 and Vasquez Boulevard over Sandcreek Drive South. These bridges are being replaced since most are structurally deficient and also need to accommodate additional width and capacity for the Proposed Action. • Replacement of the full cloverleaf interchange at I-270/Vasquez Boulevard with a partial cloverleaf to improve safety and connectivity. Removing the I-270 westbound (WB) to Vasquez Boulevard southbound (SB) and the I-270 eastbound (EB) to Vasquez Boulevard northbound (NB) loop ramps. • Improvements along York Street and 56th Avenue.
No Action Alternative Description	The No Action Alternative includes projects that have been programmed and are included in the No Action Traffic Model. The No Action projects within the noise study zone include: • Widening of York Street • Miscellaneous safety and maintenance projects along I-270 (guardrail updates, bridge repairs, mill/overlays)
Prior National Environmental Policy Act (NEPA) Approvals	Not applicable. This project is a new action.

3.0 BACKGROUND

This noise analysis was done as required by 23 CFR 772 in accordance with CDOT's *Noise Analysis and Abatement Guidelines* (NAAG) (CDOT, 2015 and 2020) and FHWA's *Highway Traffic Noise: Analysis and Abatement Guidance* (Guidance) (FHWA, 2011). The analysis determines whether 2040 traffic noise levels from the Proposed Action (General Purpose Lane and Express Lane operating options) will exceed applicable impact thresholds at properties (i.e., receptors) within the Proposed Action Noise Study Zone (this zone is described in Section 4.1). Traffic noise abatement is evaluated for any such impacted receptors. The analysis was conducted based on conceptual design files provided by CDOT and updated by Jacobs. The files were received by the noise analyst in October 2020 and were based on a 15 percent level of conceptual design which is the level of design also assumed in the EA.

This noise analysis included the following tasks:

- Conducting field measurements of existing condition sound levels (see Section 4.3)
- Validating an existing condition noise model using field measurement results (see Section 4.4)
- Modeling existing condition noise levels for existing roadways (see Chapter 5)

- Modeling Proposed Action (General Purpose Lane and Express Lane operating options) and design year No Action Alternative noise levels for design roadways (see Chapter 5)
- Evaluating noise abatement (see Chapter 6)
- Modeling noise contour lines for unpermitted, undeveloped land (see Chapter 9)

3.1 Characteristics of Noise

Fundamental information about noise, such as terminology, how sound travels, and sound intensity, is included in Appendix B of the CDOT NAAG. It is incorporated by reference to supplement this report.

3.2 Applicable Regulations, Guidelines, and Tools

The following regulation, guidelines, and tools were used to complete this noise analysis:

- ***23 CFR Part 772 (Procedures for Abatement of Highway Traffic Noise and Construction Noise)*** (23 CFR §772, 2010): Federal highway noise standard that must be followed in analyzing and abating highway traffic noise. This regulation required states to adopt state-specific guidelines, which included adopting specific parameters such as the noise reduction design goal.
- ***CDOT NAAG*** (CDOT, 2015 and 2020): Fulfilled Federal requirement to adopt state-specific guidelines. Provides Colorado's procedural and technical requirements for analyzing highway project traffic noise and evaluating noise abatement. Most of the analysis was conducted based on the 2020 NAAG. However, the 2015 NAAG was used for field noise measurements because the 2020 NAAG was approved after this work was conducted.
- ***FHWA Guidance*** (FHWA, 2011): Provides FHWA guidance for applying 23 CFR Part 772 in the analysis and abatement of highway traffic noise.
- ***Noise Measurement Handbook*** (FHWA, 2018): Includes procedures for measuring highway noise.
- ***FHWA Traffic Noise Model (TNM) Version 2.5*** (FHWA, February 2004): Model used to determine existing condition and design year noise levels.

3.3 CDOT Noise Abatement Criteria and Land Use Activity Categories

A traffic noise impact occurs if either of the following conditions is met:

- Predicted design year traffic noise level approaches (i.e., equals) or exceeds CDOT's Noise Abatement Criteria (NAC) at any receptor.
- Predicted design year traffic noise level substantially exceeds the existing condition highway traffic noise level at any receptor. "Substantial" is defined as a noise increase of 10 decibels (dB) or more between the existing condition and design year noise levels.

Table 3 shows CDOT's NAC. The CDOT NAAG requires that the one-hour equivalent sound level (Leq) be used in the analysis.

The NAC for Activity Category D applies to interior areas of frequent human use. All other NACs apply to exterior areas of frequent human use. Examples of exterior areas include yards for Activity Category B, park activity areas for Activity Category C, and exterior restaurant dining areas for Activity Category E.

Undeveloped lands for which development has been permitted before the Date of Public Knowledge must be treated as though the development has already been constructed. CDOT considers a proposed development to be permitted when a formal building permit has been issued to the developer.

Table 3 CDOT Noise Abatement Criteria

Activity Category	Activity Leq (dBA)[1, 2]	Evaluation Location	Activity Description
A	56.0	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]	66.0	Exterior	Residential
C[3]	66.0	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	51.0	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]	71.0	Exterior	Hotels, motels, time-share resorts[4], offices, restaurants/bars, and other developed lands, properties, or activities not included in A-D or F.
F	Not Applicable	Not Applicable	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, ship yards, utilities (water resources, water treatment, electrical), warehousing, malls[5], stores[5], shops[5], and Government managed land.[4,6]
G	Not Applicable	Not Applicable	Undeveloped lands that are not permitted.

1 Table 1 of 23 CFR 772 allows state highways agencies to use either Leq(h) or L10(h) on a project but not both. CDOT uses Leq(h), which is an Hourly A-weighted sound level in dBA.

2 NACs are for impact determination only. They are not design standards for noise abatement measures.

3 Includes undeveloped lands permitted for this activity category.

4 This activity description is not listed in Table 1 of 23 CFR 772.

5 This activity description is not listed in Table 1 of 23 CFR 772 but is in FHWA's Frequently Asked Question D7.

6 Areas of frequent human use within the Government (Federal, State, and County)-managed land will be treated as the appropriate land use (e.g., a campground would be Activity Category C, as described in Section 3.5.4 of the CDOT NAAG).

4.0 NOISE ANALYSIS METHODS

The noise analysis includes identifying the Noise Study Zone, identifying the land uses within the Noise Study Zone, taking noise measurements within the Noise Study Zone, validating the existing condition noise model, and inputting several parameters into the noise model. These steps are described in this chapter.

4.1 Noise Study Zone Identification

The Noise Study Zone for this project extends 500 feet in all directions from the proposed edge of travel lanes of freeways or expressways and 300 feet for other types of roads throughout the project extent, as shown on Figures 2A and 2B.

4.2 Land Use Identification

Table 4 identifies the land use categories, receivers, and receptors included in the noise analysis. Figures 2A and 2B identify land uses in the Noise Study Zone.

Table 4 Land Use Considerations

Receiver Activity Category Summary (see Table B-2, Appendix B)	Receivers with the following Activity Categories were modeled in the existing condition and design year scenarios: • Activity Category B: 98 receivers representing 98 receptors • Activity Category C: 17 receivers representing 23 receptors • Activity Category E: 2 receivers representing 8 receptors
Other Considerations	• The Noise Study Zone does not contain any permitted receptors that have not been built. • The Noise Study Zone contains Activity Category F activities and Activity Category G land. Activity Category F activities and Activity Category G land are not considered noise-sensitive, so receivers are not required for these locations. However, contour lines must be provided for Activity Category G lands. These are shown on Figures 7A through 7C. • The Noise Study Zone has 16 Section 4(f) sites with frequent human use, which were modeled as receivers R47 – R51 and R107 – R117. • The Noise Study Zone has 12 Section 106 sites, which include ten historic linear features (i.e. ditches, railroads, roadways) and two architectural structures that have no outdoor uses. Given the nature of these resources, noise information was not needed for Section 106 purposes.

4.3 Field Noise Measurements

Field noise measurements performed for this analysis are summarized in Tables 5 and 6. Noise measurements were performed at different locations, as shown on Figures 2A and 2B, to acquire data for validation of the existing condition model. Associated traffic counts and speeds are listed in Table A-1 in Appendix A. Field noise measurement data sheets are in Appendix A.

Table 5 Field Noise Measurement Summary

Measurement Location ID	Location	Date	Time (a.m. or p.m.)		Length (minutes)
			Start	Stop	
NML 1	Behind 7261 Washington Street	9/17/2020	3:37 p.m.	3:47 p.m.	10
NML 2	2161 E 68th Avenue	9/17/2020	10:32 a.m.	10:42 a.m.	10
NML 3	6850 Race Street	9/17/2020	11:30 a.m.	11:40 a.m.	10
NML 4	6702 York Street	9/17/2020	1:07 p.m.	1:17 p.m.	10
NML 5	Trailhead at Sand Creek Greenway (Spur at O'Brian Canal)	9/17/2020	12:19 p.m.	12:29 p.m.	10
NML 6	Dahlia Trailhead at Sand Creek Greenway	9/17/2020	2:37 p.m.	2:47 p.m.	10
NML 7	Trail Pavilion at Sand Creek Greenway	9/17/2020	2:07 p.m.	2:17 p.m.	10
NML 8	5250 Oneida Street	9/16/2020	12:08 p.m.	12:18 p.m.	10
NML 9	Trail at Northfield Pond Park	9/16/2020	11:20 a.m.	11:30 a.m.	10

Notes:

Noise measurements were collected for 10-minutes instead of 15-minutes because field work was conducted under the 2015 NAAG, prior to the 2020 NAAG being released on October 9, 2020.

E = east

Table 6 Field Noise Measurement Details

Number of Field Measurement Locations	9
Field Measurement Locations	Traffic noise field measurement locations are shown on Figures 2A and 2B. These measurement locations were selected because they appropriately cover the limits of the project corridor and represent locations on or near noise-sensitive receptors. • NML 1 – near business (behind 7261 Washington Street) • NML 2 – residential (2161 68th Avenue) • NML 3 – residential (6850 Race Street) • NML 4 – residential (6702 York Street) • NML 5 – Trailhead at Sand Creek Greenway (Spur at O'Brian Canal) • NML 6 – Dahlia Trailhead at Sand Creek Greenway • NML 7 – Trail Pavilion at Sand Creek Greenway • NML 8 – residential (5250 Oneida Street) • NML 9 – Trail at Northfield Pond Park
Basis for Measurement Length	10-minute measurements were collected instead of 15-minute measurements because field work was conducted under the 2015 NAAG, prior to the 2020 NAAG being released on October 9, 2020.

Table 6 Field Noise Measurement Details

Method to Estimate Traffic Volume during Field Measurement	Traffic was counted simultaneously on all roadways contributing to noise at the location. Video recording was used for I-270 traffic and a clicker was used for traffic on local roadways during each noise measurement.
Method to Estimate Traffic Speed	Drove test vehicle through traffic within 30 minutes of noise measurement; traffic was still representative of when measurements were taken.
Weather Conditions Summary (See Appendix A)	Field measurements were made during weather conditions acceptable according to FHWA guidance (FHWA, 2018). Weather conditions, including wind speed, were noted during the measurements.
Sound Level Meter Used	Quest 2900 Type I Sound Level Meter
Sound Level Meter Laboratory Calibration Date	September 3, 2020
Field Calibrator Used	QC-10 Calibrator Calibrations traceable to the United States National Institute of Standards and Technology were performed in the field before each set of measurements and checked in the field after each set of measurements.
Height of Noise Measurement Above Grade	5 feet

4.4 Validation of Existing Condition Model

Existing condition noise levels were measured in the field, as described in Section 4.3, and compared to computer noise level predictions that were based on traffic data measured in the field. This was done to verify the accuracy of the existing condition noise model. This process is called validation of the existing condition noise model. The model may be described as being an initial existing condition model during the validation process because it is not required to include any receivers except those representing the noise measurement locations.

If predicted and measured noise levels are within ±3.0 dB of each other, the existing condition noise model is within the accepted level of accuracy and is considered to have been validated. Measured noise levels, corresponding modeled noise levels, and the differences between the two are presented in Table 7.

Table 7 Existing Condition Model Validation Summary

Noise Measurement Location ID	Location (see Figures 2A and 2B)	Measured Leq (dBA)	Modeled Leq (dBA)	Difference (dB)
NML 1	Behind 7261 Washington Street	58.7	60.7	+2.0
NML 2	2161 E 68th Avenue	58.9	60.7	+1.8
NML 3	6850 Race Street	56.1	58.8	+2.7
NML 4	6702 York Street	63.4	66.3	+2.9
NML 5	Trailhead at Sand Creek Greenway (Spur at O'Brian Canal)	68.5	69.5	+1.0

Table 7 Existing Condition Model Validation Summary

Noise Measurement Location ID	Location (see Figures 2A and 2B)	Measured Leq (dBA)	Modeled Leq (dBA)	Difference (dB)
NML 6	Dahlia Trailhead at Sand Creek Greenway	66.3	66.3	0
NML 7	Trail Pavilion at Sand Creek Greenway	63.6	61.4	-2.2
NML 8	5250 Oneida Street	66.1	68.6	+2.5
NML 9	Trail at Northfield Pond Park	62.4	64.9	+2.5

Differences between measured and predicted levels are all within the allowable ±3.0 dB tolerance. Therefore, the existing condition noise model is considered to be validated for this project.

4.5 TNM Model Inputs

The noise model software being used on this project was TNM Version 2.5. It was used to analyze existing condition (2016) and design year (2040) noise levels. As part of the analysis, the model calculated noise levels at receivers that are in the Noise Study Zone. Each receiver represented one or more receptors. Modeling results represent predicted traffic conditions during worst-hour noise periods. Because estimated traffic volumes from the existing conditions and design year project traffic analysis for I-25, I-76, and I-70 exceeded the volumes listed in Table 3 of the CDOT NAAG, Table 3 volumes were used. Table 8 describes model inputs and methods.

Table 8 TNM Model Inputs and Methods

Noise-Sensitive Receptors	Noise-sensitive receptors are defined according to Table 3. Receivers (modeled points) have been selected to represent these receptors within the Noise Study Zone.
Receivers	Receivers are listed in Table B-2 in Appendix B and shown on Figures 4A through 4J and 5A through 5J.
Modeled Roadways	The following roadways were modeled: • I-25 NB • I-25 off- and on-ramps • I-270 EB and WB • I-270 on- and off-ramps • I-76 EB and WB • I-76 on- and off-ramps • York Street • York Street on- and off ramps • SH 6/Vasquez NB and SB • SH 6/Vasquez on- and off-ramps • 56th Avenue • Sandcreek Drive • SH 35/Quebec Street NB and SB • SH 35/Quebec Street on- and off-ramps • I-70 EB and WB

Table 8 TNM Model Inputs and Methods

	• I-270 EB off-ramp to SH 6/Vasquez Boulevard NB (existing condition; not in Proposed Action)
	• I-270 WB off-ramp to SH 6/Vasquez Boulevard SB (existing condition; not in Proposed Action)
	• SH 6/Vasquez Boulevard NB to I-270 EB on-ramp (Proposed Action; not in existing condition)
	For the Proposed Action, the analysis included:
	• roads that would be changed by the project:
	  • I-25 ramp
	  • I-270 (mainlines and ramps)
	  • I-76 ramps
	  • York Street (mainlines and ramps)
	  • SH6/Vasquez ramps
	• roads that would be important local traffic noise sources:
	  • I-25 (mainlines and ramps)
	  • I-76 (mainlines and ramps)
	  • SH 6/Vasquez (mainlines and ramps)
	  • 56th Avenue
	  • Sandcreek Drive
	  • SH 35/Quebec Street (mainlines and ramps)
	  • I-70 mainlines

Differences in How Roadways Were Modeled Between Alternatives	I-270 was modeled as two general purpose lanes in each direction of travel for existing and No Action conditions. For the Proposed Action, I-270 was modeled as three lanes in each direction of travel with two operating options: three general purpose lanes (General Purpose Lane Operating Option) and two general purpose lanes with one express lane (Express Lane Operating Option). Auxiliary lanes were also modeled for the Proposed Action General Purpose Lane and Express Lane operating options. Under the Proposed Action, the I-270 WB off-ramp to Vasquez Boulevard SB (loop ramp) would be removed as well as the I-270 EB off-ramp to Vasquez Boulevard NB (loop ramp). The Vasquez Boulevard NB to I-270 EB on-ramp was modeled for the Proposed Action, but not under existing and No Action conditions.
TNM Objects and Elevations	The following objects were modeled: shoulders modeled as roadways (which acts as ground zones), terrain lines, buildings modeled as noise barriers, median and shoulder jersey barriers modeled as walls, and pavement and water features modeled as ground zones. These are shown on Figures 3A through 3G.
Existing Noise Barriers	The Noise Study Zone includes one existing noise barrier (CDOT Noise Barrier ID 5311). The existing noise barrier is 840 feet in length and 12 feet in height. The barrier was constructed in 2001 for a residential development. The primary construction material is block and the surface texture is reflective. It is located along the ROW for I-270 EB west of York Street and north of 68th Avenue adjacent to the residential development. The existing noise barrier would not be impacted by the project.

Table 8 TNM Model Inputs and Methods

Modeled Pavement Type	Average
Default Ground Type	Lawn
Traffic Data (See Appendix B, Table B-1)	• Roadway coordinates generated from MicroStation files and aerial photographs (dated 2018 to 2020) • Traffic volumes for existing, No Action, and Proposed Action are from several sources (see fourth bullet below). These include: – Project-specific: I-270 Traffic Technical Report 2021 (2016 [existing] and 2040 [design]) – Non-project specific: CDOT OTIS 2020 (2019 [existing] and 2040 [design]) – Maximum traffic volumes: CDOT NAAG 2020 • Vehicle mixes for existing, No Action, and Proposed Action are from: – I-270 Traffic Technical Report 2021 (2016 [existing] and 2040 [design]) – CDOT OTIS 2020 (2019 [existing] and 2040 [design]) • Basis for identifying traffic noise worst-hour: Project specific traffic volumes along I-270 and local roadways (York Street, 56th Avenue, and Sandcreek Drive) were modeled because they are below the maximum traffic volumes for worst-noise hour as defined in CDOT NAAG. The PM peak hour traffic volumes are highest compared to AM peak hour and were modeled to represent the worst-noise hour. Project specific traffic volumes were not available for I-25, I-76, Vasquez Boulevard, Quebec Street, and I-70. Therefore, traffic data was obtained from CDOT OTIS for those roadways. Peak hour traffic volumes for I-25, I-76, and I-70 would exceed the maximum traffic volumes for worst-noise hour as defined in CDOT NAAG Table 3. Therefore, based on a freeway facility type, the maximum traffic volumes modeled were 2,000 and 1,600 vehicles/lane/hour with posted speed limits of 55 and 75 miles per hour (mph), respectively. • During preparation of the EA, the Denver Regional Council of Governments released Focus 2.3 Transportation Demand Model (TDM) with 2050 as the horizon year. A sensitivity analysis was conducted to determine whether switching to the new Focus 2.3 2050 TDM would change conclusions made during the EA based on the Focus 2.1 2040 TDM. Section 5.3 briefly discusses the results of the noise sensitivity analysis to determine whether any increase in traffic from Focus 2.3 2050 traffic volumes could potentially change the noise analysis results based on the Focus 2.1 2040 traffic volumes.

5.0 TNM RESULTS

Modeled noise levels for the existing condition and design year scenarios are shown in Table B-2 in Appendix B. This data was used to identify which, if any, receptors would be impacted as a result of the Proposed Action.

5.1 Existing Conditions Summary

Under existing conditions (2016), modeled noise levels at 117 receivers range from 50.9 to 76.9 dBA. Figures 4A through 4J show the locations of all modeled receivers. Table B-2 in Appendix B shows the modeled noise level at each receiver. Existing conditions are not described as having noise impacts. If the project were not built, the project would not be responsible to mitigate noise via an abatement measure regardless of if existing condition noise levels exceeded NACs.

5.2 No Action Alternative Summary

Under the No Action Alternative (2040), modeled noise levels at 117 receivers range from 51.8 to 78.0 dBA. Figures 4A through 4J show the locations of all modeled receivers. Table B-2 in Appendix B shows the modeled noise level at each receiver. No Action Alternatives are not described as having noise impacts. If the project were not built, the project would not be responsible to mitigate noise via an abatement measure regardless of if No Action Alternative noise levels exceeded NACs.

5.3 Proposed Action Summary

Under the Proposed Action (2040) General Purpose Lane Operating Option, modeled noise levels at 117 receivers range from 52.9 to 77.9 dBA. Under the Proposed Action (2040) Express Lane Operating Option, modeled noise levels at 117 receivers range from 52.9 to 77.9 dBA. Under both operating options, 32 receivers, representing 32 receptors, would exceed the NAC. No receivers would experience a substantial noise increase of at least 10 db. Therefore, a total of 32 receivers, representing 32 receptors, would be impacted during the 2040 worst-hour noise period (see Figures 5A through 5J). Table B-2 in Appendix B shows the modeled noise level at each receiver.

As mentioned in Table 8, forecasted peak-hour volumes and truck percentages for years 2040 and 2050 were reviewed to gauge the potential change in design year noise levels. The sensitivity analysis found that 2050 traffic volumes are not expected to notably change the findings of this noise analysis. While use of the 2050 traffic volumes and vehicle mix in the noise model could result in additional impacted receptors as compared to modeling traffic noise with the 2040 traffic data, the sensitivity analysis found that use of the 2050 traffic data would not result in an audible increase (i.e., > 3 dBA) in traffic noise levels at any receptor location, as compared to predicted noise levels using the 2040 traffic data. Additionally, use of the 2050 traffic data would not change the conclusions of the noise analysis or determinations regarding potential noise abatement as compared to the noise analysis using the 2040 traffic data. Appendix B of the *Traffic Technical Report* (Appendix A2 of the EA) provides additional details of the sensitivity analysis.

6.0 NOISE ABATEMENT EVALUATION

As described in Chapter 5, 32 receptors in the Noise Study Zone would be impacted by noise in 2040 under the Proposed Action (General Purpose Lane and Express Lane operating options). Therefore, abatement for the impacted receptors was evaluated in accordance with guidelines from the CDOT NAAG and FHWA's Guidelines. Although abatement was required to be evaluated, it is only recommended for inclusion in the project when determined to be both feasible and reasonable.

Abatement is feasible if it:

- Provides at least 5 dB of noise reduction for at least three impacted receptors
- Does not have any design and construction factors that are "fatal flaw" issues (e.g., safety, barrier height, topography, drainage, utilities, abatement maintenance, maintenance access to adjacent properties, and access to adjacent properties [i.e., arterial widening projects])

If abatement is not feasible, further evaluation is not needed. However, if it is feasible, reasonableness is evaluated. Abatement is reasonable if it:

- Meets the minimum noise reduction design goal of at least 7 dB for at least two benefited receptors
- The Cost Benefit ($/receptor) equals or is less than the Cost Benefit Index ($34,000/receptor)
- Has support from more than 50 percent of the potentially benefited receptors[2]

6.1 Noise Abatement Options Considered

Noise barriers (walls and, to a lesser extent, berms) are commonly used as noise abatement and must be evaluated when doing a mitigation analysis for impacted receptors, per 23 CFR 772.13(c)(1). Other mitigation measures may also be considered, including traffic management measures (e.g., traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, modified speed limits, and exclusive lane designations); alteration of horizontal and vertical alignments; and acquisition of real property or interests therein to serve as a buffer zone to preempt development that would be adversely impacted by traffic noise. However, these mitigation measures are generally not feasible and/or reasonable. For this project, noise walls were the only abatement evaluated.

6.2 Noise Abatement: Noise Insulation

The Noise Study Zone does not have any Activity Category D receptors. Therefore, noise insulation was not considered as abatement for this project.

6.3 Noise Barrier Evaluation – Proposed Action

The Proposed Action (General Purpose Lane and Express Lane operating options) has fifteen impacted areas. Of the fifteen impacted areas, noise barriers were not modeled for thirteen areas where a barrier is not able to benefit at least three impacted receptors because there are fewer than three impacted receptors behind the prospective barrier. Therefore, per CDOT NAAG, a barrier does not need to be modeled to be determined that it is not feasible.

Barrier placement for two impacted areas with three or more impacted receptors behind the prospective barrier was considered in multiple locations. The location determined to be the best performer for each set of impacted receivers was optimized, and those results are described in Table 9. Figures 6A and 6B show the best performing evaluated barrier location, as determined by iterative modeling to identify the most efficient use of materials to achieve the noise reduction goal at as many receptors as possible within reasonableness criteria. Appendix D has two

[2] Support determined through Benefited Receptor Preference Survey, which may be conducted after the NEPA process and is documented in a separate report.

CDOT Noise Abatement Determination Worksheets (CDOT Form 1209); one was completed for each impacted area with three or more impacted receptors behind the prospective barrier. Of these two evaluated noise barriers, the noise barriers would meet the feasible criteria, but not the reasonable criteria, as described in Table 9. Attempts to achieve reasonable wall designs by lowering Barrier 1 to benefit only first-row residences and shortening both Barrier 1 and Barrier 2 to benefit fewer impacted receptors were unsuccessful. Further attempts were made by realigning Barrier 1 within 5 feet of the ROW line (closer to impacted residences); realigning Barrier 2 along the proposed I-270 westbound edge of the clear zone (closer to the roadway); and designing a combination of overlapping walls for Barrier 1 along the proposed I-270 WB edge of clear zone and ROW line. All further attempts were unsuccessful at achieving both a feasible and reasonable wall design for either Barrier 1 or Barrier 2.

The modeled barrier locations and results for the GP option and EL option are the same. The only difference between the two options is the traffic volumes and the associated noise levels and insertion loss which are summarized in Table 9.

Table 9 Noise Barrier Evaluation

Barrier ID	1		2	
	GP Operating Option	EL Operating Option	GP Operating Option	EL Operating Option
Barrier Location (general)	I-270 WB adjacent to North Sandcreek Drive between Krameria Street and Magnolia Street		I-270 WB between Newport Street and Oneida Street	
Barrier Location: Distance from Proposed Edge of Roadway (feet)	38 feet at south end to 51 feet at north end		75 feet at north end to 120 feet at south end	
Barrier Location Justification	Optimal modeled location within the project ROW for the most efficient use of materials to achieve the noise reduction goal at as many receptors as possible within reasonableness criteria			
Impacted Receiver IDs	See Figures 5A through 5J		See Figures 5A through 5J	
Benefited Receiver IDs	See Appendix C, Table C-1		See Appendix C, Table C-1	
Figure #	6A and 6B		6A and 6B	
Fatal Flaw(s)?	No		No	
Reduces Noise ≥5.0 dB for ≥3 Impacted Receptors	Yes		Yes	
Reduces Noise ≥7.0 dB for ≥2 Benefited Receptors	Yes		Yes	
Optimized Barrier Height and Length (feet)[1]	16 high to 17 high x 196 long, south end 18 high x 1,702 long, north end		8 high to 14 high x 496 long	
Barrier Area[2] (square feet)	34,096		5,074	
Unit Cost	$45/ft^2		$45/ft^2	
Total Cost[3]	$1,534,320		$228,330	
No. Benefited Receptors	30		6	

Table 9 Noise Barrier Evaluation

Barrier ID	1		2	
	GP Operating Option	EL Operating Option	GP Operating Option	EL Operating Option
Total Decibels of Benefit Provided	212.2	212.5	40.2	38.8
Average Benefit (dB/receptor)	6		6	
Cost Benefit($/receptor)[3]	$51,144		$38,055	
Design Year Leq Range without Abatement (dBA)	53.6 to 71.4	53.3 to 71.2	60.7 to 72.6	60.6 to 72.3
Design Year Leq Range with Abatement (dBA)	49.7 to 63.0	49.4 to 62.6	58.8 to 66.6	58.8 to 66.2
Feasible?	Yes		Yes	
Reasonable?	No		No	
Recommended?	No		No	

1. The barrier heights and/or lengths listed in this table are rounded. Therefore, if they are used to calculate the barrier area, the resulting area may be slightly different than the reported barrier area due to round-off error.
2. The barrier areas listed in this table are rounded. Therefore, if they are used to calculate the total cost, the resulting cost may be slightly different than the reported cost due to round-off error.
3. The total cost listed in this table is rounded. Therefore, when used to calculate the cost benefit, the resulting cost benefit may be slightly different than the reported cost benefit due to round-off error.

Notes:

GP = general purpose lane
EL = express lane

7.0 STATEMENT OF LIKELIHOOD

As described in Chapter 5, based on the most current analysis, this project will result in noise impacts at 32 receptors in the design year (2040). Because there would be fewer than three impacted receptors behind the prospective barriers in thirteen areas with a total of 17 impacted receptors, it was not necessary to evaluate noise abatement in these locations. However, if during final design it is determined that at least three receptors behind the prospective barrier in any of the thirteen areas are impacted, abatement measures will be evaluated and may be constructed.

Noise abatement at two locations for 15 impacted receptors was determined to be feasible, but not reasonable, as described in Section 6.3 and Table 9.

The final noise abatement decision will be made during the project's final design. Feasibility and reasonableness determinations for this project may change if there are changes in final design after approval of the NEPA documentation.

8.0 CONSTRUCTION NOISE

This chapter describes construction noise implications, construction noise mitigation strategies, and whether the project is in an area that is subject to local noise ordinances.

8.1 Construction Noise Implications

Properties adjoining project construction may be exposed to noise caused by construction activities of the Proposed Action. Examples of construction equipment noise that may be relevant to this project are listed in Table 10. Construction noise differs from traffic noise in several ways:

- Construction noise lasts only for the duration of construction, with most construction activities in noise sensitive areas being conducted during hours that are least disturbing to most nearby residents, when feasible.
- Construction activities generally are short-term and, depending on the nature of the construction operations, last from seconds (e.g., a truck passing a receptor) to months (e.g., bridge construction).
- Construction equipment noise is intermittent and depends on the type of operation, location, and function of the equipment, as well as the equipment usage cycle.
- As opposed to operational traffic noise, construction noise is not analyzed; there are no FHWA or CDOT construction NACs. However, construction noise is subject to relevant local regulations and ordinances (see Section 8.3).

Table 10 Typical Construction Equipment Noise

Equipment	Maximum Noise Level (dBA at 50 feet)[1]
Scraper	89[2]
Dozer (Bulldozer)	85
Truck (Heavy Truck)	88[2]
Pickup Truck	55
Concrete Pump Truck	82
Backhoe	80
Pneumatic Tools	85
Concrete Saw	90
Pile Driver (Sonic)	96[2]
Pile Driver (Impact)	101[2]

1. Noise levels are from Table 9.1 of FHWA's 2006 Construction Noise Handbook (FHWA, 2006), unless otherwise noted.
2. This noise level is from Table 9.9 of FHWA's 2006 Construction Noise Handbook (FHWA, 2006), which is taken from Chapter 12 of the FTA Transit Noise and Vibration Guidance Handbook.

8.2 Construction Noise Mitigation Strategies

To minimize construction noise levels, typical best management practices will be incorporated into construction contracts, plans, and specifications where it is appropriate to do so. The determination of practices weighs the benefits achieved and the overall adverse social, economic, and environmental effects and costs of abatement measures. These may include:

- Notify neighbors in advance when construction noise may occur
- Keep noisy activities as far from sensitive receptors as possible
- Keep exhaust systems on equipment in good working order. It should be subject to inspection by the construction project manager to ensure maintenance is being conducted
- Use properly designed engine enclosures and intake silencers, if appropriate
- Place stationary equipment as far from sensitive receptors as possible
- Perform construction activities in noise sensitive areas during hours that are least disturbing to nearby residents, generally daytime hours, as feasible
- Locate haul roads so they are as least disruptive as possible
- Provide mechanisms for noise complaints

8.3 Local Noise Ordinances

The project occurs in Adams County, Commerce City, and City and County of Denver. Although Adams County does not have a noise ordinance, local noise ordinances exist for Commerce City and the City and County of Denver. The Colorado Noise Statute (C.R.S. 25-12-102) also applies and says that noise at 25 feet from the project boundary may not exceed 80 dBA from 7:00 a.m. until 7:00 p.m. and 75 dBA from 7:00 p.m. until 7:00 a.m. Under the Commerce City noise ordinance, city codes agents determine what constitutes “unreasonable noise.” Construction equipment operating between the hours of 7:00 a.m. and 8:00 p.m.is exempt under the Commerce City noise ordinance. The City and County of Denver Ordinance includes Allowable Sound Pressure Levels (in dB(A)) with Time of Day Allowances for different source and receptor types under Table A of the ordinance. These ordinances are listed below:

- The City and County of Denver has a noise ordinance (Section 36-7 prohibited noise activities [https://www.denvergov.org/content/dam/denvergov/Portals/771/documents/PHI/HFHH/Chapter-36-Noise-Control.pdf], dated 2001) that prohibits noise from construction equipment and activities on weekdays between the hours of 9:00p.m. and 7:00a.m. and weekends between the hours of 5:00 p.m. and 8:00 a.m. in a manner that exceeds the sound pressure limits as specified in the noise ordinance.
- https://library.municode.com/co/commerce_city/codes/municipal_code?nodeId=COOR_CH6NU_ARTIISPNU

Nighttime construction activities are anticipated with this project. Per City and County of Denver, a variance may be granted from construction restrictions if it can be demonstrated that a construction project will interfere with traffic or jeopardize public safety if competed during daytime hours. Coordination should be conducted with Commerce City and City and County of Denver prior to commencement of any construction activities outside of allowable hours.

The information provided from the local ordinances is current at the time this report was prepared. Local ordinances should be reviewed prior to construction to confirm any potential changes to the information provided in this report.

9.0 INFORMATION FOR LOCAL OFFICIALS

This project's Noise Study Zone includes land that is unpermitted and undeveloped (i.e., Activity Category G) (see Figures 2A and 2B). Therefore, 23 CFR 772.17 is applicable and noise related information needs to be provided to local officials to support local land use planning decisions and future development, as described in Section 6.3 of the NAAG.

Contour lines represent distances from the edge of the nearest travel lane of the highway improvement to where the design year (2040) noise levels reach the Activity Category B and C NAC (66 dBA) and Activity Category E's NAC (71 dBA). These were developed for Activity Category G land within the Noise Study Zone and are shown on Figures 7A through 7C.

Each state highway agency is required to identify when the public is officially notified of a proposed highway project location. The CDOT NAAG defines the Date of Public Knowledge as the date on which the final environmental project document is approved (i.e., signed Categorical Exclusion Form 128, Finding of No Significant Impact, or Record of Decision). After this date, CDOT and FHWA will be responsible for analyzing and documenting existing condition and design year noise levels for these lands as part of Type I noise analyses, but will not be required to provide noise abatement for development on these lands if it was permitted after the Date of Public Knowledge. In addition, these areas would not be eligible for Federal-aid participation for Type II projects, if funding to the Type II program were to be reinstated in Colorado. Colorado does not currently have a Type II program. Decisions concerning such noise abatement are left to local government agencies and private developers.

Noise compatible planning concepts should be considered by local agencies. Examples are available in the following documents. Additional material and technical support are available from CDOT, upon request.

- *The Audible Landscape: A Manual for Highway Noise and Land Use* (Urban Systems Research and Engineering, Inc., 1974)
- *Guidelines for Considering Noise in Land Use Planning and Control* (Federal Interagency Committee on Urban Noise, 1980)
- *Entering the Quiet Zone: Noise Compatible Land Use Planning* (FHWA brochure, 2002)

10.0 IMPACTS AND MITIGATION COMMITMENTS

Because this project is an EA, the following table that describes impacts on noise resources and mitigation commitments for noise resources is being provided. Information from this table is generally copied into the NEPA document table, which lists impacts and mitigation commitments for all resources.

Table 11 Summary of Impacts and Mitigation Table for NEPA Documents

Impact	Mitigation Commitment	Responsible Branch	Mitigation Timing/Phase
32 receptors	None	Environmental (CDOT R1)	None
Construction Noise	• Notify neighbors in advance when construction noise may occur • Keep noisy activities as far from sensitive receptors as possible • Keep exhaust systems on equipment in good working order. It should be subject to inspection by the construction project manager to ensure maintenance is being conducted • Use properly designed engine enclosures and intake silencers, if appropriate • Place stationary equipment as far from sensitive receptors as possible • Perform construction activities in noise sensitive areas during hours that are least disturbing to nearby residents, generally daytime hours, as feasible • Locate haul roads so they are as least disruptive as possible • Provide mechanisms for noise complaints • A variance from Commerce City and the City and County of Denver will be required for noise should there be construction at night	Environmental (CDOT R1); Construction Engineer	Construction

11.0 SOURCES AND REFERENCES

Colorado Department of Transportation (CDOT). 2015. *Noise Analysis and Abatement Guidelines*, January.

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City and County of Denver. 2001. Noise Ordinance, Section 36-7 Prohibited Noise Activities. https://www.denvergov.org/content/dam/denvergov/Portals/771/documents/PHI/HFHH/Chapter-36-Noise-Control.pdf.

Commerce City. 2011. Noise Ordinance, Section 6-2011 Unreasonable Noise. https://library.municode.com/co/commerce_city/codes/municipal_code?nodeId=COOR_CH6NU.

Federal Highway Administration (FHWA). 2006. *Construction Noise Handbook.* August.

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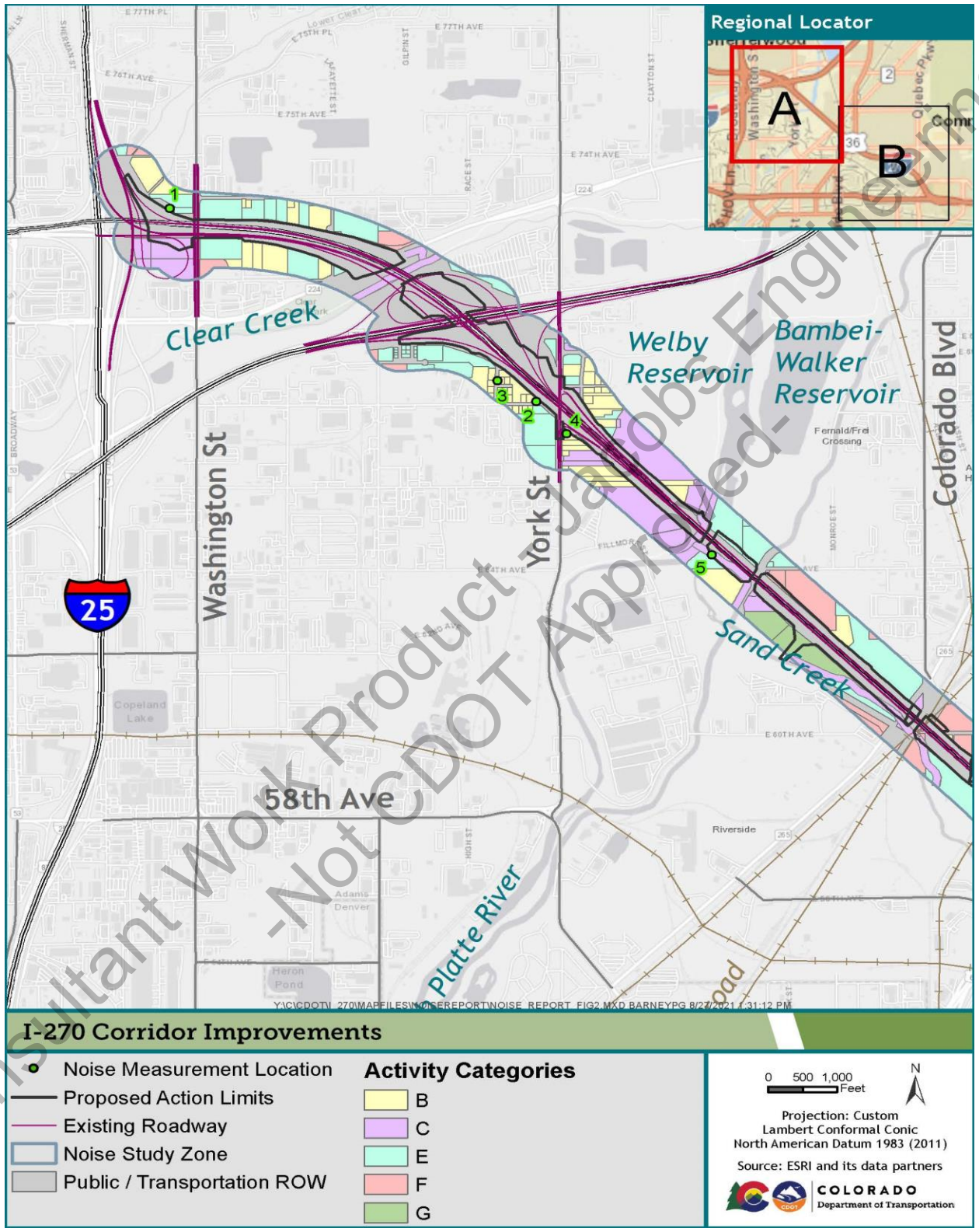
Federal Highway Administration (FHWA). 2011. *Highway Traffic Noise: Analysis and Abatement Guidance.* December.

Federal Highway Administration (FHWA). 2018. *Noise Measurement Handbook*, FHWA-HEP-18-065, June.

Jacobs Engineering Group Inc. (Jacobs). 2021. *Traffic Technical Report*.

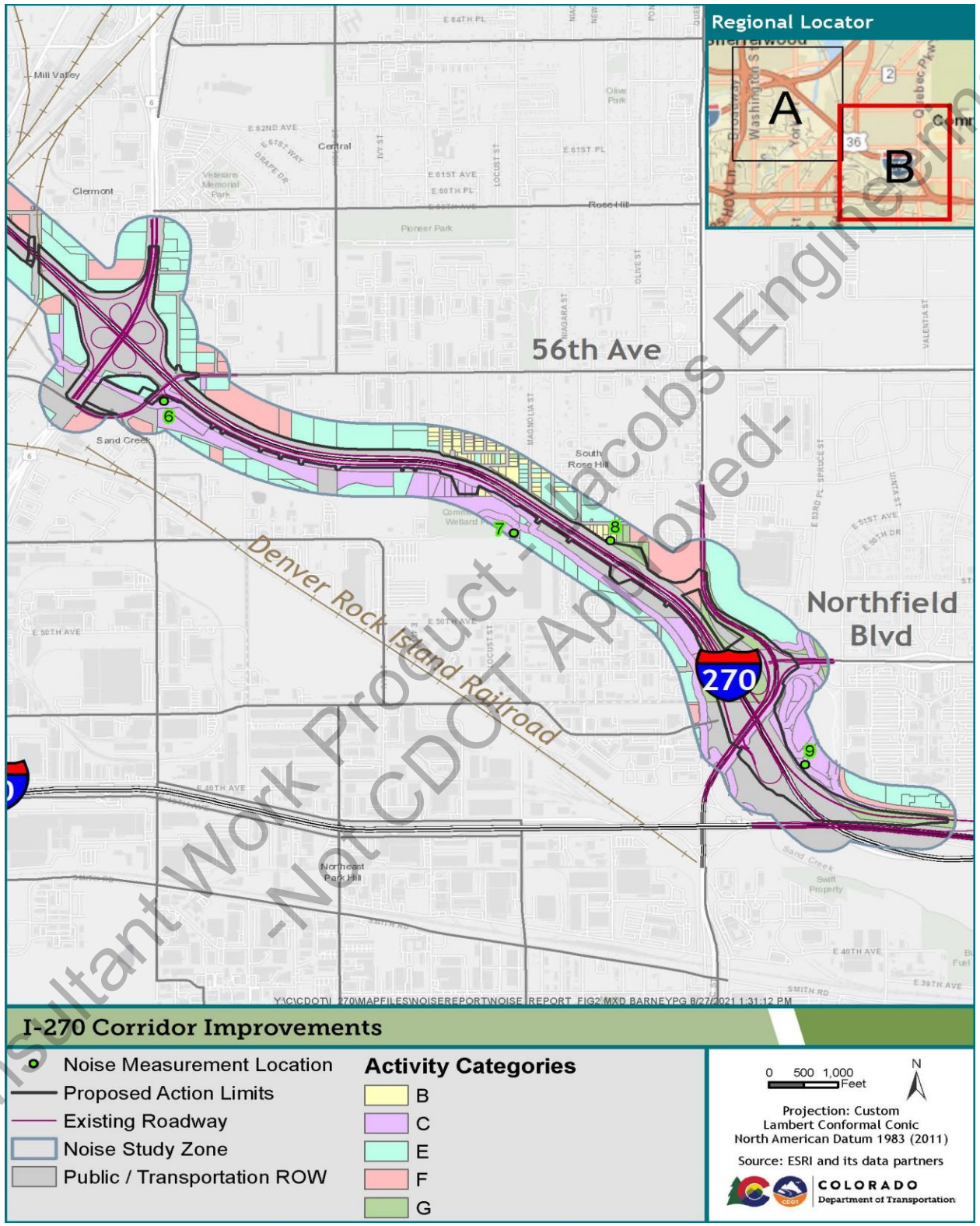
Figure 1 I-270 Corridor Improvements Project Vicinity

Figure 2A Noise Study Zone, Activity Categories, and Noise Measurement Locations



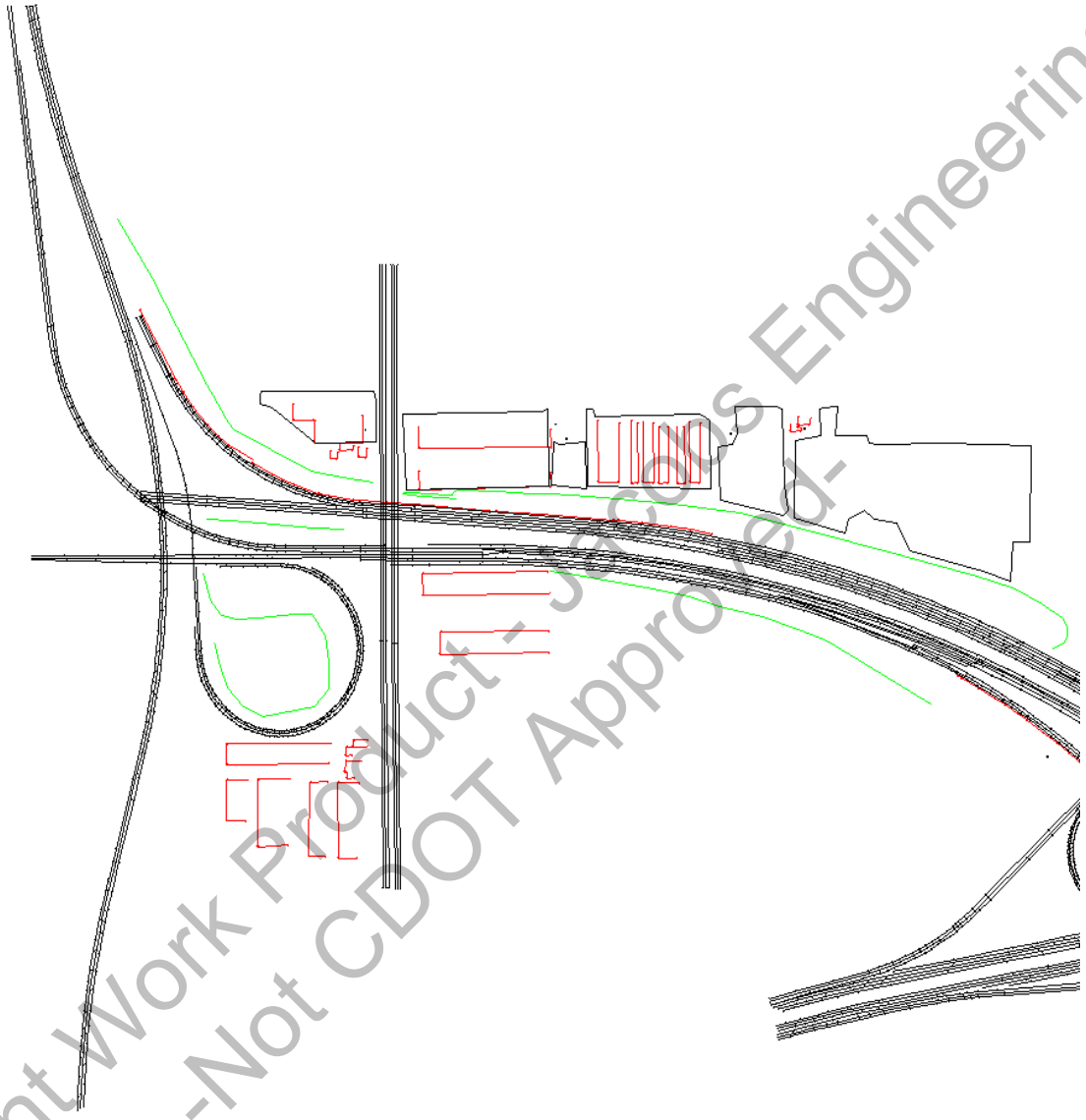
Note: This land use data was obtained from Adams County and City and County of Denver. Jacobs did not field verify or use aerial photograph to verify and update this data.

Figure 2B Noise Study Zone, Activity Categories, and Noise Measurement Locations



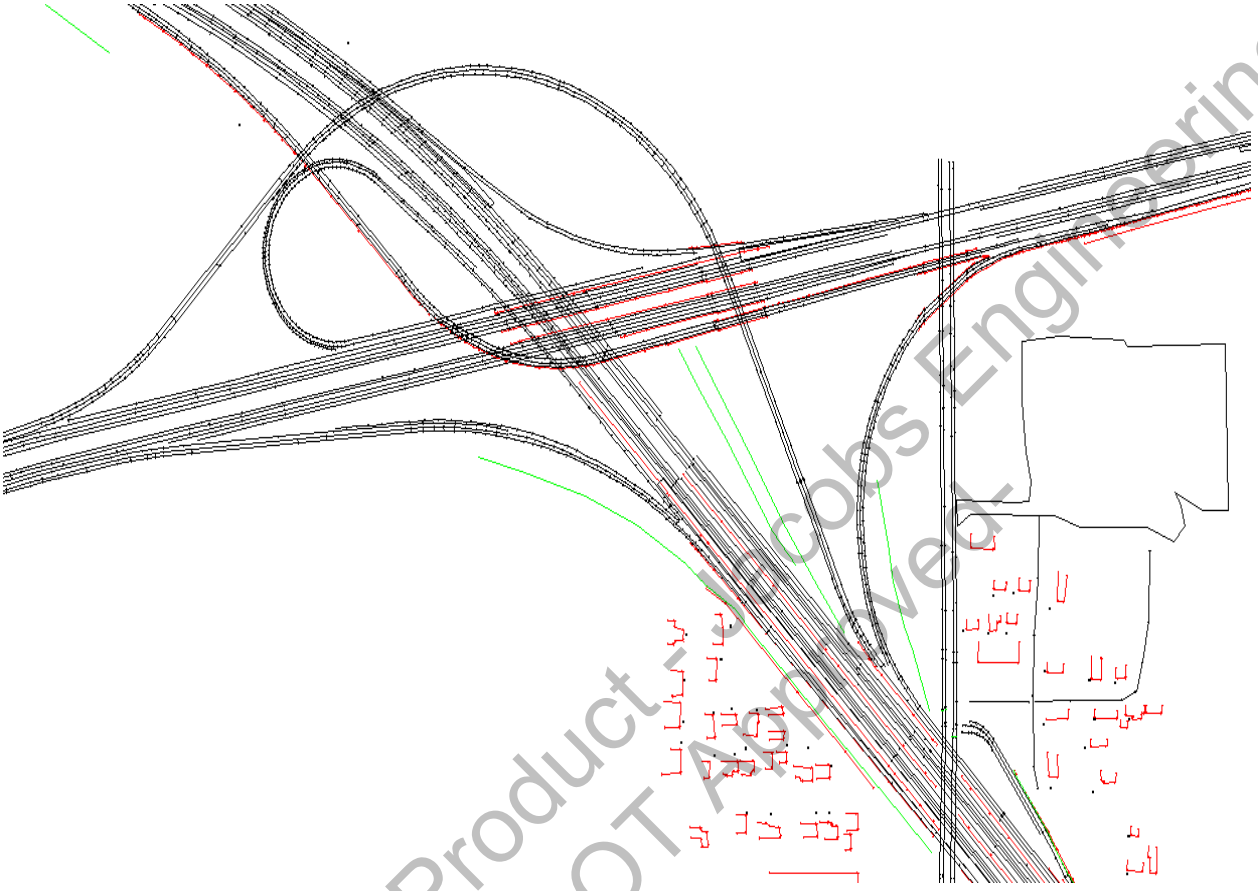
Note: This land use data was obtained from Adams County and City and County of Denver. Jacobs did not field verify or use aerial photograph to verify and update this data.

Figure 3A TNM Model Objects for Design Year (2040) Proposed Action



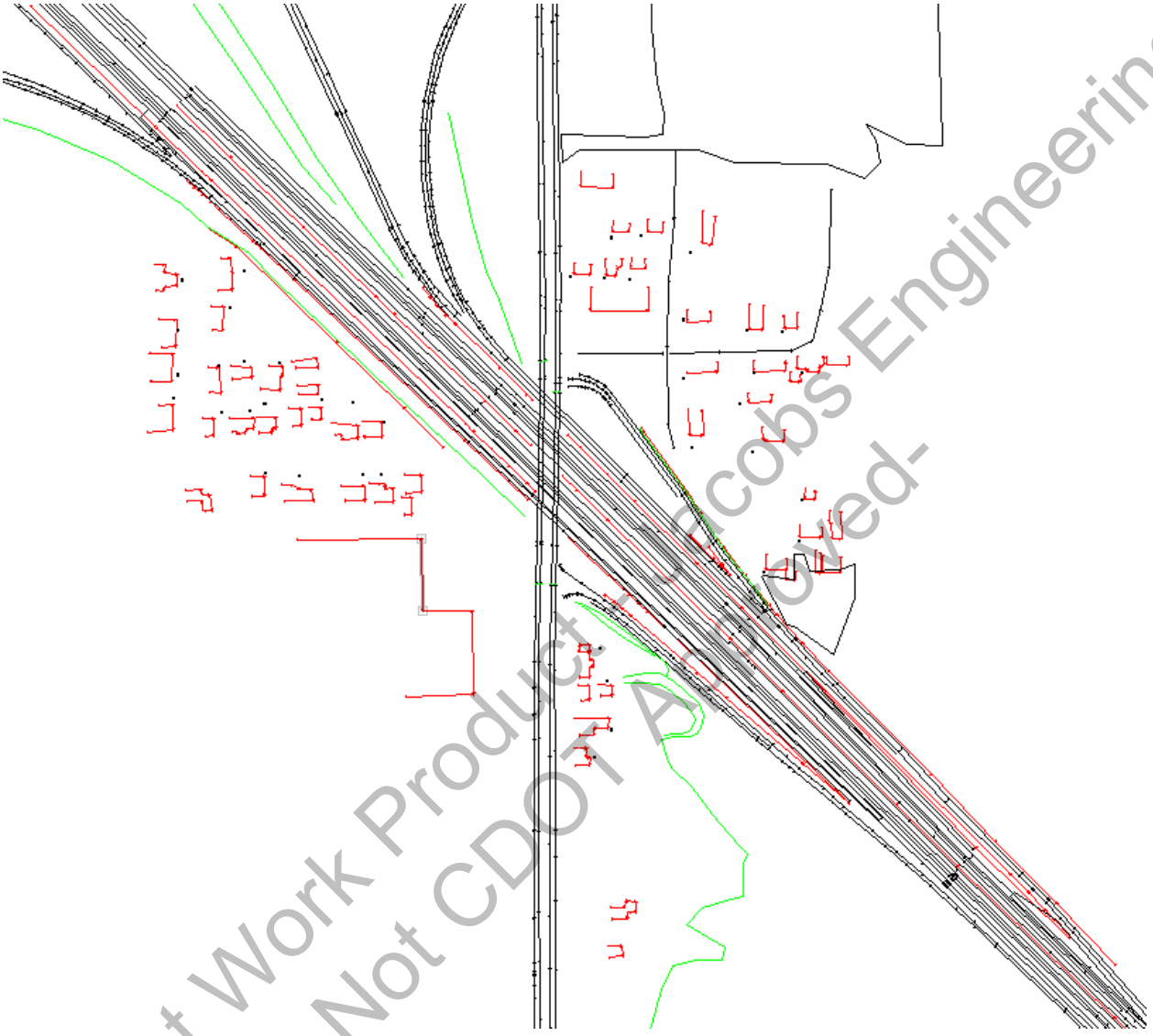
Note: All model inputs are the same for the Proposed Action GP and EL options. The only difference between the modeled options is the traffic volumes.

Figure 3B TNM Model Objects for Design Year (2040) Proposed Action



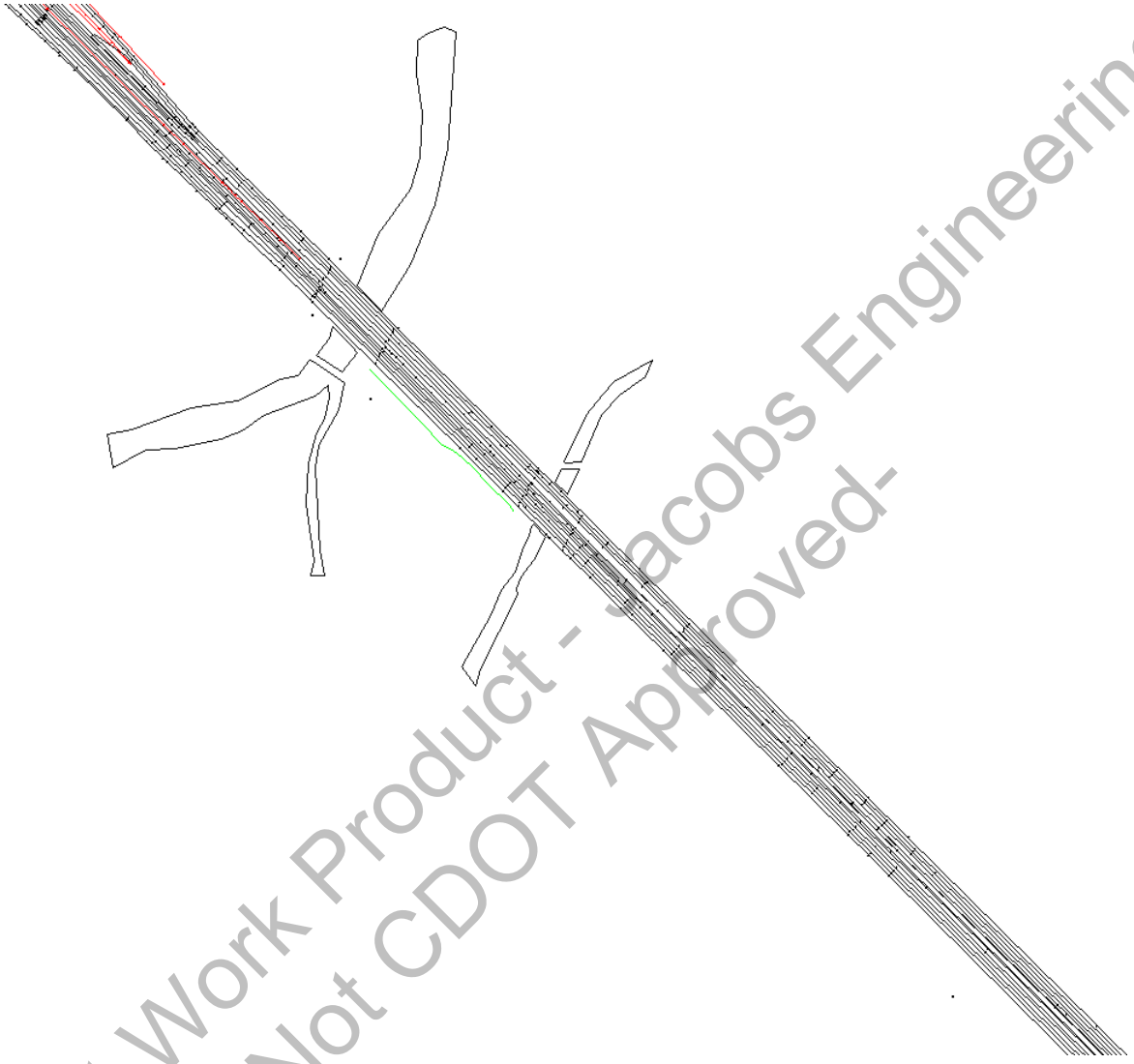
Note: All model inputs are the same for the Proposed Action GP and EL options. The only difference between the modeled options is the traffic volumes.

Figure 3C TNM Model Objects for Design Year (2040) Proposed Action



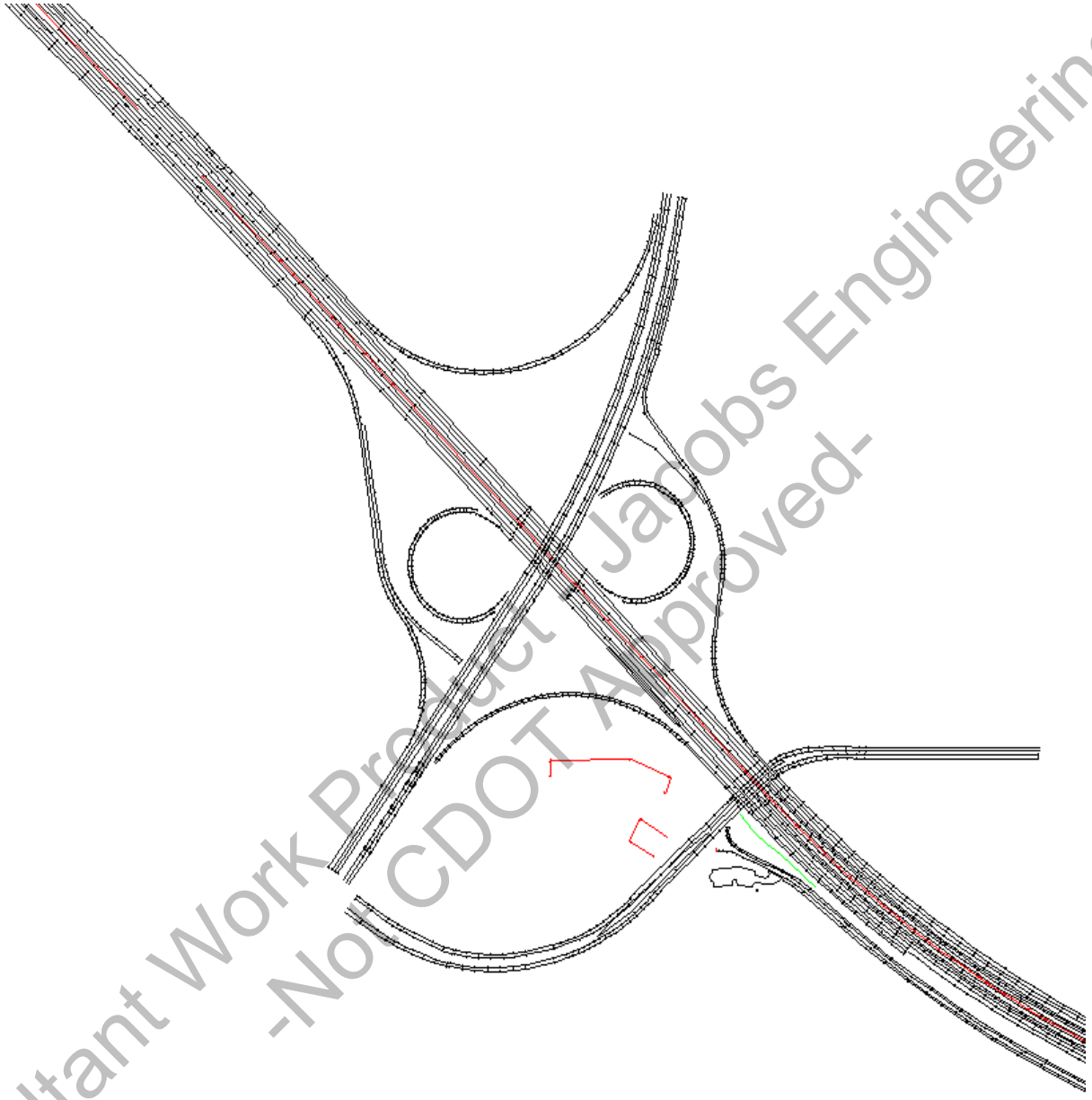
Note: All model inputs are the same for the Proposed Action GP and EL options. The only difference between the modeled options is the traffic volumes.

Figure 3D TNM Model Objects for Design Year (2040) Proposed Action



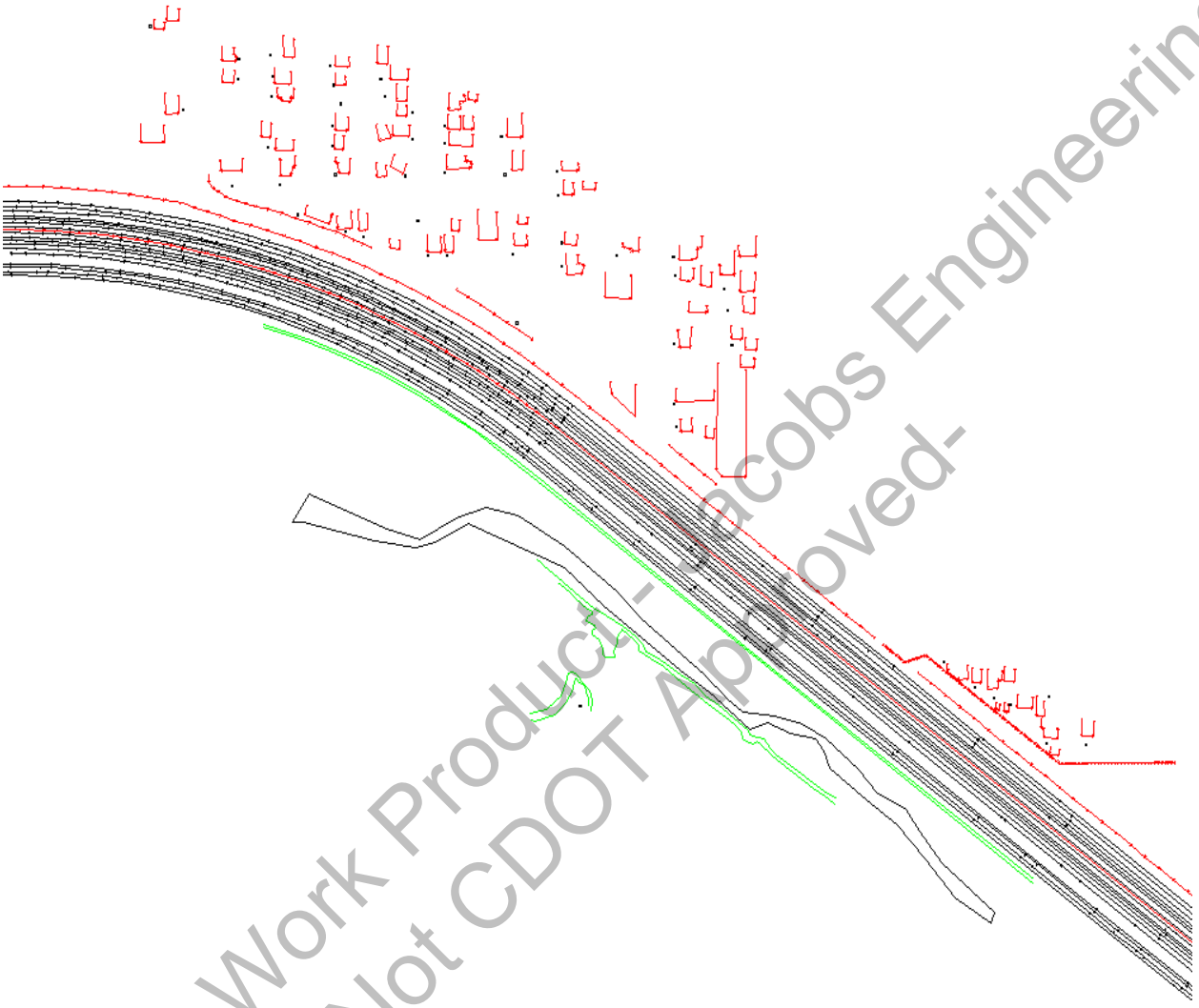
Note: All model inputs are the same for the Proposed Action GP and EL options. The only difference between the modeled options is the traffic volumes.

Figure 3E TNM Model Objects for Design Year (2040) Proposed Action



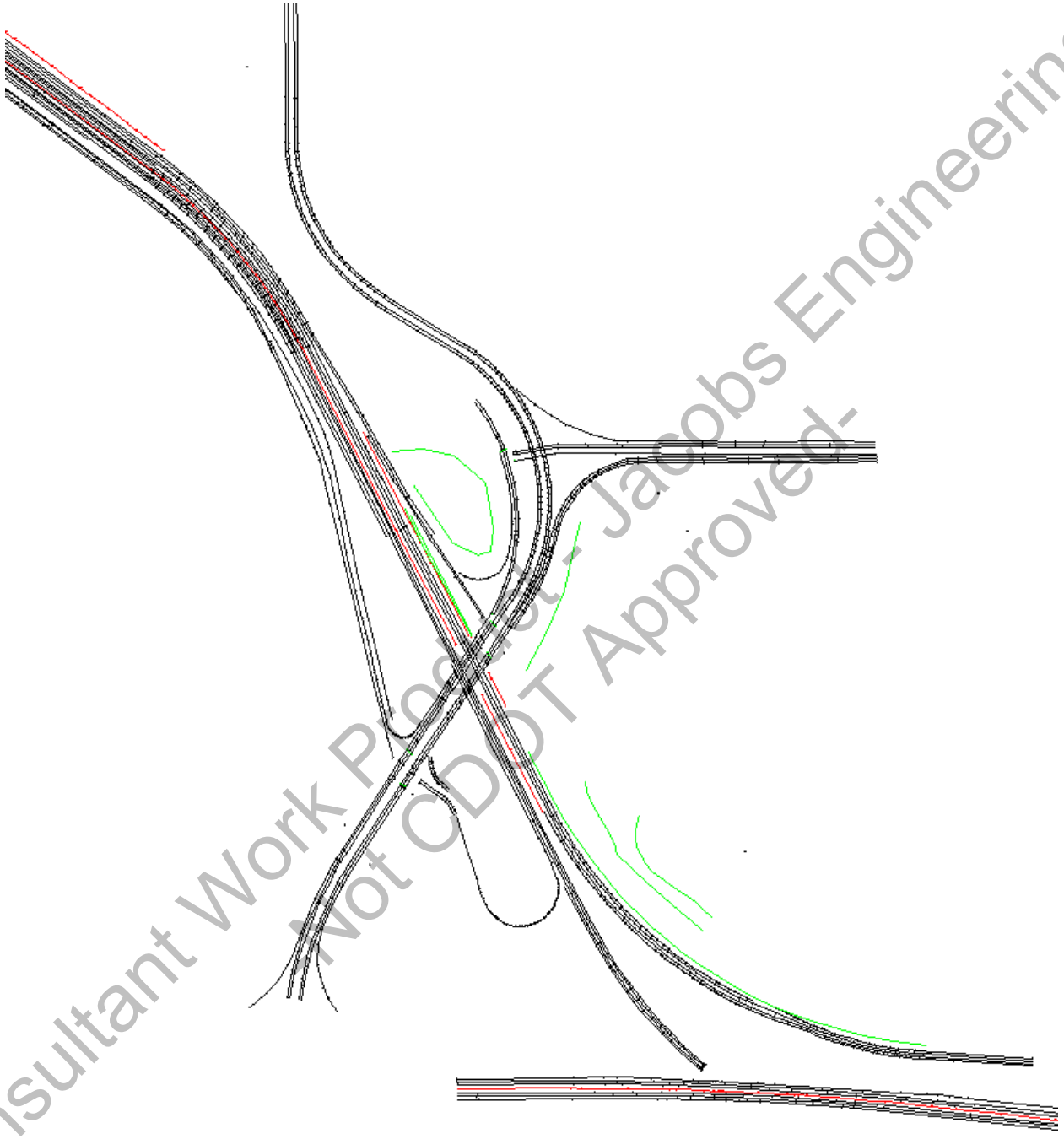
Note: All model inputs are the same for the Proposed Action GP and EL options. The only difference between the modeled options is the traffic volumes.

Figure 3F TNM Model Objects for Design Year (2040) Proposed Action



Note: All model inputs are the same for the Proposed Action GP and EL options. The only difference between the modeled options is the traffic volumes.

Figure 3G TNM Model Objects for Design Year (2040) Proposed Action



Note: All model inputs are the same for the Proposed Action GP and EL options. The only difference between the modeled options is the traffic volumes.

Figure 4A Roadways and Receiver Locations for Existing Condition (2016) and Design Year (2040) No Action Alternative

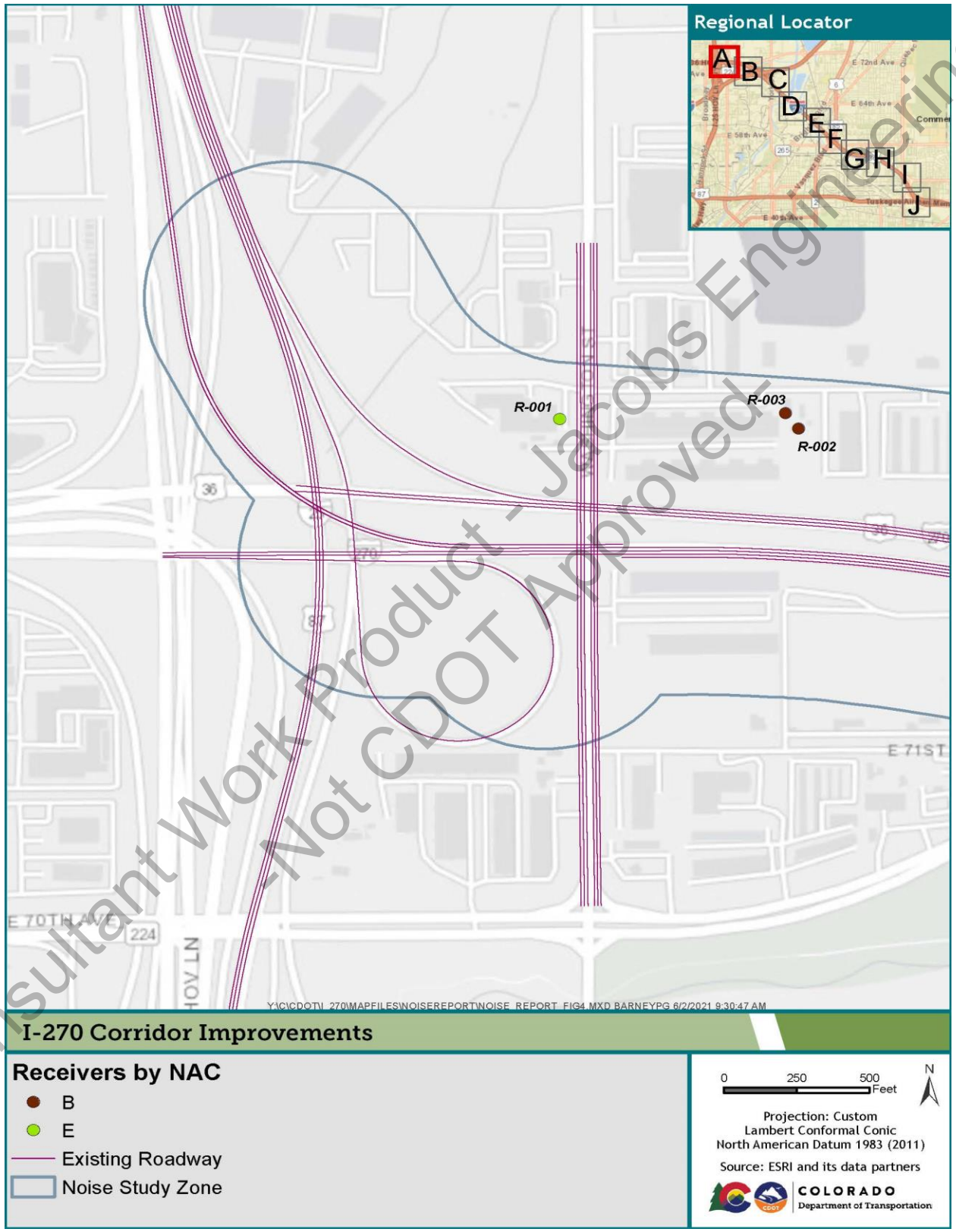


Figure 4B Roadways and Receiver Locations for Existing Condition (2016) and Design Year (2040) No Action Alternative

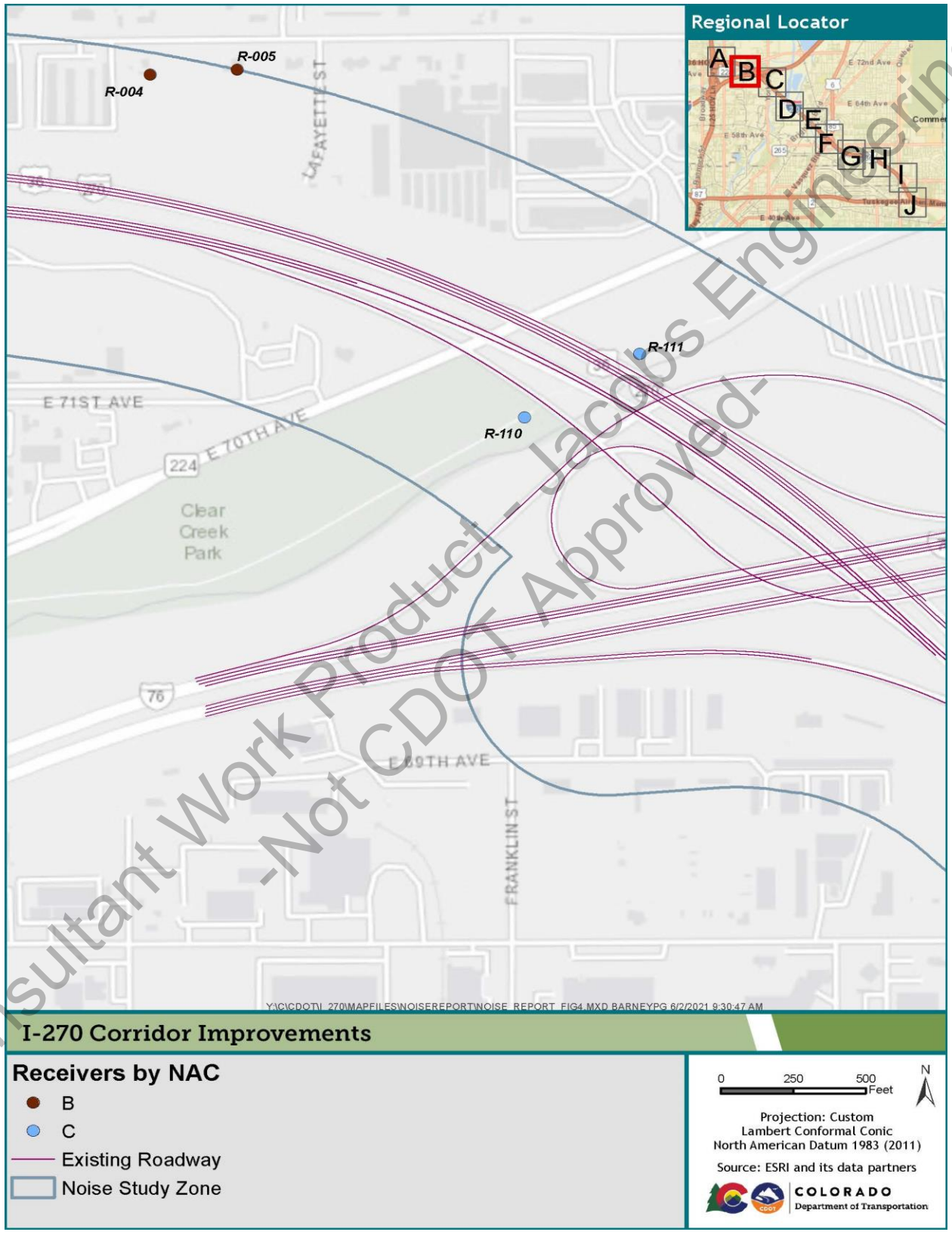


Figure 4C Roadways and Receiver Locations for Existing Condition (2016) and Design Year (2040) No Action Alternative

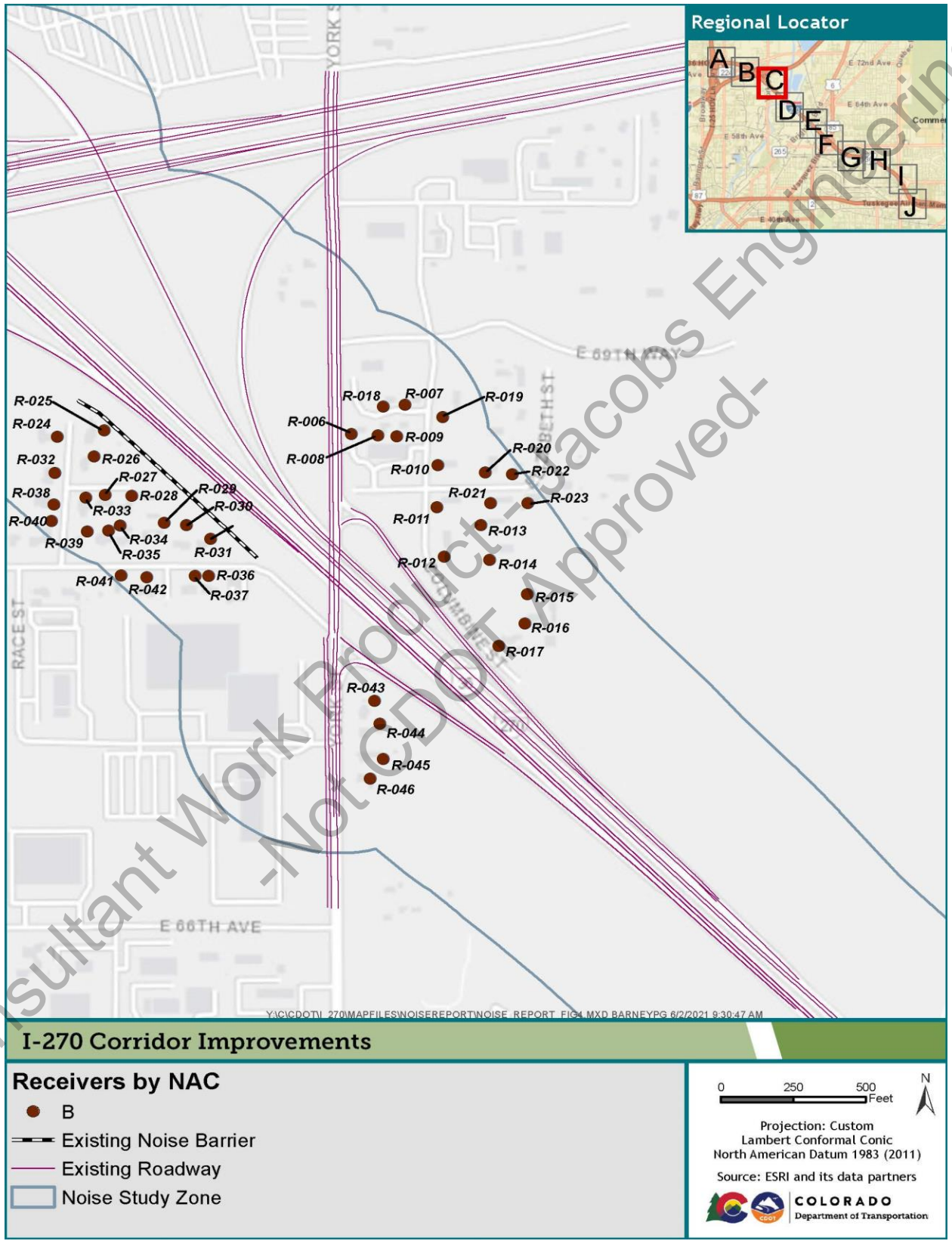


Figure 4D Roadways and Receiver Locations for Existing Condition (2016) and Design Year (2040) No Action Alternative

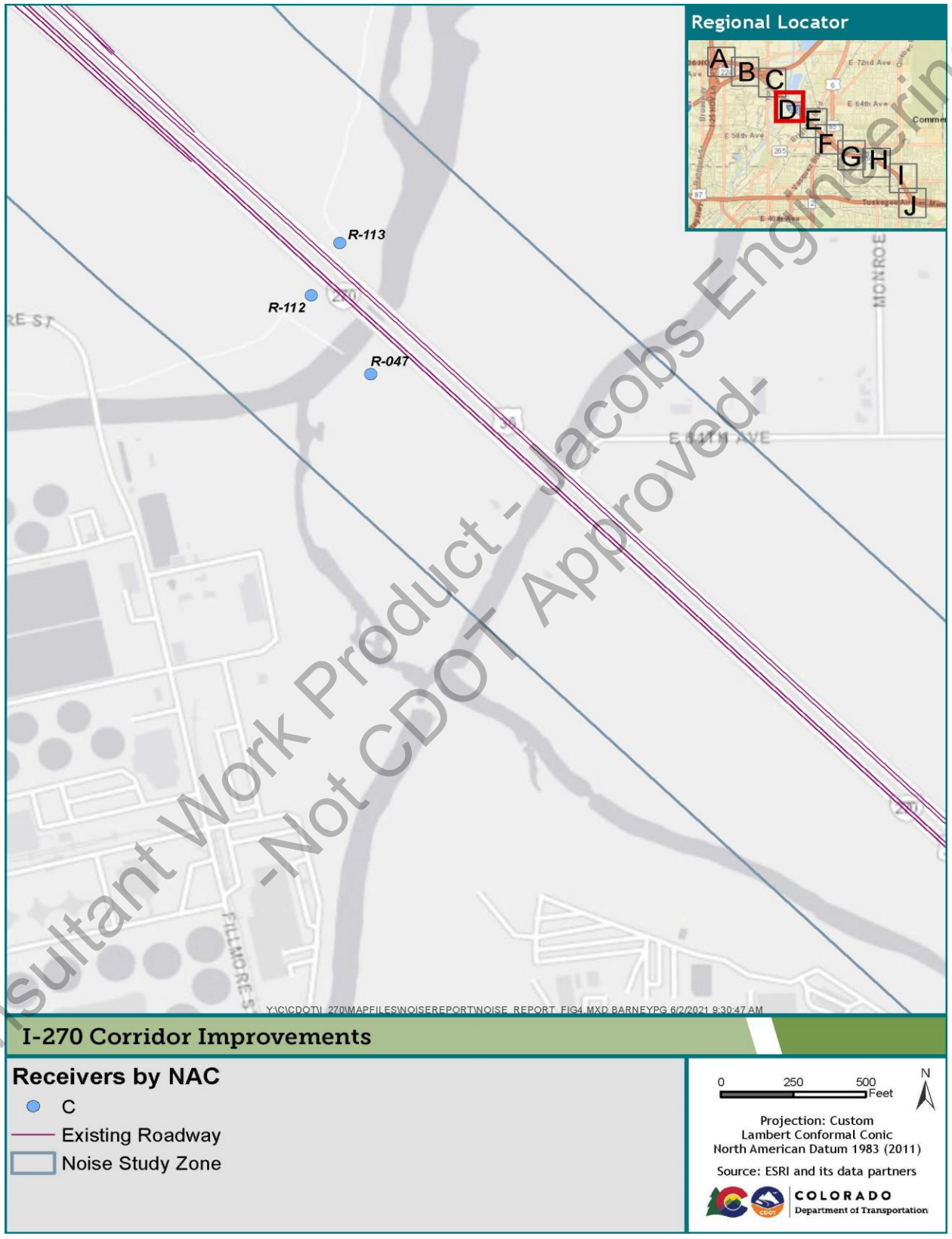


Figure 4E Roadways and Receiver Locations for Existing Condition (2016) and Design Year (2040) No Action Alternative

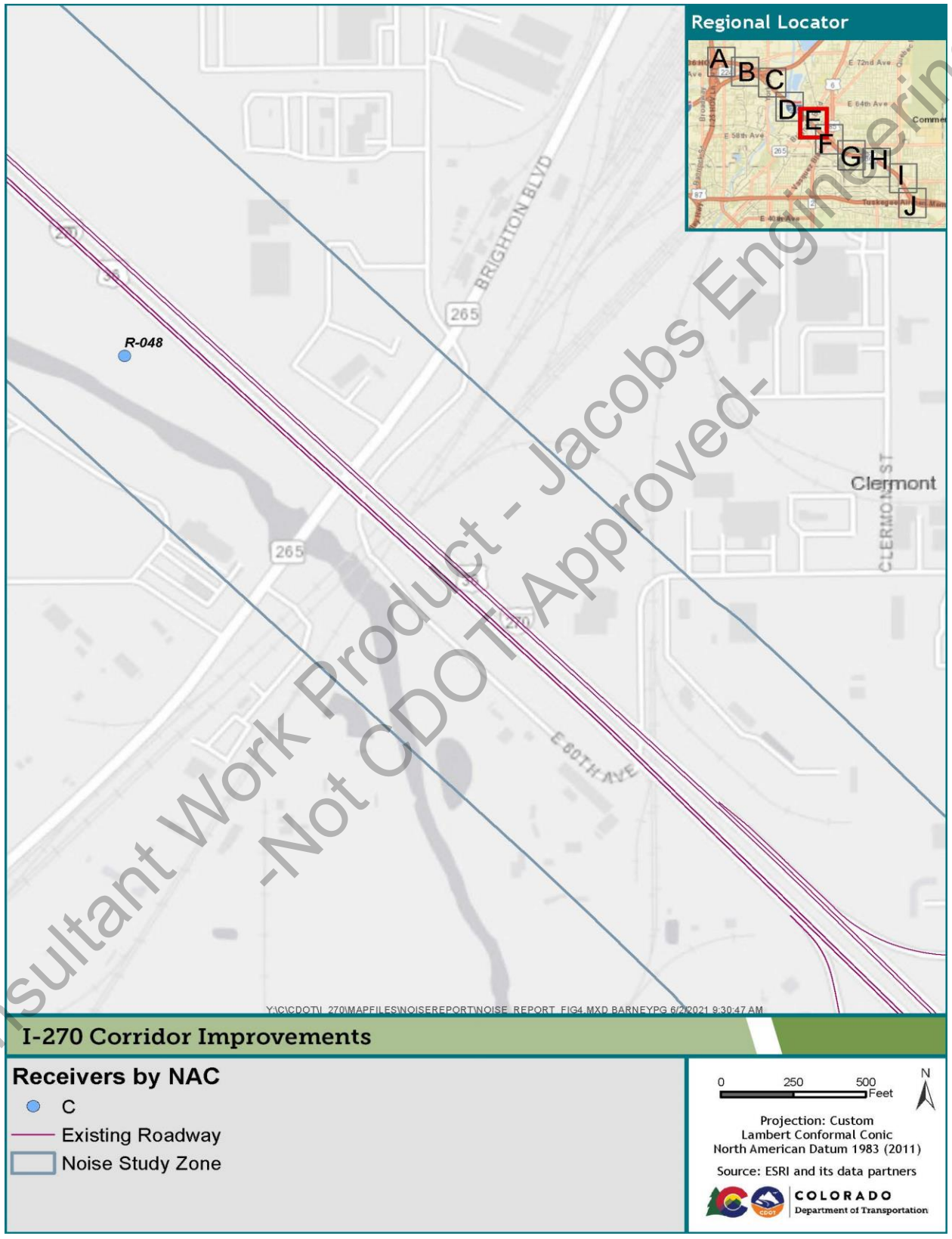


Figure 4F Roadways and Receiver Locations for Existing Condition (2016) and Design Year (2040) No Action Alternative

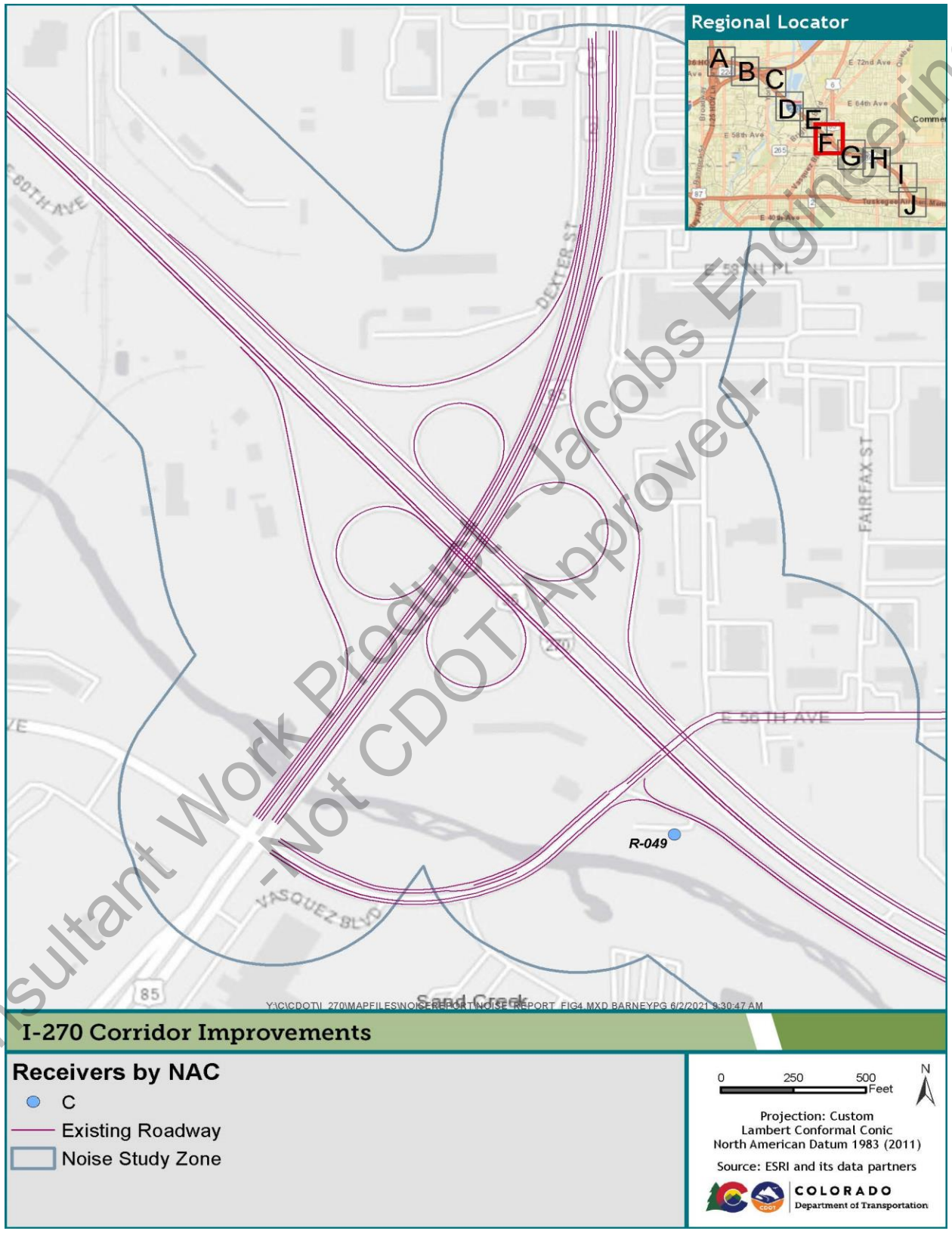


Figure 4G Roadways and Receiver Locations for Existing Condition (2016) and Design Year (2040) No Action Alternative

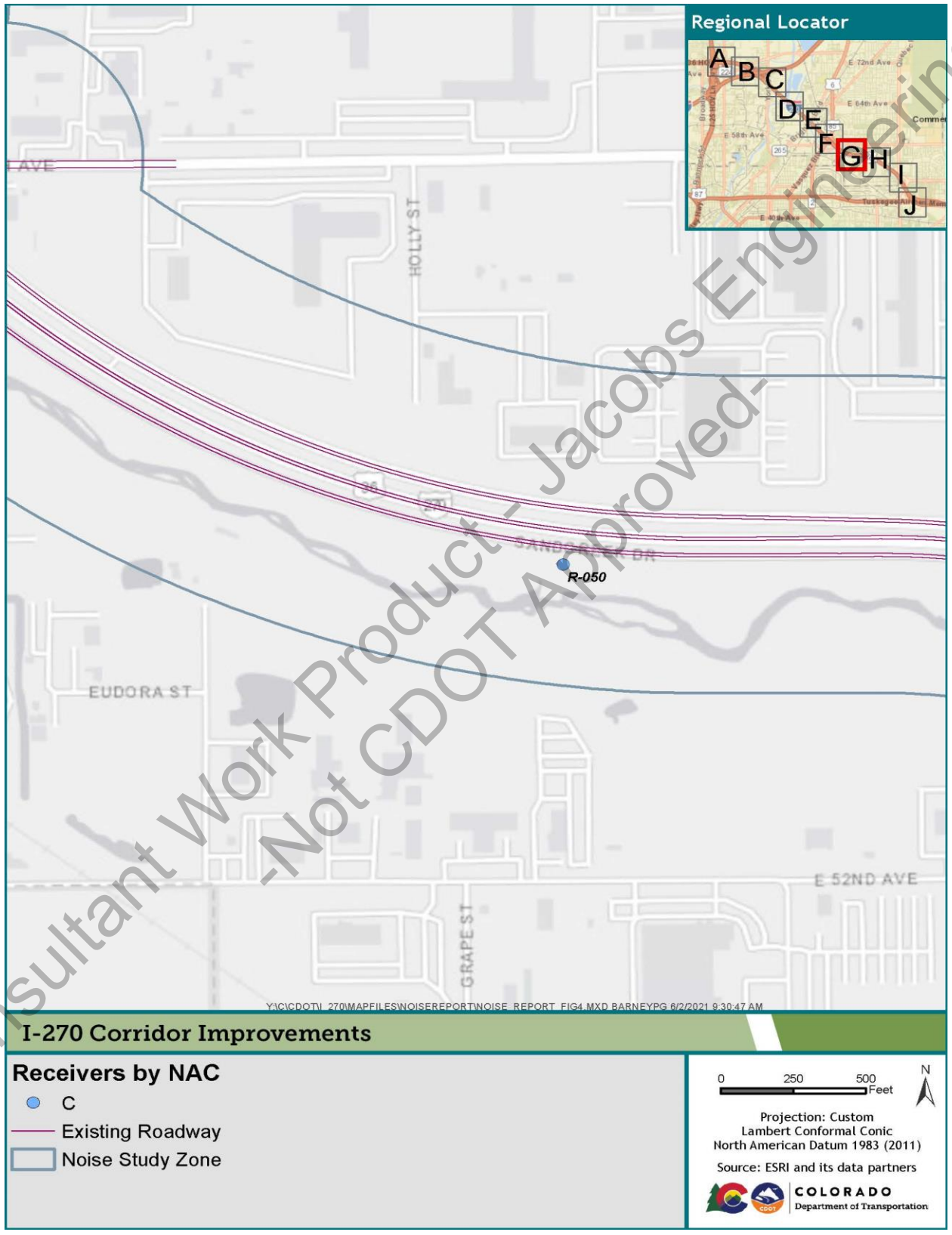


Figure 4H Roadways and Receiver Locations for Existing Condition (2016) and Design Year (2040) No Action Alternative

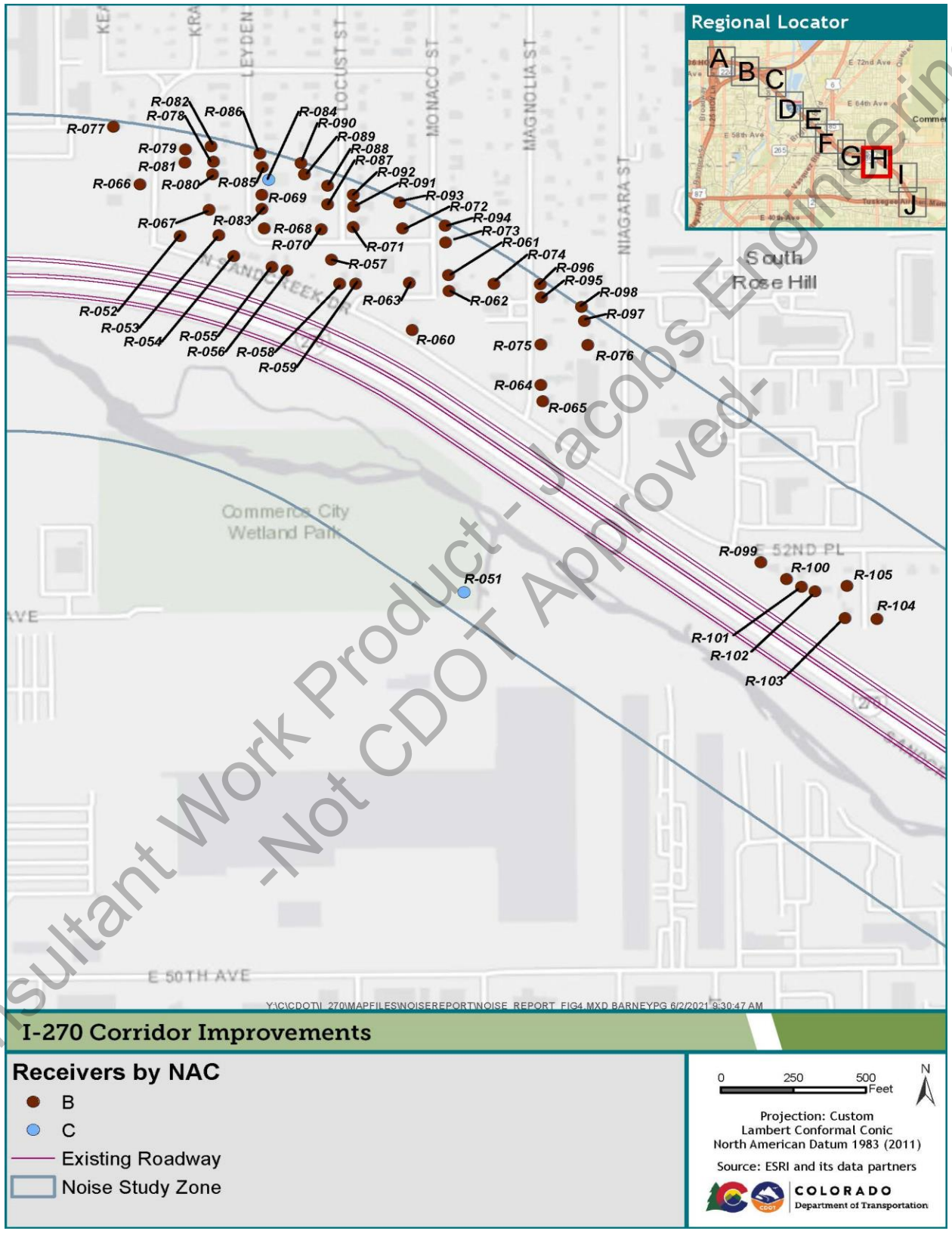


Figure 4I Roadways and Receiver Locations for Existing Condition (2016) and Design Year (2040) No Action Alternative

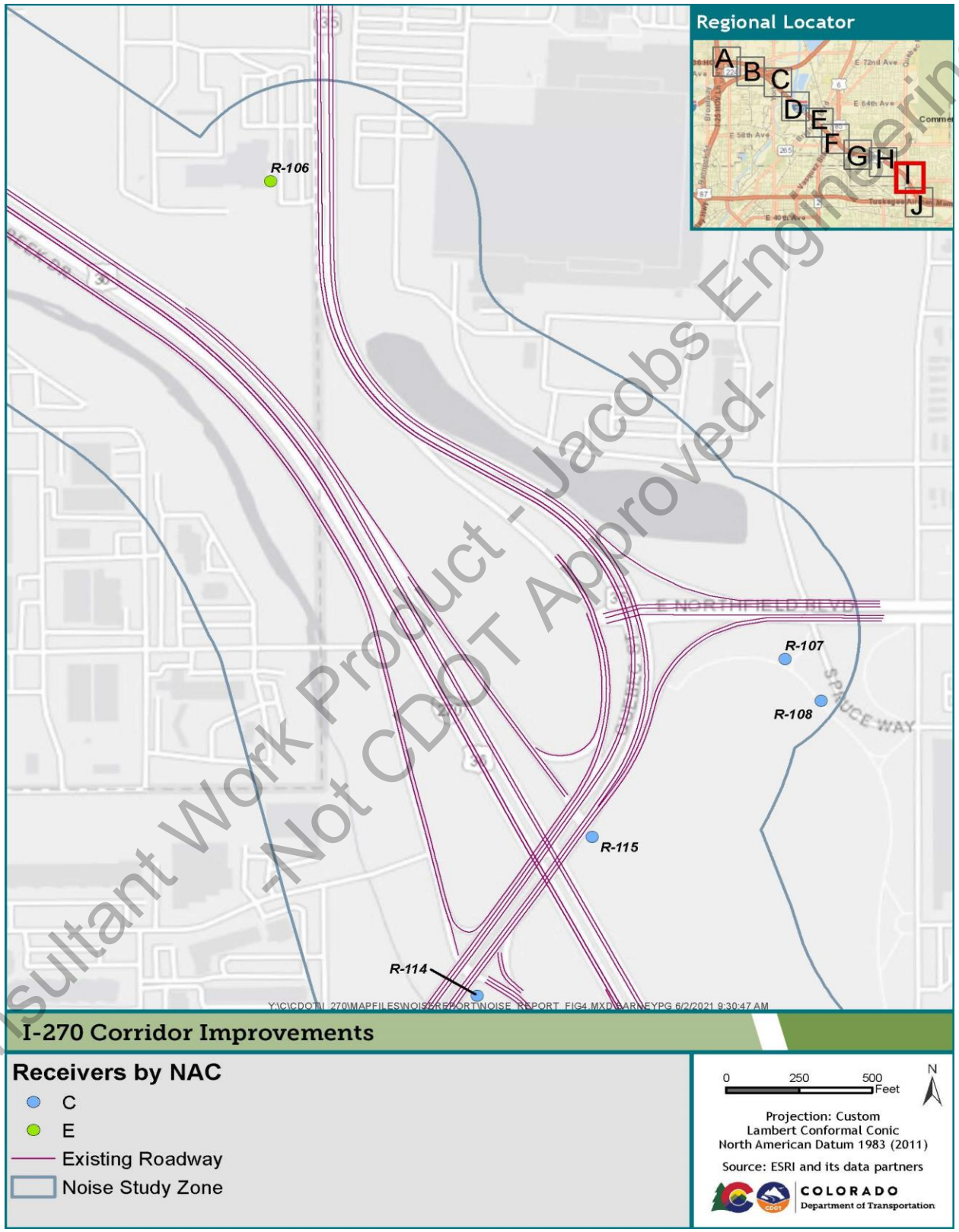


Figure 4J Roadways and Receiver Locations for Existing Condition (2016) and Design Year (2040) No Action Alternative

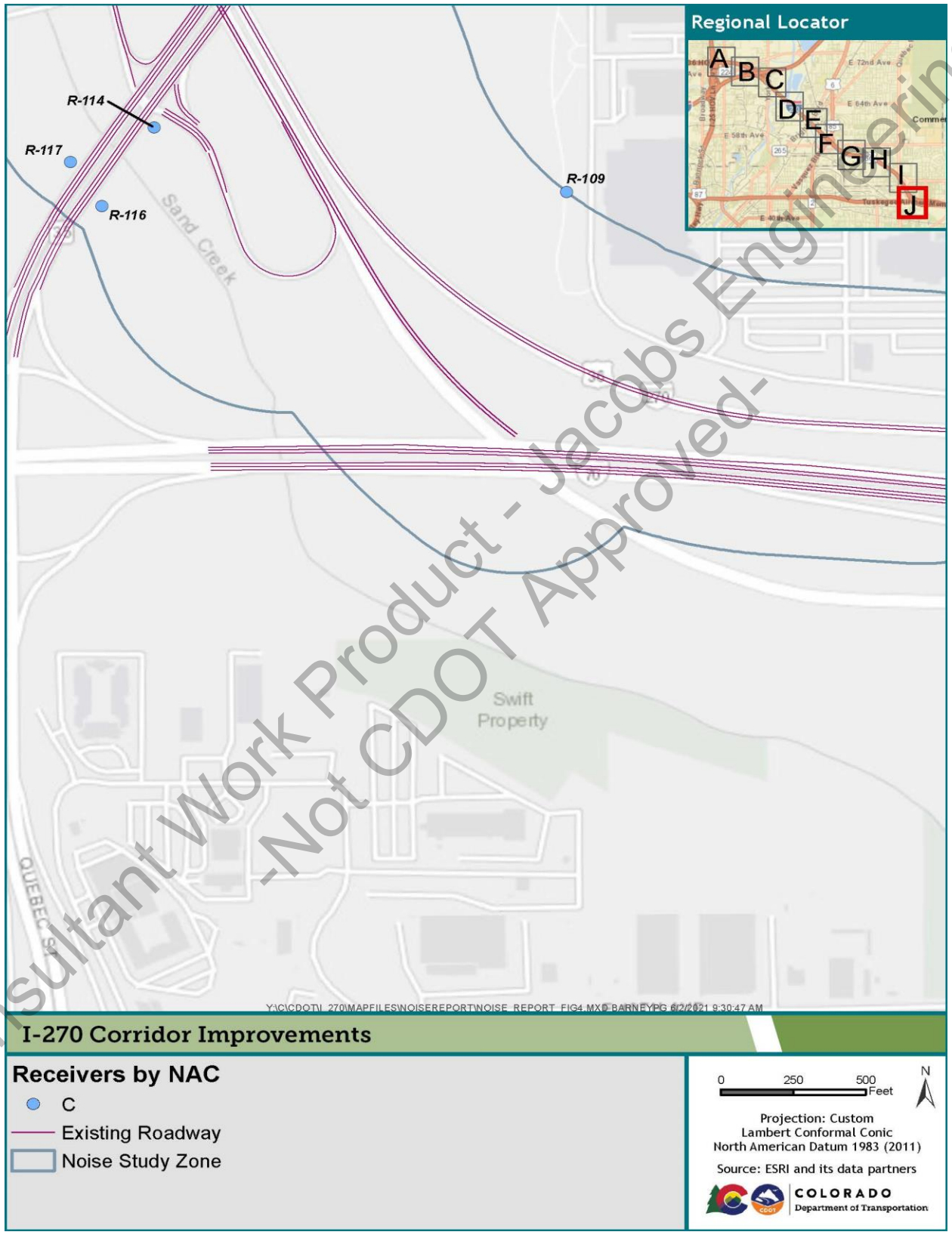
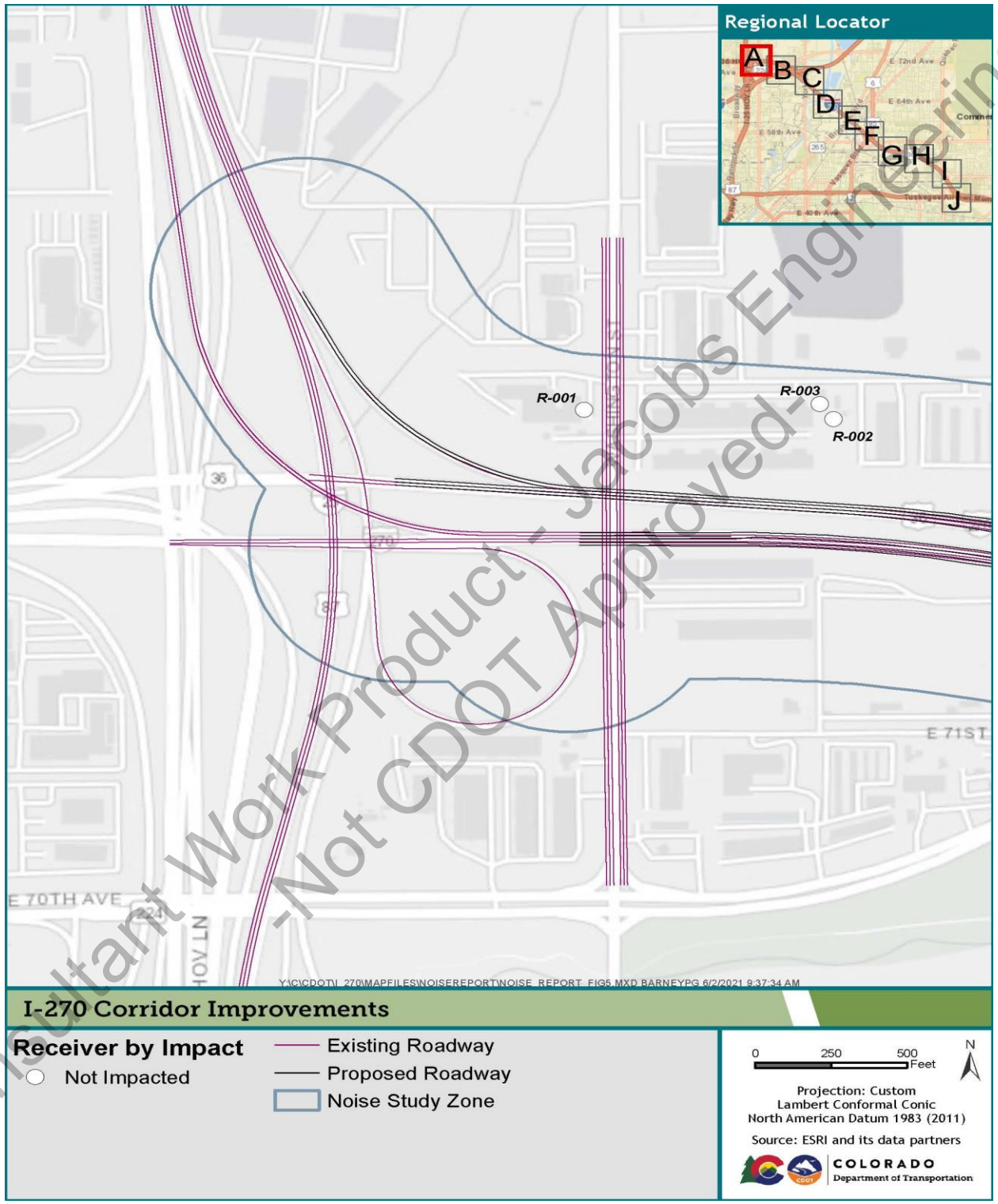
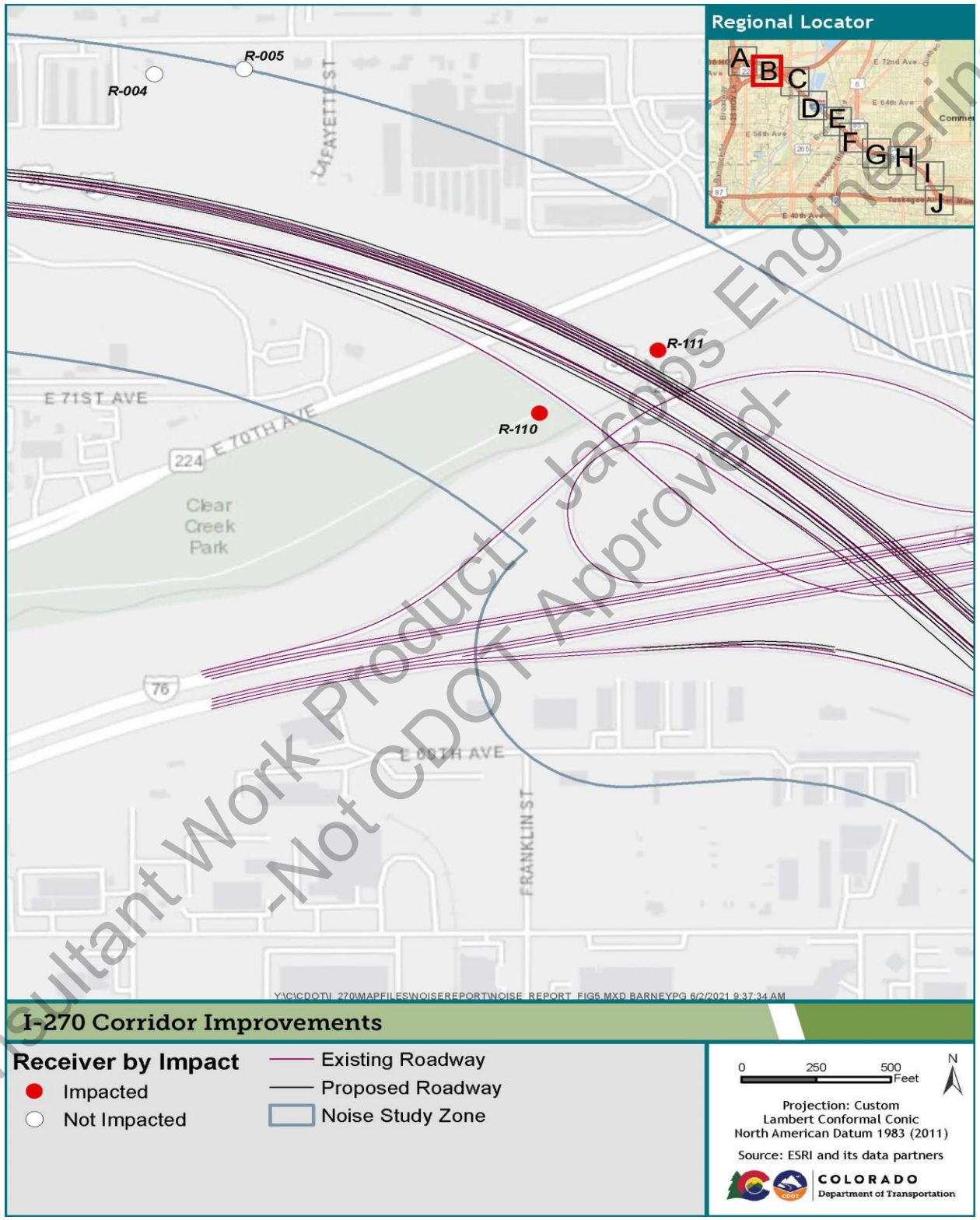


Figure 5A Roadways and Receiver Noise Levels for Design Year (2040) Proposed Action (Impacts Identified)



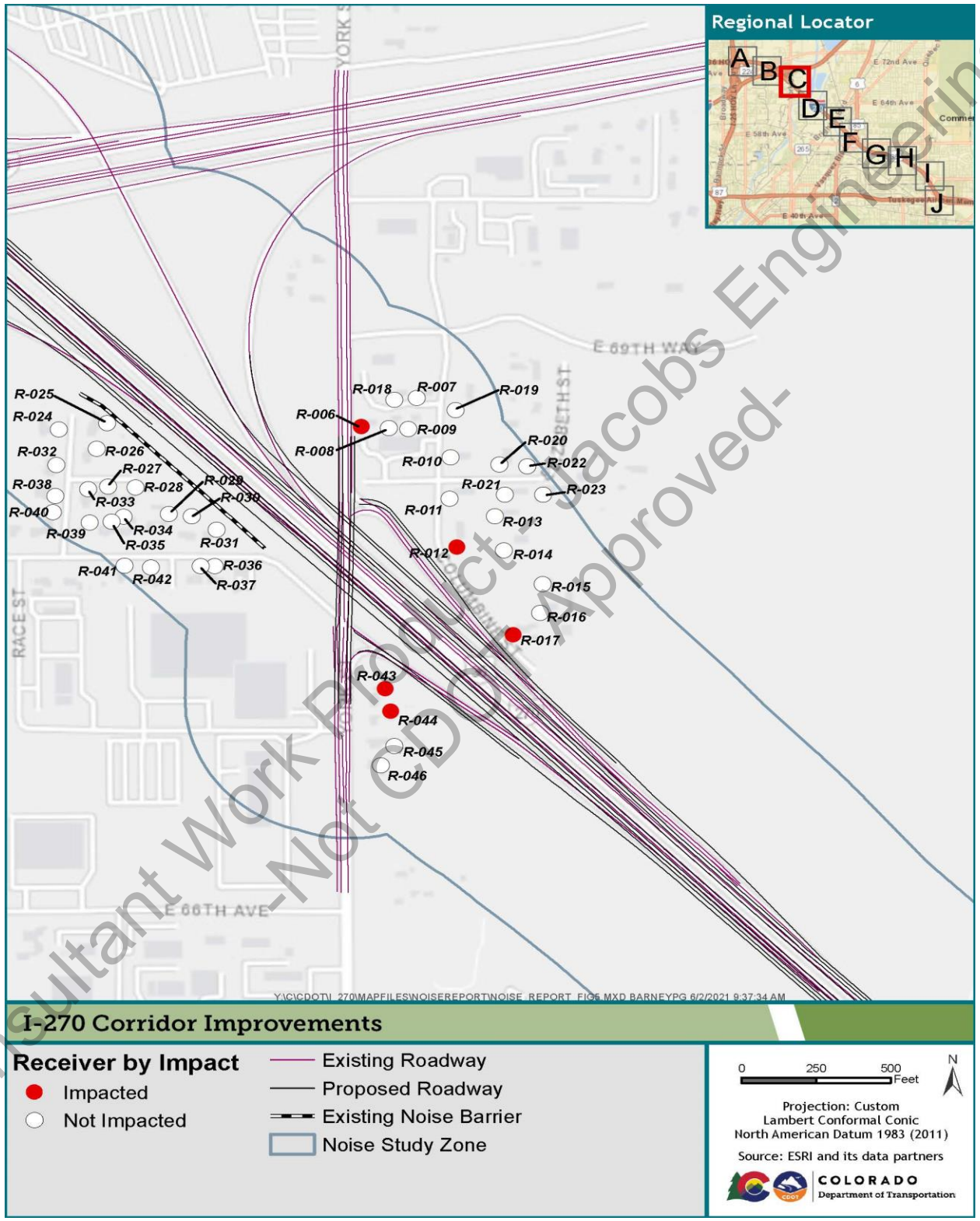
Note: Only one set of figures was included for the Proposed Action since results are the same under both operating options.

Figure 5B Roadways and Receiver Noise Levels for Design Year (2040) Proposed Action (Impacts Identified)



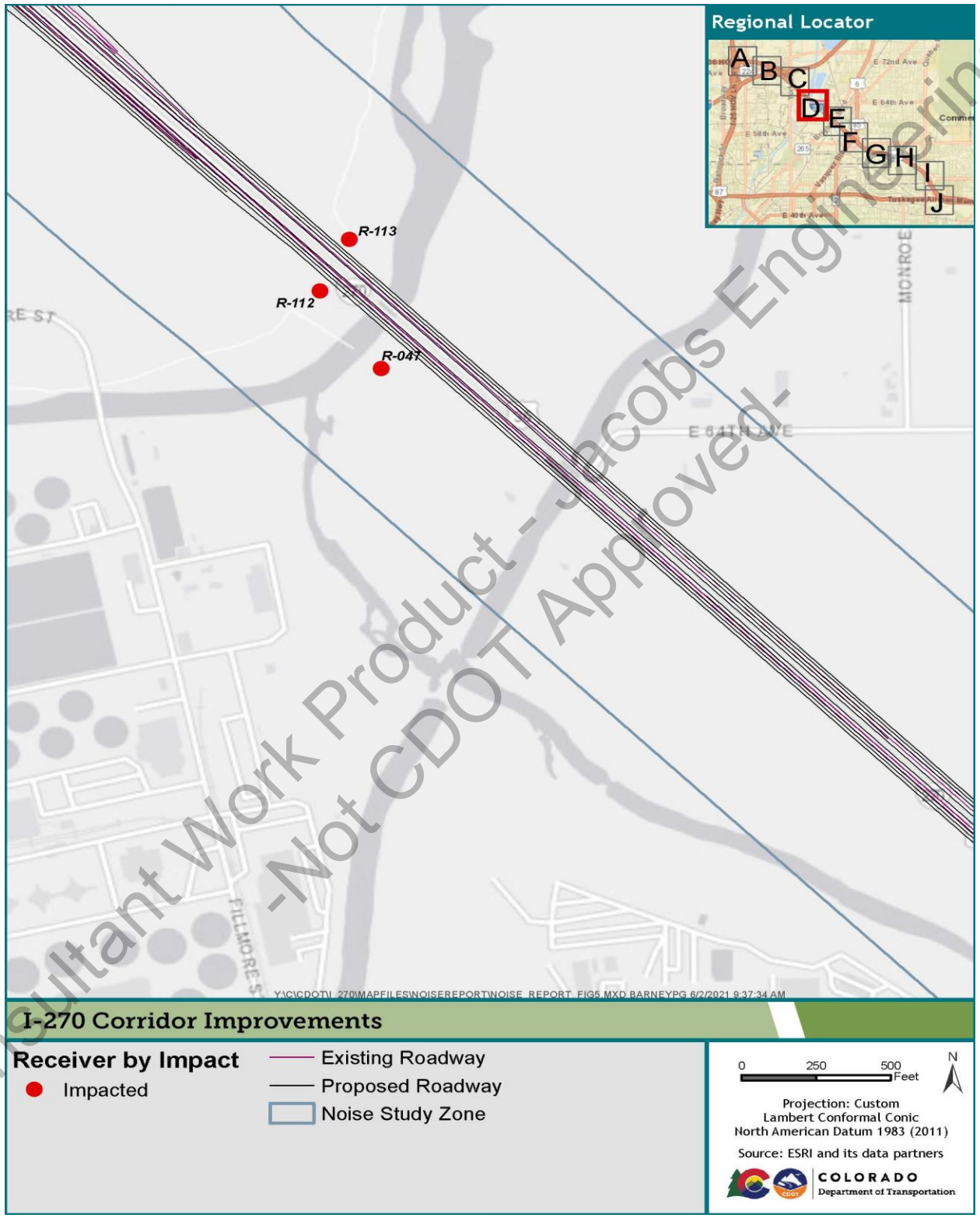
Note: Only one set of figures was included for the Proposed Action since results are the same under both operating options.

Figure 5C Roadways and Receiver Noise Levels for Design Year (2040) Proposed Action (Impacts Identified)



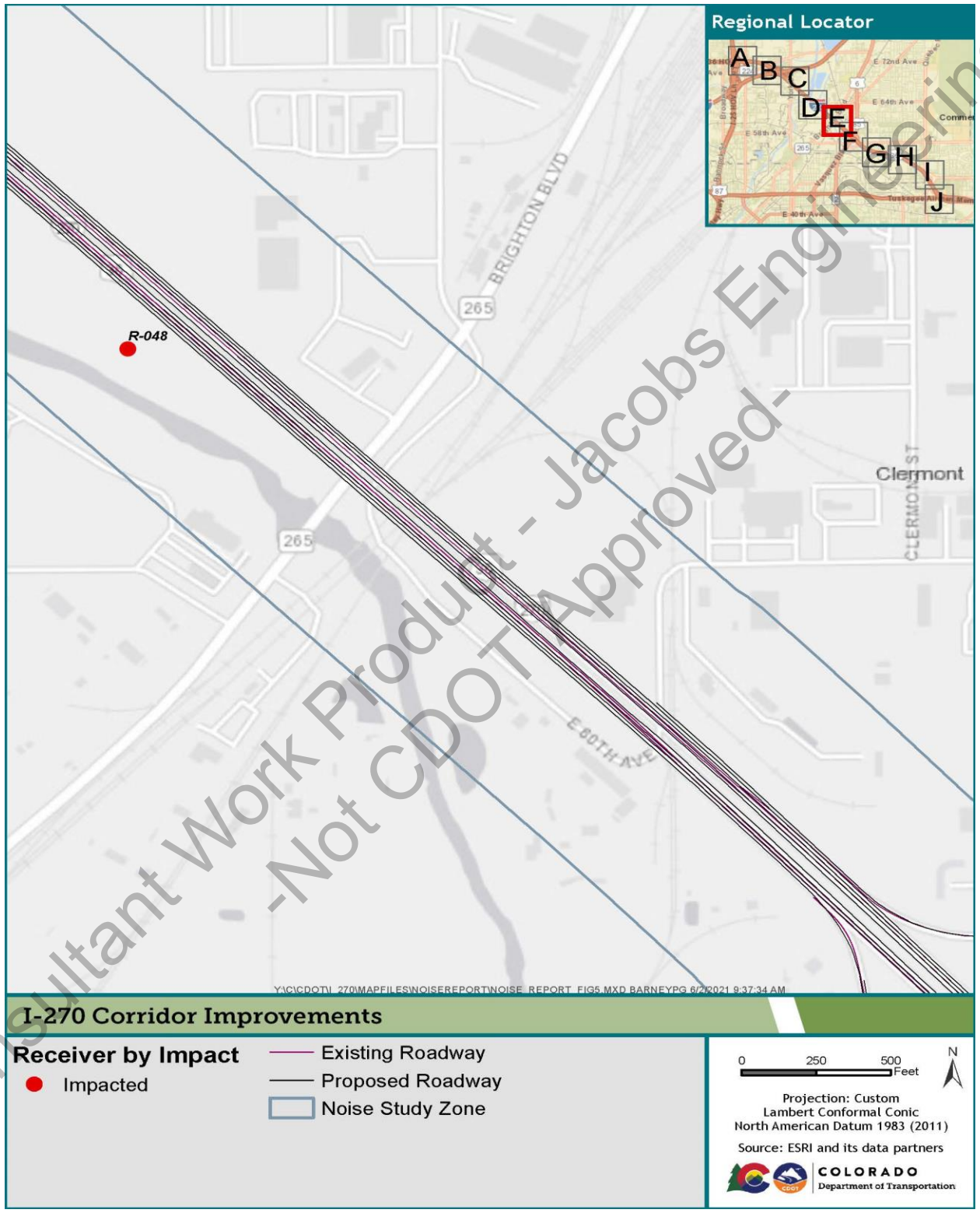
Note: Only one set of figures was included for the Proposed Action since results are the same under both operating options.

Figure 5D Roadways and Receiver Noise Levels for Design Year (2040) Proposed Action (Impacts Identified)



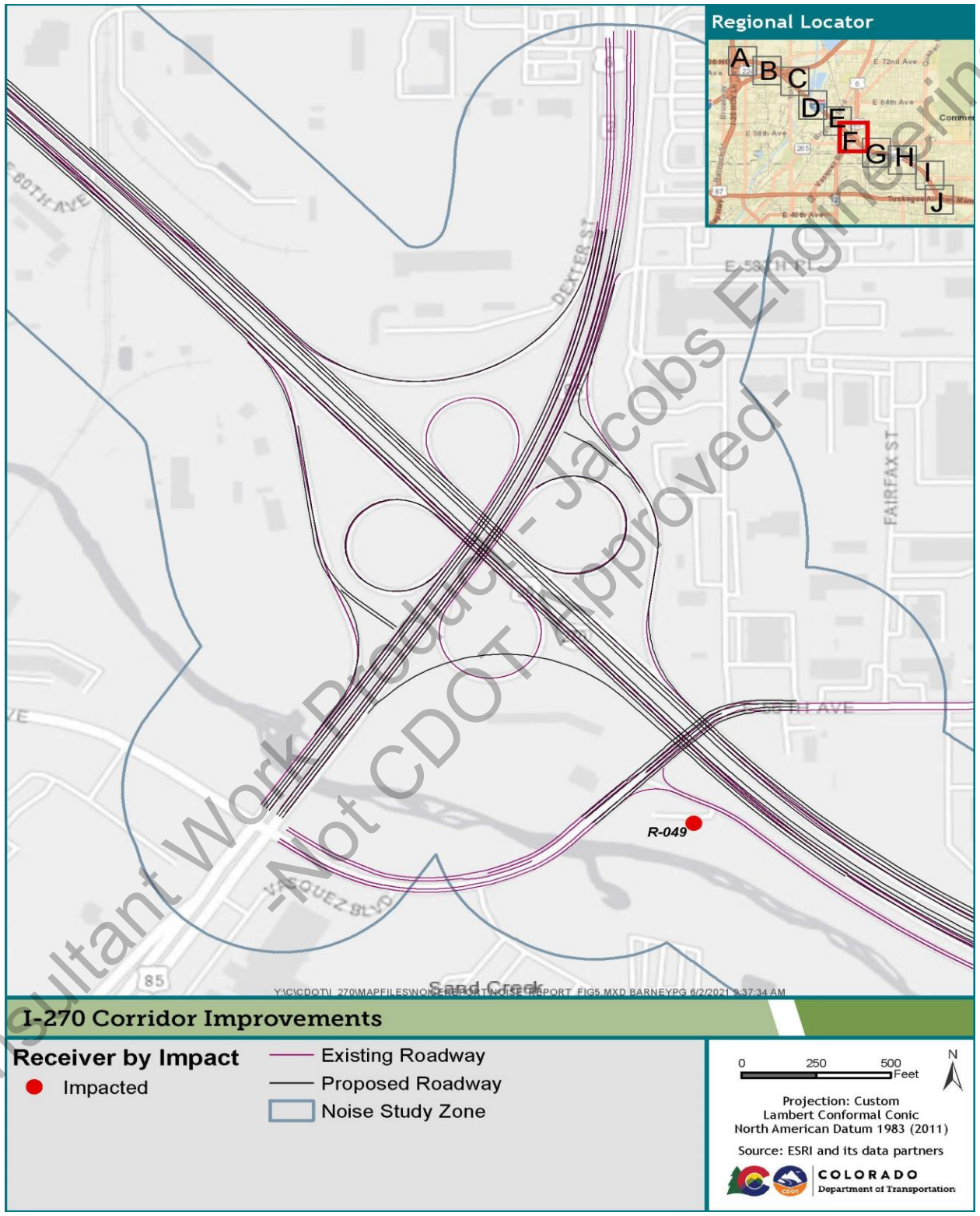
Note: Only one set of figures was included for the Proposed Action since results are the same under both operating options.

Figure 5E Roadways and Receiver Noise Levels for Design Year (2040) Proposed Action (Impacts Identified)



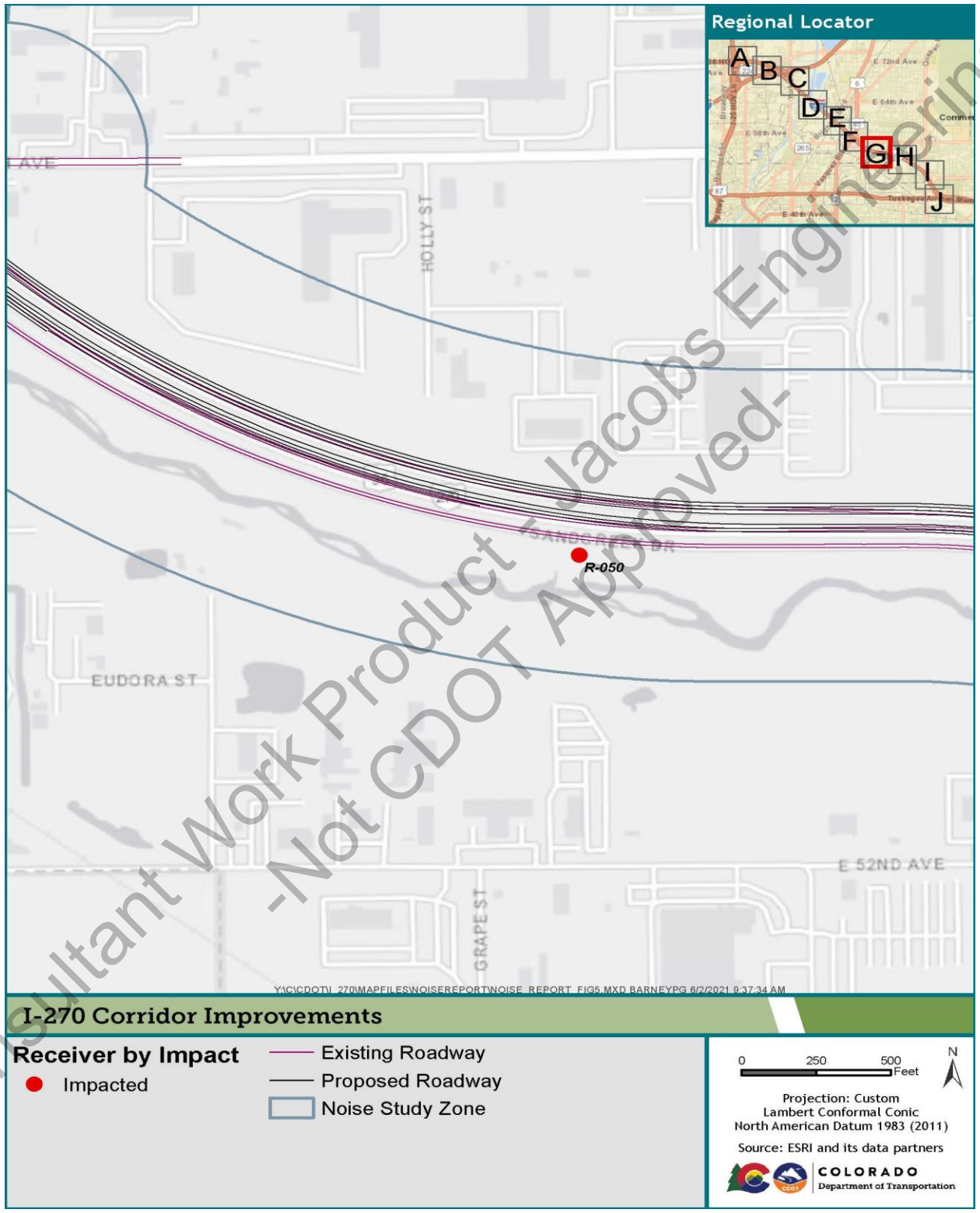
Note: Only one set of figures was included for the Proposed Action since results are the same under both operating options.

Figure 5F Roadways and Receiver Noise Levels for Design Year (2040) Proposed Action (Impacts Identified)



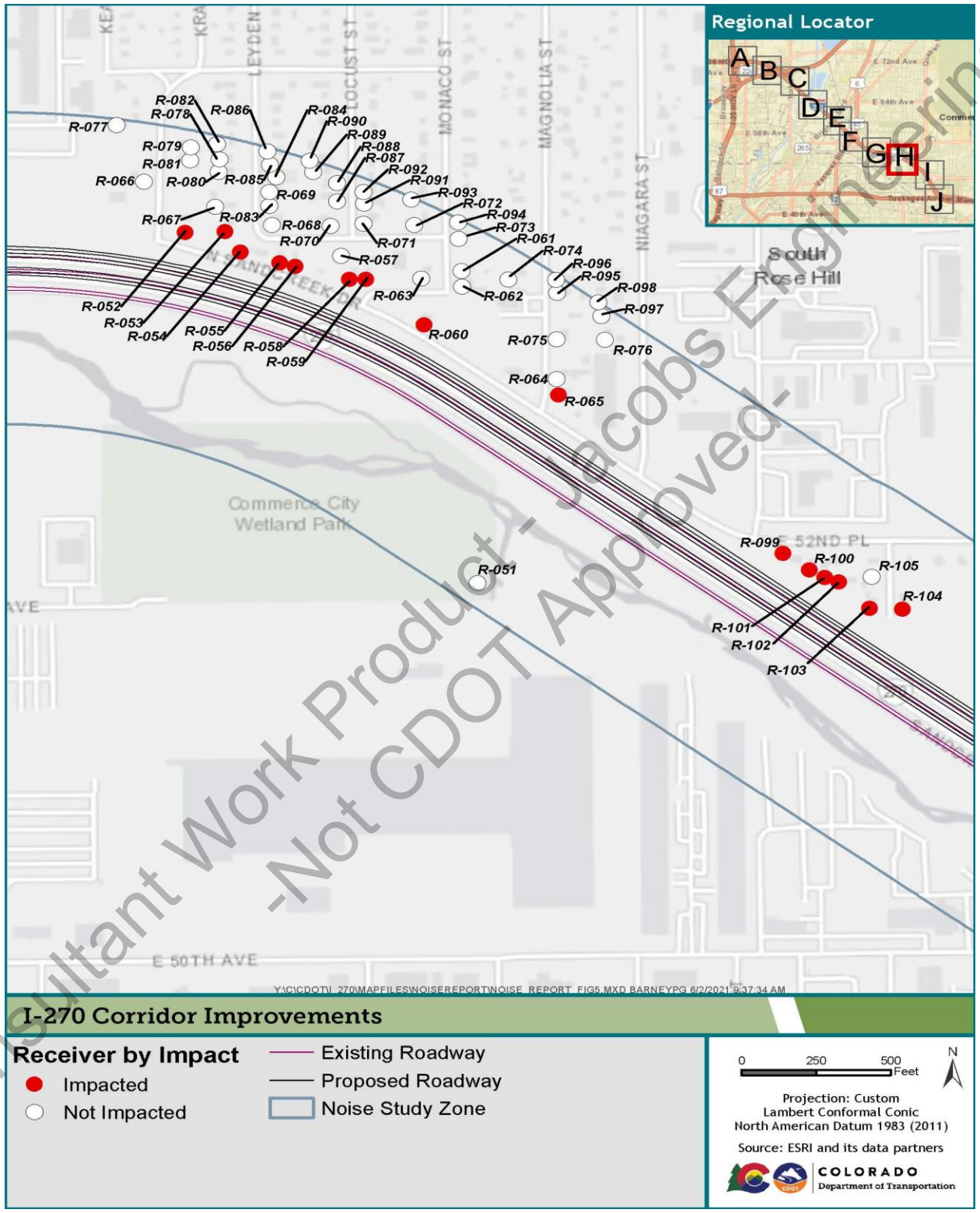
Note: Only one set of figures was included for the Proposed Action since results are the same under both operating options.

Figure 5G Roadways and Receiver Noise Levels for Design Year (2040) Proposed Action (Impacts Identified)



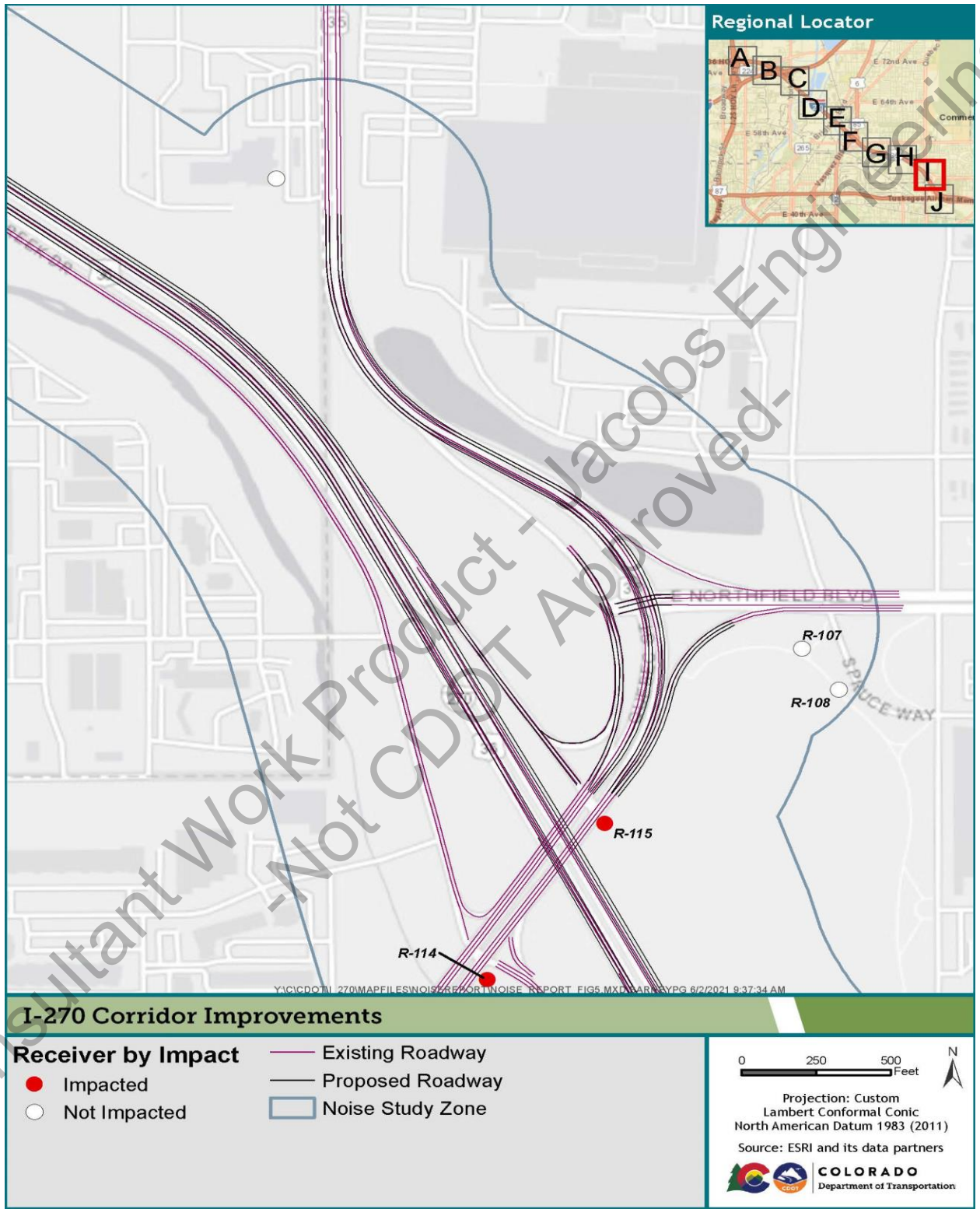
Note: Only one set of figures was included for the Proposed Action since results are the same under both operating options.

Figure 5H Roadways and Receiver Noise Levels for Design Year (2040) Proposed Action (Impacts Identified)



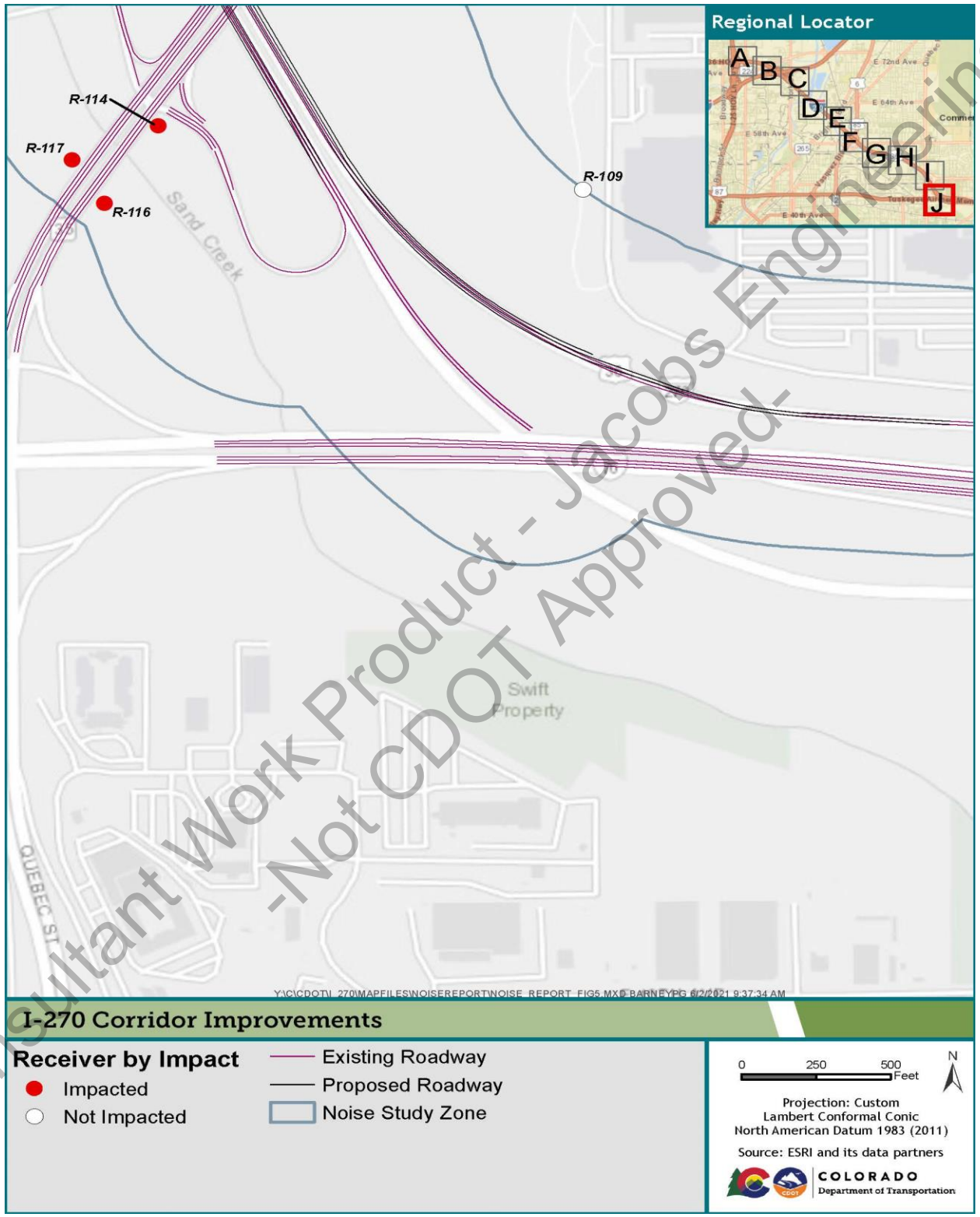
Note: Only one set of figures was included for the Proposed Action since results are the same under both operating options.

Figure 5I Roadways and Receiver Noise Levels for Design Year (2040) Proposed Action (Impacts Identified)



Note: Only one set of figures was included for the Proposed Action since results are the same under both operating options.

Figure 5J Roadways and Receiver Noise Levels for Design Year (2040) Proposed Action (Impacts Identified)



Note: Only one set of figures was included for the Proposed Action since results are the same under both operating options.

Figure 6A Evaluated Noise Barrier Locations

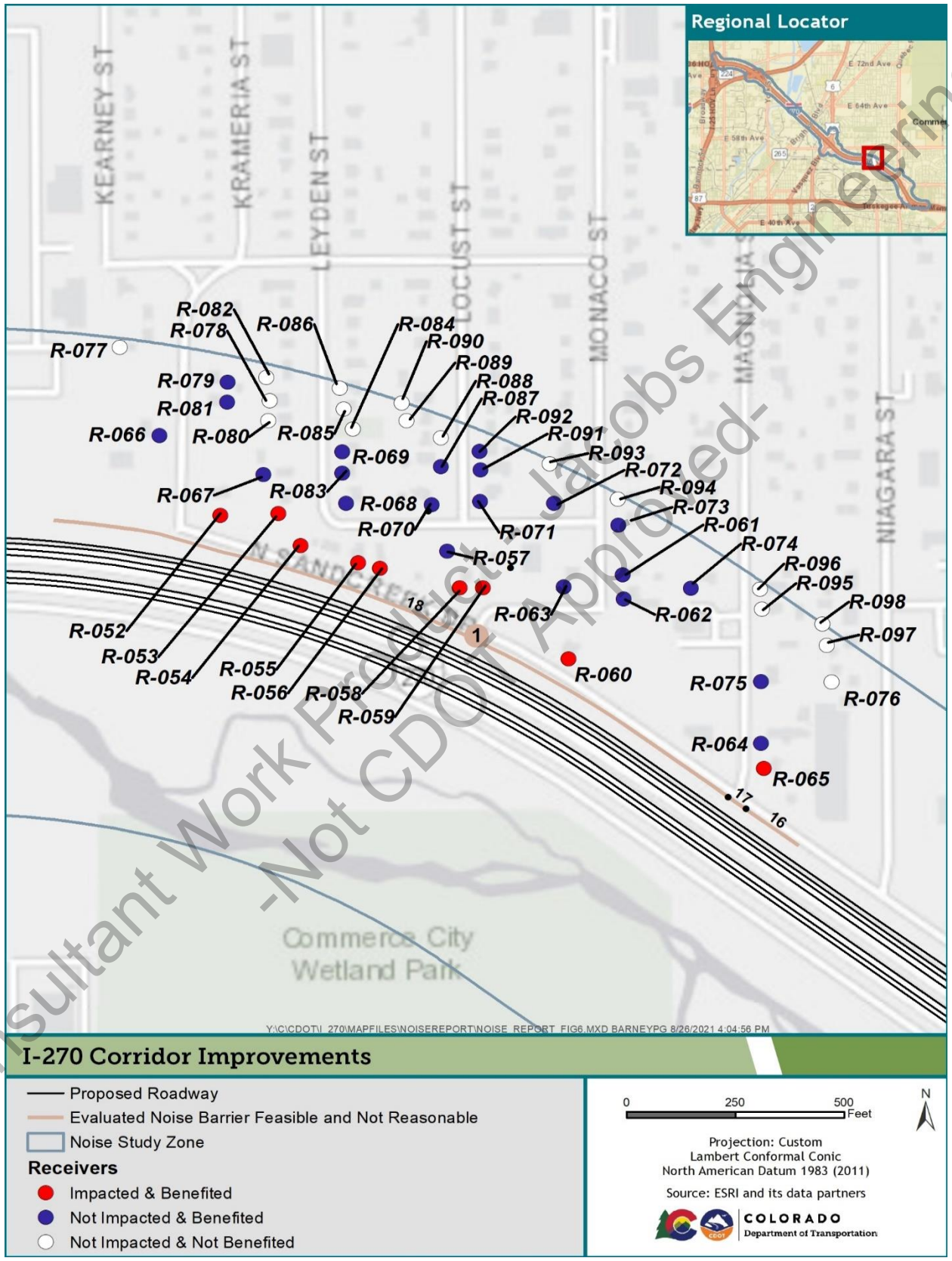


Figure 6B Evaluated Noise Barrier Locations

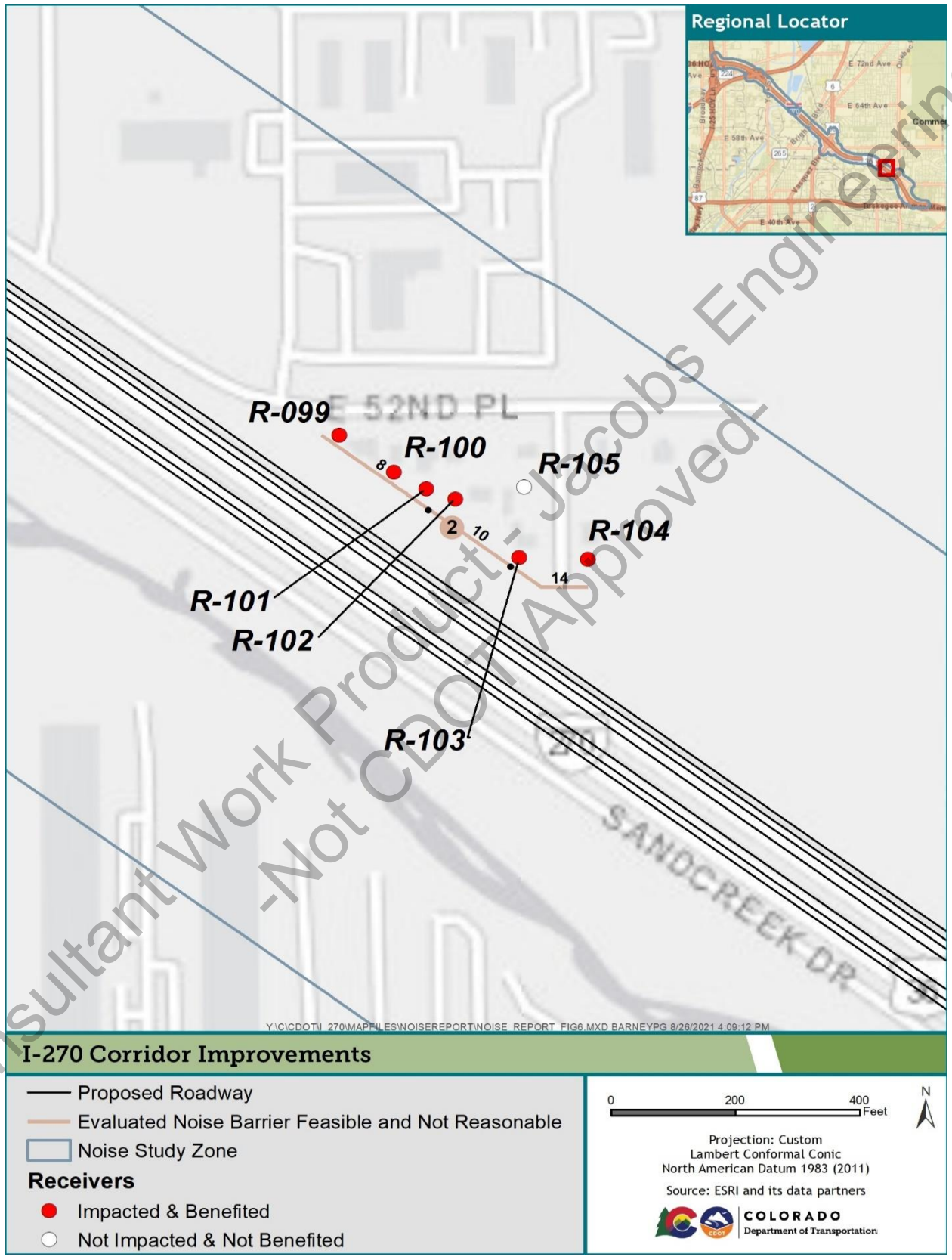


Figure 7A Design Year (2040) Proposed Action NAC Activity Category G Noise Level Contours

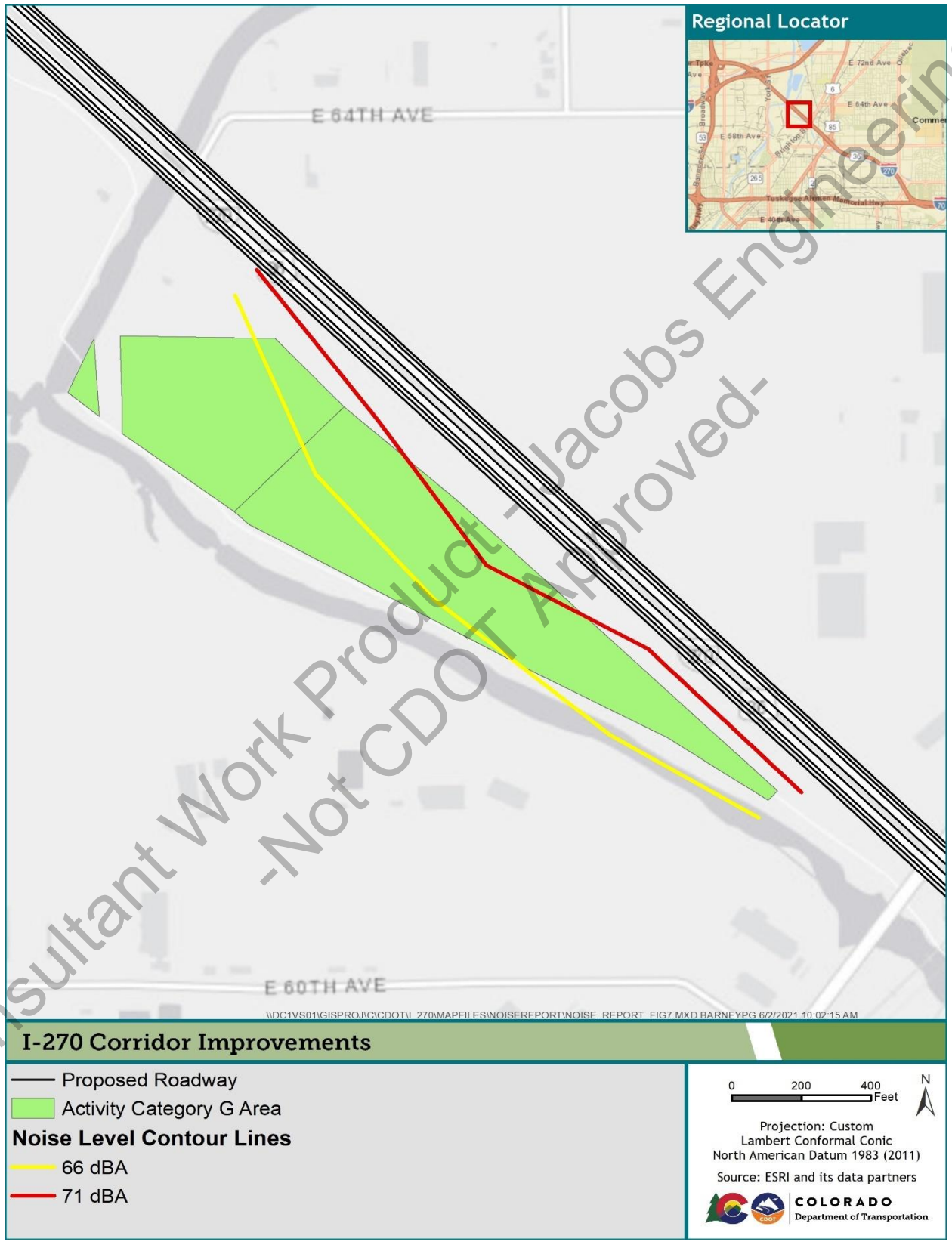


Figure 7B Design Year (2040) Proposed Action NAC Activity Category G Noise Level Contours

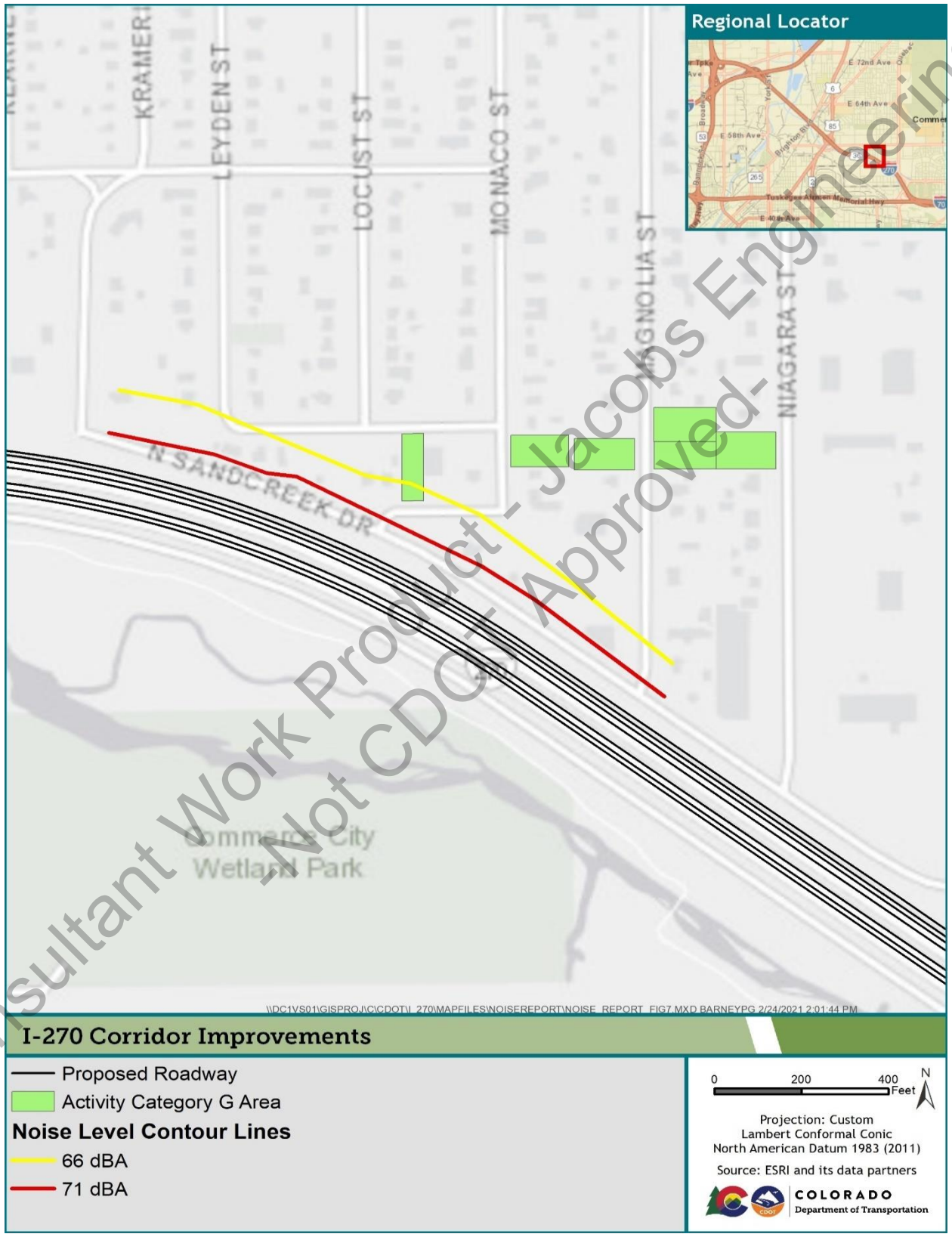
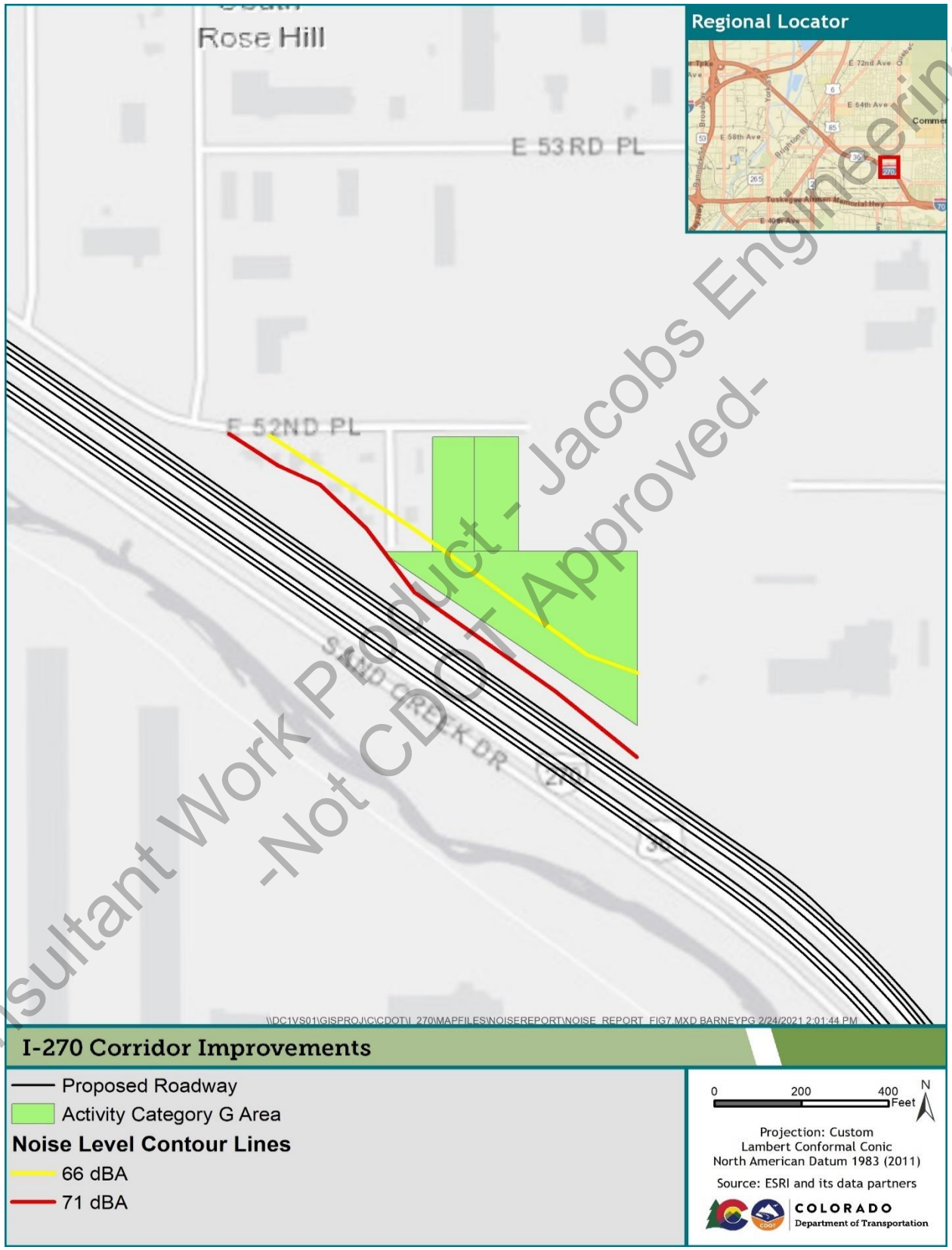


Figure 7C Design Year (2040) Proposed Action NAC Activity Category G Noise Level Contours



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APPENDIX A FIELD NOISE MEASUREMENT DATA

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Table A-1 Field Noise Measurement Traffic Volumes and Speeds Used in Validation

Roadway	Measurement Location ID	Date and Time of Traffic Volume and Speed Measurement	Equivalent Hourly Traffic Volume[1]					Estimated Vehicular Speed[2] (mph)	Posted Speed Limit[3] (mph)
			Cars	Medium Trucks	Heavy Trucks	Buses	Motorcycles		
I-270 WB from I-76 to I-25	NML 1	9/17/2020 and 3:37 PM to 3:47 PM	2,016	72	48	0	0	45 – 55	55
I-270 EB from I-25 to I-76	NML 1	9/17/2020 and 3:37 PM to 3:47 PM	2,020	132	144	0	0	45 – 55	55
I-270 WB off-ramp to I-25 NB	NML 1	9/17/2020 and 3:37 PM to 3:47 PM	1,068	18	138	0	0	20	25
I-25 SB to I-270 EB on-ramp	NML 1	9/17/2020 and 3:37 PM to 3:47 PM	912	36	138	0	0	40	40
Washington St SB from 73rd to 71st	NML 1	9/17/2020 and 3:37 PM to 3:47 PM	822	18	24	0	0	30 – 40	40
Washington St NB from 71st to 73rd	NML 1	9/17/2020 and 3:37 PM to 3:47 PM	1,242	36	30	0	0	30 – 40	40
York St SB at 68th Ave	NML 2	9/17/2020 and 10:32 AM to 10:42 AM	414	24	54	0	0	35	35
York St NB at 69th Ave	NML 2	9/17/2020 and 10:32 AM to 10:42 AM	162	0	12	0	0	35	35
I-270 WB from York to I-76	NML 2	9/17/2020 and 10:32 AM to 10:42 AM	1,800	108	132	0	0	45 – 55	55
I-270 EB from I-76 to York	NML 2	9/17/2020 and 10:32 AM to 10:42 AM	2,298	156	270	0	0	45 – 55	55

Table A-1 Field Noise Measurement Traffic Volumes and Speeds Used in Validation

Roadway	Measurement Location ID	Date and Time of Traffic Volume and Speed Measurement	Equivalent Hourly Traffic Volume[1]					Estimated Vehicular Speed[2] (mph)	Posted Speed Limit[3] (mph)
			Cars	Medium Trucks	Heavy Trucks	Buses	Motorcycles		
I-270 EB from I-76 to York	NML 3	9/17/2020 and 11:30 AM to 11:40 AM	2,142	216	294	0	6	45 – 55	55
I-270 WB from York to I-76	NML 3	9/17/2020 and 11:30 AM to 11:40 AM	1,788	84	162	0	0	45 – 55	55
I-270 off-ramp to I-76 WB	NML 3	9/17/2020 and 11:30 AM to 11:40 AM	186	54	60	0	0	25 – 35	35
I-76 EB to I-270 EB on-ramp	NML 3	9/17/2020 and 11:30 AM to 11:40 AM	120	18	60	0	0	25 – 35	35
York St NB from 67th to 68th Ave	NML 4	9/17/2020 and 1:07 PM to 1:17 PM	150	24	12	0	0	25 – 35	35
York SB from 68th to 67th Ave	NML 4	9/17/2020 and 1:07 PM to 1:17 PM	162	30	48	0	0	25 – 35	35
I-270 EB south of York Street	NML 4	9/17/2020 and 1:07 PM to 1:17 PM	2,082	210	330	0	0	45 – 55	55
I-270 WB south of York Street	NML 4	9/17/2020 and 1:07 PM to 1:17 PM	2,338	84	414	0	0	45 – 55	55
York St NB to I-270 EB on-ramp	NML 4	9/17/2020 and 1:07 PM to 1:17 PM	30	6	24	0	0	40	40
York St SB to I-270 EB on-ramp	NML 4	9/17/2020 and 1:07 PM to 1:17 PM	216	30	0	0	0	40	40

Table A-1 Field Noise Measurement Traffic Volumes and Speeds Used in Validation

Roadway	Measurement Location ID	Date and Time of Traffic Volume and Speed Measurement	Equivalent Hourly Traffic Volume[1]					Estimated Vehicular Speed[2] (mph)	Posted Speed Limit[3] (mph)
			Cars	Medium Trucks	Heavy Trucks	Buses	Motorcycles		
I-270 WB off-ramp to York	NML 4	9/17/2020 and 1:07 PM to 1:17 PM	234	12	96	0	0	30 – 40	40
I-270 EB from York to Vasquez	NML 5	9/17/2020 and 12:19 PM to 12:29 PM	2,280	228	294	0	12	55	55
I-270 WB from Vasquez to York	NML 5	9/17/2020 and 12:19 PM to 12:29 PM	2,154	288	210	0	0	55	55
56th EB south of Vasquez	NML 6	9/17/2020 and 2:37 PM to 2:47 PM	486	42	30	0	12	30	30
56th WB south of Vasquez	NML 6	9/17/2020 and 2:37 PM to 2:47 PM	816	24	78	0	6	30	30
Sandcreek EB south of 56th	NML 6	9/17/2020 and 2:37 PM to 2:47 PM	51	0	5	0	0	45	45
Sandcreek WB south of 56th	NML 6	9/17/2020 and 2:37 PM to 2:47 PM	153	0	13	0	0	45	45
I-270 WB south of Vasquez	NML 6	9/17/2020 and 2:37 PM to 2:47 PM	2,010	66	288	0	0	20	55
I-270 EB south of Vasquez	NML 6	9/17/2020 and 2:37 PM to 2:47 PM	2,754	144	252	0	0	55	55
I-270 WB from Quebec to Vasquez	NML 7	9/17/2020 and 2:07 PM to 2:17 PM	1,890	120	204	0	0	55	55

Table A-1 Field Noise Measurement Traffic Volumes and Speeds Used in Validation

Roadway	Measurement Location ID	Date and Time of Traffic Volume and Speed Measurement	Equivalent Hourly Traffic Volume[1]					Estimated Vehicular Speed[2] (mph)	Posted Speed Limit[3] (mph)
			Cars	Medium Trucks	Heavy Trucks	Buses	Motorcycles		
I-270 EB from Vasquez to Quebec	NML 7	9/17/2020 and 2:07 PM to 2:17 PM	2,334	114	240	0	0	55	55
I-270 WB from Quebec to Vasquez	NML 8	9/16/2020 and 12:08 PM to 12:18 PM	2,112	90	360	6	0	55	55
I-270 EB from Vasquez to Quebec	NML 8	9/16/2020 and 12:08 PM to 12:18 PM	1,806	168	378	0	0	55	55
I-270 WB onramp from I-70	NML 9	9/16/2020 and 11:20 AM to 11:30 AM	1,746	114	396	0	0	40 – 50	50
I-270 EB off-ramp to I-70	NML 9	9/16/2020 and 11:20 AM to 11:30 AM	1,626	138	282	0	0	45	45
I-270 EB off-ramp to Quebec	NML 9	9/16/2020 and 11:20 AM to 11:30 AM	264	24	48	0	0	20 – 25	25

1. Traffic volumes were measured during field noise measurements. These are shown on field data sheets, which are in this appendix.
2. Method used to estimate vehicular speed: Drove test vehicle through traffic within 30 minutes of noise measurement; traffic was still representative of when measurements were taken. Although varying speeds were observed during the measurements, the highest observed speed was modeled for all vehicle types in the validation models.
3. Posted speeds are included for informational purposes. Estimated speeds were used when validating the existing conditions model.

Noise Measurement Data Sheet				
Conducted by: Rachel Saunders, Carrie Wencel, Matt Berns			**Date:** 9/17/20	
Project Name and Number: I-270 Improvements (23198)				
Site Address: behind 7261 Washington Street			**Site Id:** NML #1	
Noise Meter Model: Quest 2900	**Response** Fast ☐ Slow ☒	**Weighting** A ☒ C ☐	**Calibrator** Model: QC-10	Calibrator @ 114 dBA
Weather Data Temp: 87 Humidity: Wind Speed: <5 mph Notes				

Measurement Data					
Event #:	Begin Time:	End Time:	L_{eq} (dBA):	L_{min} (dBA):	L_{max} (dBA):
NML 1	3:37pm	3:47pm	58.7	52.3	69.7

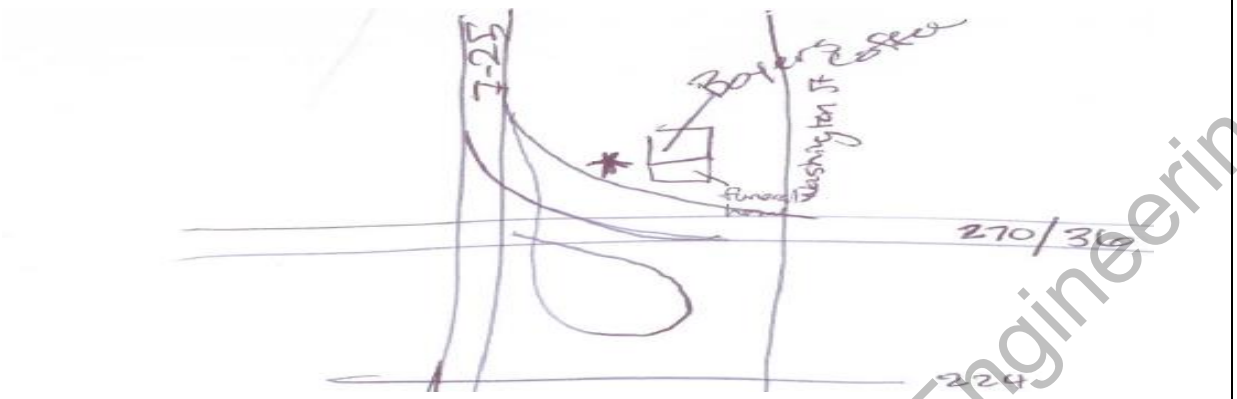
Vehicle Type	**Roadway:** I-270 between I-25 and I-76			**Roadway:** I-270 WB offramp to I-25 NB		
	Directional Volume* WB	**Directional Volume*** EB	**Speed (mph)**	**Directional Volume*** WB	**Directional Volume***	**Speed (mph)**
Autos	2,016	2,020	55	1,068		25
Medium Trucks	72	132	50	18		25
Heavy Trucks	48	144	45	138		25
Buses						
Motorcycles						

*total hourly counts (10-minute count times 6)

Vehicle Type	**Roadway:** I-25 SB to I-270 EB onramp			**Roadway:** Washington Street between 71st and 73rd		
	Directional Volume* WB	**Directional Volume***	**Speed (mph)**	**Directional Volume*** SB	**Directional Volume*** NB	**Speed (mph)**
Autos	912		40	822	1,242	40
Medium Trucks	36		40	18	36	35
Heavy Trucks	138		40	24	30	30
Buses						
Motorcycles						

*total hourly counts (10-minute count times 6)

Site Sketch – NML #1



(show distances to important features, e.g., centerline, buildings, driveways, etc.)

Notes

(Major sources, background noise, unusual events, etc.)

Plane at 3:37pm; recycling center "beeps" high pitch at 3:44pm

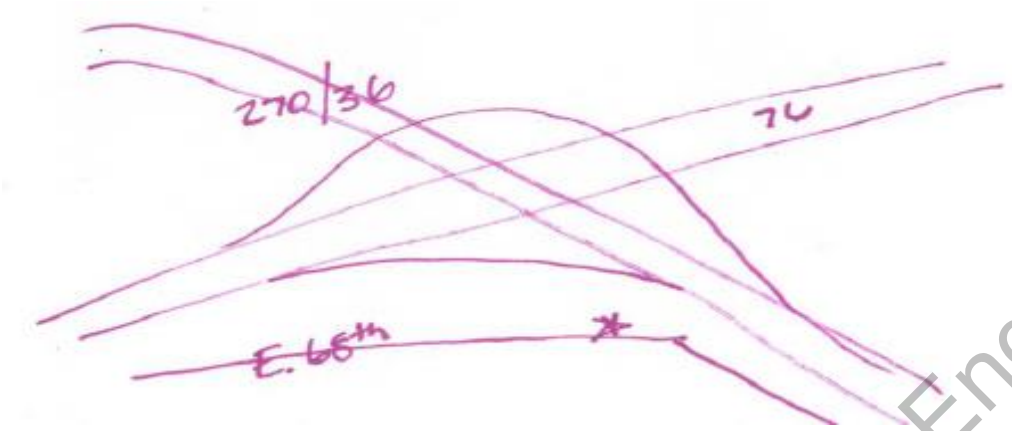
Noise Measurement Data Sheet				
Conducted by: Rachel Saunders, Carrie Wencel, Matt Berns				**Date:** 9/17/20
Project Name and Number: I-270 Improvements (23198)				
Site Address: 2161 E 68th Avenue				**Site Id:** NML #2
Noise Meter Model: Quest 2900	**Response** Fast ☐ Slow ☒	**Weighting** A ☒ C ☐	**Calibrator** Model: QC-10	Calibrator @ 114 dBA
Weather Data Temp: 71 Humidity: 29% Wind Speed: <5 mph Notes				

Measurement Data					
Event #:	Begin Time:	End Time:	L_{eq} (dBA):	L_{min} (dBA):	L_{max} (dBA):
NML 2	10:32 am	10:42 am	58.9	57.1	62.1

Vehicle Type	**Roadway:** I-270 between I-76 and York Street			**Roadway:** York Street at 68th Avenue		
	Directional Volume* WB	**Directional Volume*** EB	**Speed (mph)**	**Directional Volume*** SB	**Directional Volume*** NB	**Speed (mph)**
Autos	1,800	2,298	55	414	162	35
Medium Trucks	108	156	50	24	0	35
Heavy Trucks	132	270	45	54	12	35
Buses						
Motorcycles						

*total hourly counts (10-minute count times 6)

Site Sketch – NML #2



(show distances to important features, e.g., centerline, buildings, driveways, etc.)

Notes

(Major sources, background noise, unusual events, etc.)

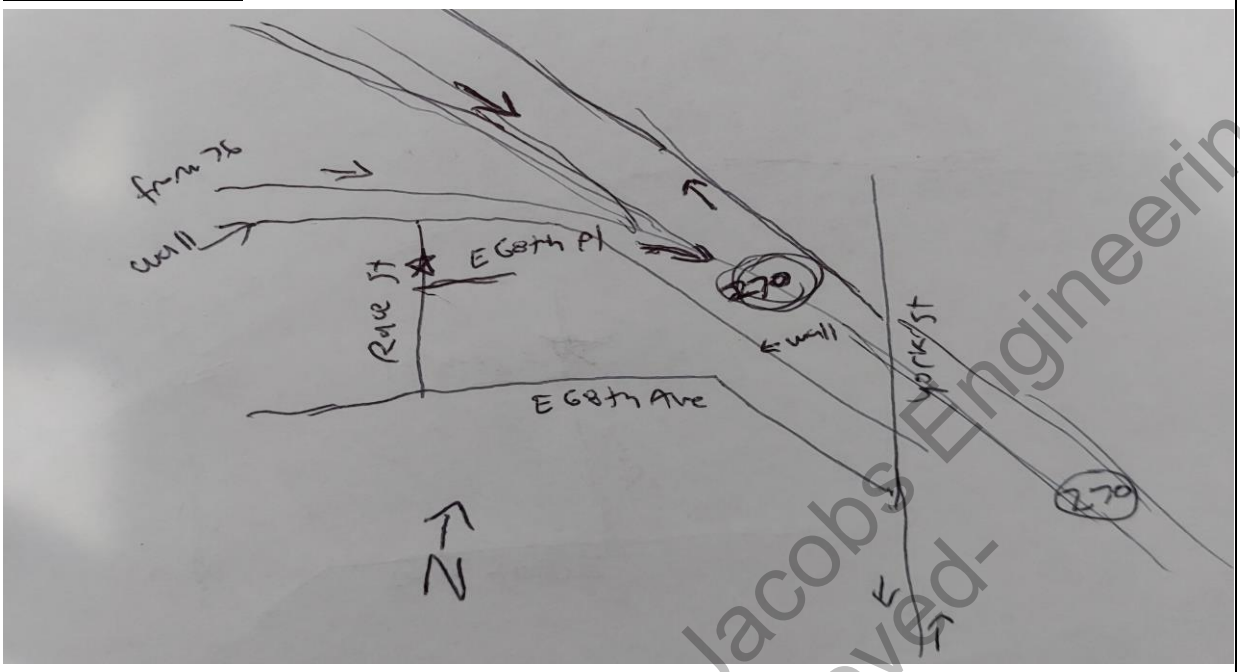
Noise Measurement Data Sheet				
Conducted by: Rachel Saunders, Carrie Wencel, Matt Berns			**Date:** 9/17/20	
Project Name and Number: I-270 Improvements (23198)				
Site Address: 6850 Race St			**Site Id:** NML #3	
Noise Meter Model: Quest 2900	**Response** Fast ☐ Slow ☒	**Weighting** A ☒ C ☐	**Calibrator** Model: QC-10	Calibrator @ 114 dBA
Weather Data Temp: 66 Humidity: Wind Speed: 0 mph Notes				

Measurement Data					
Event #:	Begin Time:	End Time:	L_{eq} (dBA):	L_{min} (dBA):	L_{max} (dBA):
NML 3	11:30 am	11:40 am	56.1	51.8	60.9

Vehicle Type	**Roadway:** I-270 between I-76 and York Street			**Roadway:** I-76 ramps		
	Directional Volume* WB	**Directional Volume*** EB	**Speed (mph)**	**Directional Volume*** Offramp to I-76	**Directional Volume*** Onramp to I-270	**Speed (mph)**
Autos	1,788	2,142	55	186	120	35
Medium Trucks	84	216	50	54	18	30
Heavy Trucks	162	294	45	60	60	25
Buses						
Motorcycles		6	55			

*total hourly counts (10-minute count times 6)

Site Sketch – NML #3



(show distances to important features, e.g., centerline, buildings, driveways, etc.)

Notes

(Major sources, background noise, unusual events, etc.)

Airplane 11:31 am

Rooster 11:34 am

Noise Measurement Data Sheet				
Conducted by: Rachel Saunders, Carrie Wencel				**Date:** 9/17/20
Project Name and Number: I-270 Improvements (23198)				
Site Address: 6702 York St.				**Site Id:** NML #4
Noise Meter Model: Quest 2900	**Response** Fast ☐ Slow ☒	**Weighting** A ☒ C ☐	**Calibrator** Model: QC-10	Calibrator @ 114 dBA
Weather Data Temp: 82 Humidity: Wind Speed: 0 mph Notes				

Measurement Data					
Event #:	Begin Time:	End Time:	L_{eq} (dBA):	L_{min} (dBA):	L_{max} (dBA):
NML 4	1:07 pm	1:17 pm	63.4	57.2	75.7

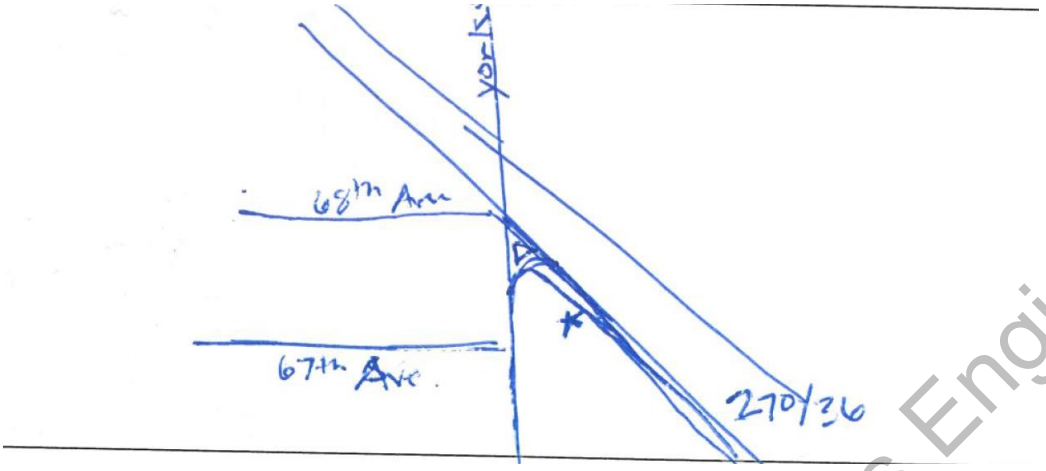
Vehicle Type	**Roadway:** I-270 south of York Street			**Roadway:** York Street between 67th and 68th Avenue		
	Directional Volume* WB	**Directional Volume*** EB	**Speed (mph)**	**Directional Volume*** NB	**Directional Volume*** SB	**Speed (mph)**
Autos	2,338	2,082	55	150	162	35
Medium Trucks	84	210	50	24	30	30
Heavy Trucks	414	330	45	12	48	25
Buses						
Motorcycles						

*total hourly counts (10-minute count times 6)

Vehicle Type	**Roadway:** York Street to I-270 EB onramp			**Roadway:** I-270 offramp to York Street		
	Directional Volume* NB	**Directional Volume*** SB	**Speed (mph)**	**Directional Volume*** WB	**Directional Volume***	**Speed (mph)**
Autos	30	216	40	234		40
Medium Trucks	6	30	40	12		35
Heavy Trucks	24	0	40	96		30
Buses						
Motorcycles						

*total hourly counts (10-minute count times 6)

Site Sketch – NML #4



(show distances to important features, e.g., centerline, buildings, driveways, etc.)

Notes

(Major sources, background noise, unusual events, etc.)

Airplane 11:31 am

Rooster 11:34 am

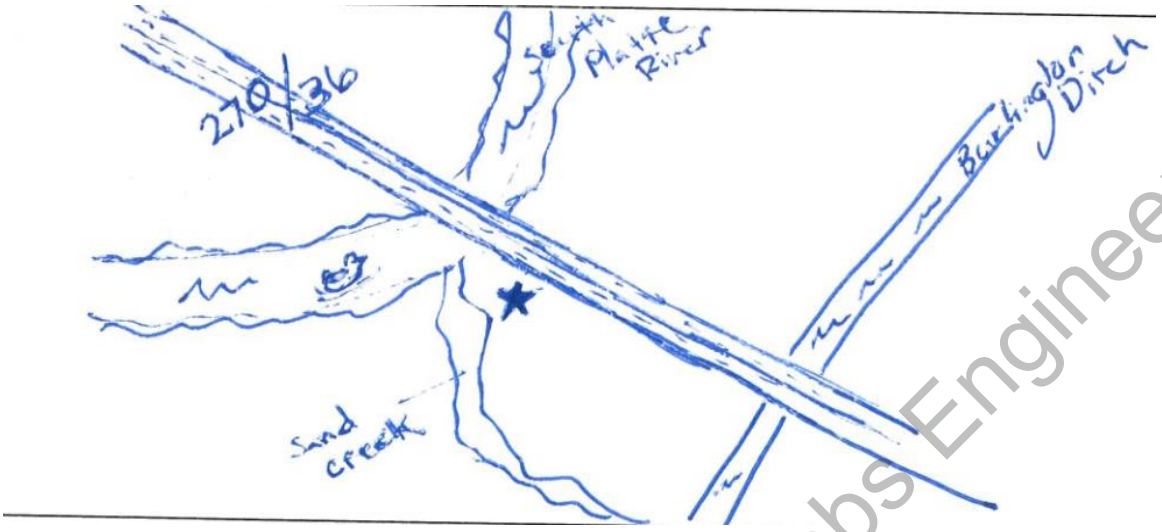
Noise Measurement Data Sheet				
Conducted by: Rachel Saunders, Carrie Wencel, Matt Berns				**Date:** 9/17/20
Project Name and Number: I-270 Improvements (23198)				
Site Address: Trailhead at Sand Creek Greenway (Spur at O'Brian Canal)				**Site Id:** NML #5
Noise Meter Model: Quest 2900	**Response** Fast ☐ Slow ☒	**Weighting** A ☒ C ☐	**Calibrator** Model: QC-10	Calibrator @ 114 dBA
Weather Data Temp: 80 Humidity: Wind Speed: 0 mph Notes				

Measurement Data					
Event #:	Begin Time:	End Time:	L_{eq} (dBA):	L_{min} (dBA):	L_{max} (dBA):
NML 5	12:19 pm	12:29 pm	68.5	62.0	77.8

Vehicle Type	**Roadway:** I-270 between York Street and Vasquez Boulevard			**Roadway:**		
	Directional Volume* WB	**Directional Volume*** EB	**Speed (mph)**	**Directional Volume***	**Directional Volume***	**Speed (mph)**
Autos	2,154	2,280	55			
Medium Trucks	288	228	55			
Heavy Trucks	210	294	55			
Buses						
Motorcycles		12	55			

*total hourly counts (10-minute count times 6)

Site Sketch – NML #5



(show distances to important features, e.g., centerline, buildings, driveways, etc.)

Notes

(Major sources, background noise, unusual events, etc.)

Biker – 12:23pm, 12:26pm, 12:27pm

Noise Measurement Data Sheet				
Conducted by: Rachel Saunders, Carrie Wencel, Matt Berns				**Date:** 9/17/20
Project Name and Number: I-270 Improvements (23198)				
Site Address: Dahlia Trailhead at Sand Creek Greenway				**Site Id:** NML #6
Noise Meter Model: Quest 2900	**Response** Fast ☐ Slow ☒	**Weighting** A ☒ C ☐	**Calibrator** Model: QC-10	Calibrator @ 114 dBA
Weather Data Temp: 84 Humidity: Wind Speed: <5 mph Notes				

Measurement Data					
Event #:	Begin Time:	End Time:	L_{eq} (dBA):	L_{min} (dBA):	L_{max} (dBA):
NML 6	2:37 pm	2:47 pm	66.3	61.6	77.9

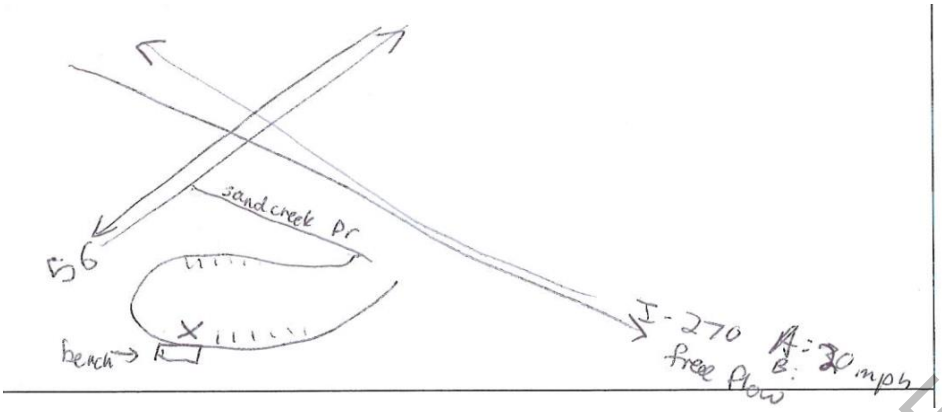
Vehicle Type	**Roadway:** I-270 WB south of Vasquez Boulevard			**Roadway:** I-270 EB south of Vasquez Boulevard		
	Directional Volume* WB	**Directional Volume***	**Speed (mph)**	**Directional Volume*** EB	**Directional Volume***	**Speed (mph)**
Autos	2,010		20	2,754		55
Medium Trucks	66		20	144		55
Heavy Trucks	288		20	252		55
Buses						
Motorcycles						

*total hourly counts (10-minute count times 6)

Vehicle Type	**Roadway:** Sandcreek Drive south of 56th Avenue			**Roadway:** 56th Avenue south of Vasquez		
	Directional Volume* WB	**Directional Volume*** EB	**Speed (mph)**	**Directional Volume*** WB	**Directional Volume*** EB	**Speed (mph)**
Autos	153	51	45	816	486	30
Medium Trucks	0	0	0	24	42	30
Heavy Trucks	13	5	45	78	30	30
Buses						
Motorcycles				6	12	30

*total hourly counts (10-minute count times 6)

Site Sketch – NML #6



(show distances to important features, e.g., centerline, buildings, driveways, etc.)

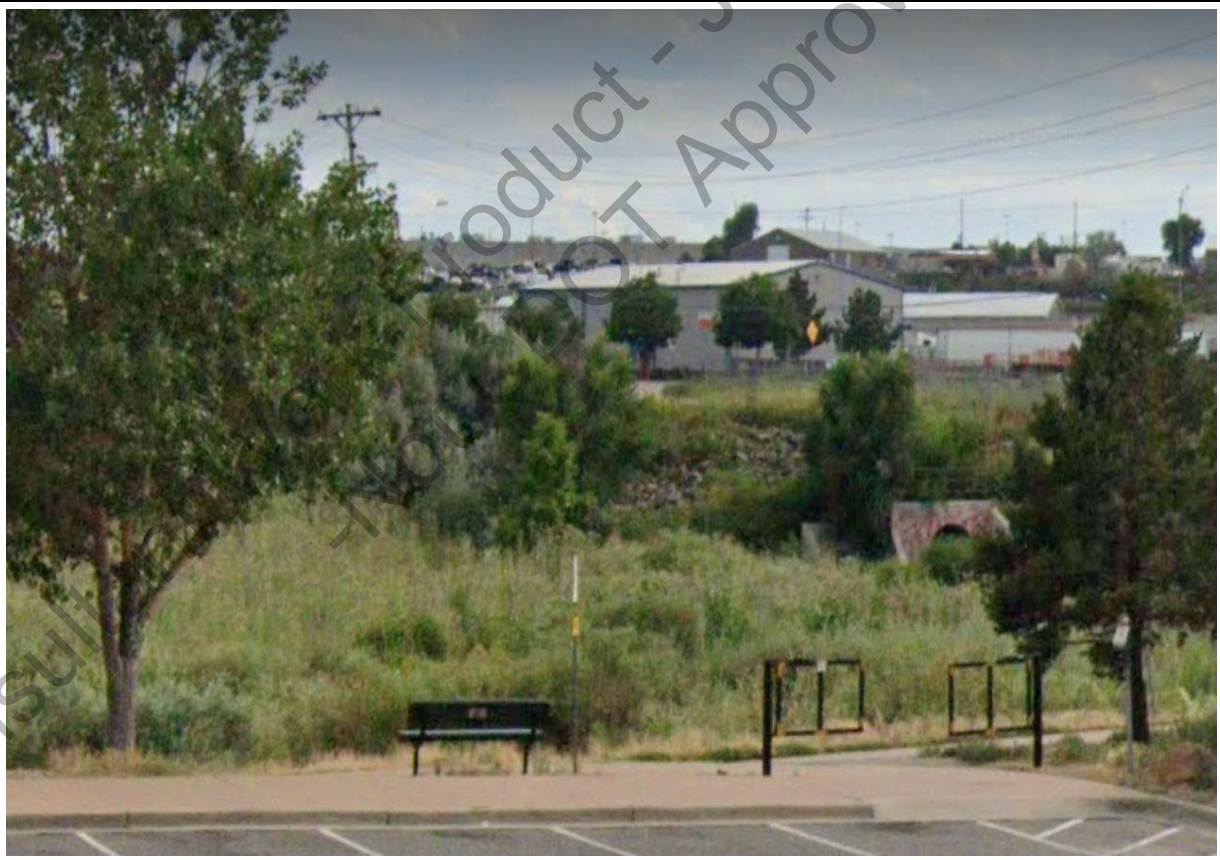
Notes

(Major sources, background noise, unusual events, etc.)

2 cars in parking lot

Siren 2:41pm

Horn honk 2:43pm



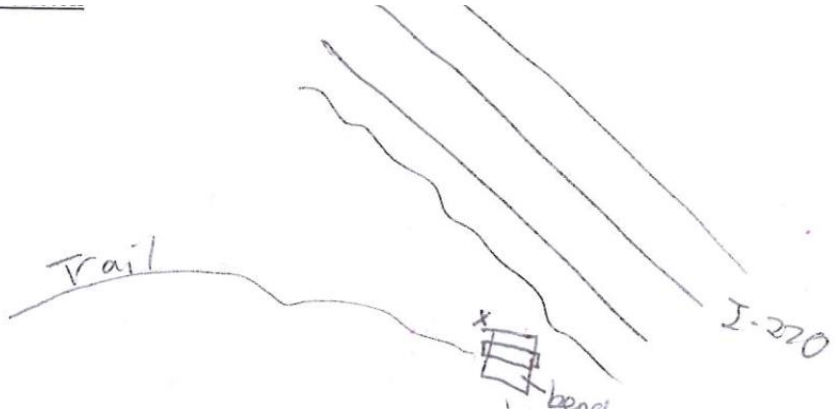
Noise Measurement Data Sheet				
Conducted by: Rachel Saunders, Carrie Wencel, Matt Berns				**Date:** 9/17/20
Project Name and Number: I-270 Improvements (23198)				
Site Address: Trail Pavilion at Sand Creek Greenway				**Site Id:** NML #7
Noise Meter Model: Quest 2900	**Response** Fast ☐ Slow ☒	**Weighting** A ☒ C ☐	**Calibrator** Model: QC-10	Calibrator @ 114 dBA
Weather Data Temp: 84 Humidity: Wind Speed: <5 mph Notes				

Measurement Data					
Event #:	Begin Time:	End Time:	L_{eq} (dBA):	L_{min} (dBA):	L_{max} (dBA):
NML 7	2:07 pm	2:17 pm	63.6	61.6	70.3

Vehicle Type	**Roadway:** I-270 between Vasquez Boulevard and Quebec Street			**Roadway:**		
	Directional Volume* WB	**Directional Volume*** EB	**Speed (mph)**	**Directional Volume***	**Directional Volume***	**Speed (mph)**
Autos	1890	2334	55			
Medium Trucks	120	114	55			
Heavy Trucks	204	240	55			
Buses						
Motorcycles						

*total hourly counts (10-minute count times 6)

Site Sketch – NML #7



(show distances to important features, e.g., centerline, buildings, driveways, etc.)

Notes

(Major sources, background noise, unusual events, etc.)

Bag fell over 2:10pm

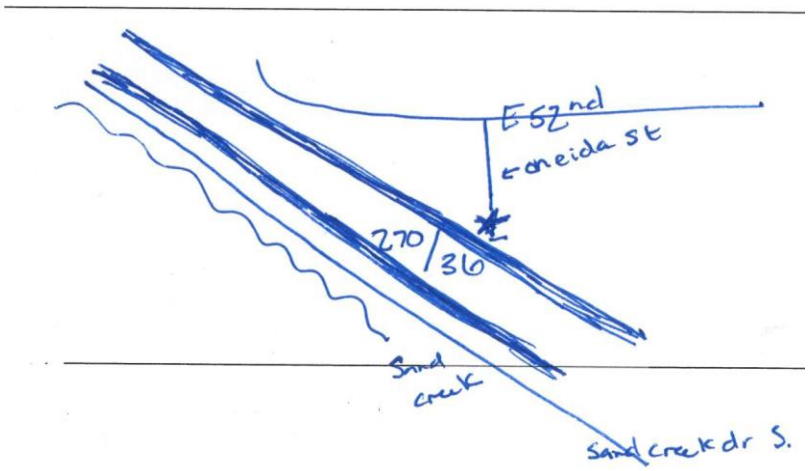
Noise Measurement Data Sheet				
Conducted by: Rachel Saunders, Carrie Wencel, Matt Berns				**Date:** 9/16/20
Project Name and Number: I-270 Improvements (23198)				
Site Address: 5250 Oneida St.				**Site Id:** NML #8
Noise Meter Model: Quest 2900	**Response** Fast ☐ Slow ☒	**Weighting** A ☒ C ☐	**Calibrator** Model: QC-10	Calibrator @ 114 dBA
Weather Data Temp: 72 Humidity: Wind Speed: 0 mph Notes				

Measurement Data					
Event #:	Begin Time:	End Time:	L_{eq} (dBA):	L_{min} (dBA):	L_{max} (dBA):
NML 8	12:08pm	12:18pm	66.1	54.5	71.1

Vehicle Type	**Roadway:** I-270 between Vasquez Boulevard and Quebec Street			**Roadway:**		
	Directional Volume* WB	**Directional Volume*** EB	**Speed (mph)**	**Directional Volume*** EB	**Directional Volume*** WB	**Speed (mph)**
Autos	2112	1806	55			
Medium Trucks	90	168	55			
Heavy Trucks	360	378	55			
Buses	6		55			
Motorcycles						

*total hourly counts (10-minute count times 6)

Site Sketch – NML #8



(show distances to important features, e.g., centerline, buildings, driveways, etc.)

Notes

(Major sources, background noise, unusual events, etc.)

Airplane - 12:09pm, 12:11pm, 12:13pm

Noise Measurement Data Sheet				
Conducted by: Rachel Saunders, Carrie Wencel, Matt Berns				**Date:** 9/16/20
Project Name and Number: I-270 Improvements (23198)				
Site Address: Trail at Northfield Pond Park				**Site Id:** NML #9
Noise Meter Model: Quest 2900	**Response** Fast ☐ Slow ☒	**Weighting** A ☒ C ☐	**Calibrator** Model: QC-10	Calibrator @ 114 dBA
Weather Data Temp: 72 Humidity: Wind Speed: 0 mph Notes				

Measurement Data					
Event #:	Begin Time:	End Time:	L_{eq} (dBA):	L_{min} (dBA):	L_{max} (dBA):
NML 9	11:20 am	11:30 am	62.4	56.5	68.8

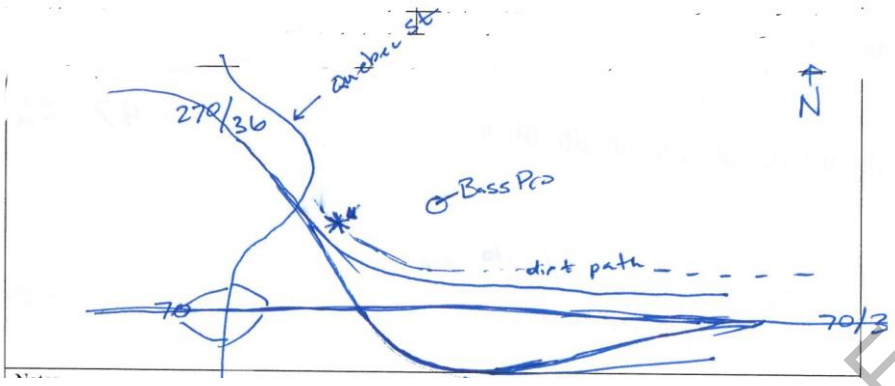
Vehicle Type	**Roadway:** I-270 WB onramp from I-70			**Roadway:** I-270 EB offramp to I-70		
	Directional Volume* WB	**Directional Volume***	**Speed (mph)**	**Directional Volume***	**Directional Volume*** EB	**Speed (mph)**
Autos	1746		50		1626	45
Medium Trucks	114		40		138	45
Heavy Trucks	396		40		282	45
Buses						
Motorcycles						

*total hourly counts (10-minute count times 6)

Vehicle Type	**Roadway:** I-270 offramp to Quebec Street			**Roadway:**		
	Directional Volume*	**Directional Volume*** EB	**Speed (mph)**	**Directional Volume***	**Directional Volume***	**Speed (mph)**
Autos		264	25			
Medium Trucks		24	20			
Heavy Trucks		48	20			
Buses						
Motorcycles						

*total hourly counts (10-minute count times 6)

Site Sketch – NML #9



(show distances to important features, e.g., centerline, buildings, driveways, etc.)

Notes

(Major sources, background noise, unusual events, etc.)

Airplane – 11:20am, 11:23am, 11:26am

Prairie Dog barking – 11:19 – 11:20am

Crickets chirping – 11:20am – 11:22am

APPENDIX B TNM NOISE MODELING INPUT DATA

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Table B-1 Traffic Input Data

Roadway	Number of Lanes	Cars/ Lane Hour	Medium Trucks/ Lane/Hour	Heavy Trucks/ Lane/Hour	Posted Speed (mph)
Existing Conditions Noise Model Traffic Data (2016)[1]					
I-25 NB[2]	3	2,757	150	150	55
I-25 NB (CDOT NAAG maximum volume)[3]	3	1,804	98	98	55
I-25 SB on-ramp to I-270 EB	2	530	13	13	40
I-270 EB at I-25	2	800	22	28	55
I-270 EB from I-25 to I-76	3	893	23	30	55
I-270 EB off-ramp to I-76 EB	1	820	13	17	40
I-76 (east of I-25)[2]	6	1,066	36	44	75
I-76 (east of I-270)[2]	4	1,670	112	137	75
I-76 (east of I-270 – CDOT NAAG maximum volume)[3]	4	1,488	50	62	75
I-270 EB between I-76 ramps N	2	950	29	36	55
I-76 WB off-ramp to I-270 EB	1	50	0	0	25
I-270 EB between I-76 ramps S	2	980	29	36	55
I-76 EB on-ramp to I-270 EB	1	560	9	11	45
I-270 EB I-76 to York	2	1,255	35	45	55
York on-ramp to I-270 EB	1	460	13	17	35
York St/S of I-270 EB on-ramp – NB	1	700	20	25	35
York St/S of I-270 EB on-ramp – SB	1	150	4	5	35
York St/N of I-270 EB on-ramp – NB	1	484	14	18	35
York St/N of I-270 EB on-ramp – SB	1	474	14	17	35
I-270 EB from York to Vasquez	2	1,495	44	56	55
I-270 EB offramp to Vasquez SB	1	530	18	22	35
I-270 EB between Vasquez ramps N	2	1,235	33	42	55
Vasquez SB on-ramp to I-270 EB – loop ramp	1	290	9	11	25
I-270 EB off-ramp to Vasquez NB – loop ramp	1	180	4	6	25
I-270 EB between Vasquez ramps S	2	1,380	40	50	55
56th Avenue EB – south of Vasquez	2	104	3	4	30
56th Avenue WB – south of Vasquez	2	426	14	18	30
SH 6/Vasquez (S of I-270)[2]	6	639	36	32	45

Table B-1 Traffic Input Data

Roadway	Number of Lanes	Cars/ Lane Hour	Medium Trucks/ Lane/Hour	Heavy Trucks/ Lane/Hour	Posted Speed (mph)
SH 6/Vasquez (N of I-270)[2]	6	647	69	34	45
I-270 EB from Vasquez to Quebec	2	1,290	37	48	55
I-270 EB off-ramp to Quebec	1	470	13	17	25
SH 35/Quebec (N of I-270)[2]	4	1,024	35	15	45
SH 35/Quebec (N of I-70)[2]	6	741	39	47	30
Sandcreek EB – north of Quebec	1	434	12	16	45
Sandcreek WB – north of Quebec	1	286	8	10	45
I-270 EB from Quebec to I-70	2	1,055	31	39	55
I-70 EB[2]	3	1,915	80	98	55
I-70 EB (CDOT NAAG maximum volumes)[3]	3	1,829	77	94	55
I-270 WB from I-70 to Quebec	2	845	22	28	55
Quebec SB on-ramp to I-270 WB	2	350	7	8	55
I-270 WB from Quebec to Vasquez	2	1,170	31	39	55
I-270 WB off-ramp to Vasquez NB	1	140	4	6	35
Vasquez NB on-ramp to I-270 WB – loop ramp	1	890	22	28	25
I-270 WB between off- and on-ramps	2	1,570	40	50	55
I-270 WB off-ramp to Vasquez SB – loop ramp	1	60	4	6	25
I-270 WB between off- and on-ramps	2	1,505	37	48	55
Vasquez SB on-ramp to I-270 WB	1	550	4	6	35
I-270 WB from Vasquez to York	2	1,765	40	50	55
I-270 WB off-ramp to I-76/York	1	930	22	28	40
I-270 WB off-ramp to York Street	2	285	11	14	35
York St/N of I-270 WB off-ramp – NB	2	489	19	24	35
York St/N of I-270 WB off-ramp – SB	2	197	8	10	35
I-270 WB off-ramp to I-76	2	170	2	3	40
I-270 WB from York to I-76	2	1,290	29	36	55
I-76 WB off-ramp to I-270 WB	1	600	13	17	35
I-270 WB from I-76 to I-25	3	1,060	23	30	55
I-270 WB off-ramp to I-25	1	1,300	22	28	55
I-270 WB west of I-25	2	940	24	31	55

Table B-1 Traffic Input Data

Roadway	Number of Lanes	Cars/ Lane Hour	Medium Trucks/ Lane/Hour	Heavy Trucks/ Lane/Hour	Posted Speed (mph)
Design Year No Action Noise Model Traffic Data (2040)[1]					
I-25 NB[2]	3	3,249	177	177	55
I-25 NB (CDOT NAAG maximum volumes)[3]	3	1,804	98	98	55
I-25 SB on-ramp to I-270 EB	2	285	20	20	40
I-270 EB at I-25	2	1,195	44	56	55
I-270 EB from I-25 to I-76	3	980	40	50	55
I-270 EB off-ramp to I-76 EB	1	960	13	17	40
I-76 (east of I-25)[2]	6	1,324	45	55	75
I-76 (east of I-270)[2]	4	2,495	168	205	75
I-76 (east of I-270 – CDOT NAAG maximum volumes)[3]	4	1,488	50	62	75
I-270 EB between I-76 ramps N	2	980	53	67	55
I-76 WB off-ramp to I-270 EB	1	10	0	0	25
I-270 EB between I-76 ramps S	2	980	55	70	55
I-76 EB on-ramp to I-270 EB	1	300	9	11	45
I-270 EB I-76 to York	2	1,125	62	78	55
York on-ramp to I-270 EB	1	540	31	39	35
York St/S of I-270 EB on-ramp – NB	1	863	25	31	35
York St/S of I-270 EB on-ramp – SB	1	209	6	8	35
York St/N of I-270 EB on-ramp – NB	1	841	24	31	35
York St/N of I-270 EB on-ramp – SB	2	302	9	11	35
I-270 EB from York to Vasquez	2	1,385	79	101	55
I-270 EB off-ramp to Vasquez SB	1	720	44	56	35
I-270 EB between Vasquez ramps N	2	1,020	59	76	55
Vasquez SB on-ramp to I-270 EB – loop ramp	1	50	13	17	25
I-270 EB offramp to Vasquez NB – loop ramp	1	10	9	11	25
I-270 EB between Vasquez ramps S	2	1,045	66	84	55
56th Avenue EB – south of Vasquez	1	210	7	9	30
56th Avenue WB – south of Vasquez	2	448	15	19	30
SH 6/Vasquez (S of I-270)[2]	6	733	41	37	45

Table B-1 Traffic Input Data

Roadway	Number of Lanes	Cars/ Lane Hour	Medium Trucks/ Lane/Hour	Heavy Trucks/ Lane/Hour	Posted Speed (mph)
SH 6/Vasquez (N of I-270)[2]	6	749	80	39	45
I-270 EB from Vasquez to Quebec	2	1,040	62	78	55
I-270 EB off-ramp to Quebec	1	670	13	17	25
SH 35/Quebec (N of I-270)[2]	4	1,369	47	20	45
SH 35/Quebec (N of I-70)[2]	6	951	50	61	30
Sandcreek EB – north of Quebec	1	369	10	13	45
Sandcreek WB – north of Quebec	1	374	11	13	45
I-270 EB from Quebec to I-70	2	760	31	39	55
I-70 EB[2]	6	2,298	96	117	55
I-70 EB (CDOT NAAG maximum volumes)[3]	6	1,829	77	94	55
I-270 WB from I-70 to Quebec	2	865	46	59	55
Quebec SB on-ramp to I-270 WB	2	335	13	17	55
I-270 WB from Quebec to Vasquez	2	1,130	57	73	55
I-270 WB off-ramp to Vasquez NB	1	40	13	17	35
Vasquez NB on-ramp to I-270 WB – loop ramp	1	700	31	39	25
I-270 WB between off- and on-ramps	2	1,090	51	64	55
I-270 WB off-ramp to Vasquez SB – loop ramp	1	30	4	6	25
I-270 WB between off- and on-ramps	2	1,425	64	81	55
Vasquez SB on-ramp to I-270 WB	1	480	13	17	35
I-270 WB from Vasquez to York	2	1,665	70	90	55
I-270 WB off-ramp to I-76/York	1	800	40	50	40
I-270 WB off-ramp to York Street	2	150	11	14	35
York St/N of I-270 WB off-ramp – NB	2	550	21	27	35
York St/N of I-270 WB off-ramp – SB	2	274	11	14	35
I-270 WB off-ramp to I-76	2	260	7	8	40
I-270 WB from York to I-76	2	1,260	51	64	55
I-76 WB off-ramp to I-270 WB	1	420	18	22	35
I-270 WB from I-76 to I-25	3	980	40	50	55
I-270 WB off-ramp to I-25	1	760	35	45	55
I-270 WB west of I-25	2	1,090	42	53	55

Table B-1 Traffic Input Data

Roadway	Number of Lanes	Cars/ Lane Hour	Medium Trucks/ Lane/Hour	Heavy Trucks/ Lane/Hour	Posted Speed (mph)
Design Year Proposed Action General Purpose Lane Operating Option Noise Model Traffic Data (2040)[1]					
I-25 NB[3]	3	3,249	177	177	55
I-25 NB (CDOT NAAG maximum volume)[3]	3	1,804	98	98	55
I-25 SB on-ramp to I-270 EB	2	330	23	23	40
I-270 EB at I-25	2	1,420	46	59	55
I-270 EB from I-25 to I-76	3	910	38	49	55
I-270 EB off-ramp to I-76 EB	1	770	18	22	40
I-76 (east of I-25)[2]	6	1,324	45	55	75
I-76 (east of I-270)[2]	4	2,495	168	205	75
I-76 (east of I-270 – CDOT NAAG maximum volume)[3]	4	1,488	50	62	75
I-270 EB between I-76 ramps N	3	910	38	49	55
I-76 WB off-ramp to I-270 EB – loop	1	10	0	0	25
I-270 EB between I-76 ramps S	3	910	38	49	55
I-76 EB on-ramp to I-270 EB	1	640	13	17	45
I-270 EB I-76 to York	3	1,130	43	54	55
York on-ramp to I-270 EB	1	930	35	45	35
York St/S of I-270 EB on-ramp – NB	2	385	11	14	35
York St/S of I-270 EB on-ramp – SB	2	107	3	4	35
York St/N of I-270 EB on-ramp – NB	2	332	9	12	35
York St/N of I-270 EB on-ramp – SB	2	426	12	16	35
I-270 EB from York to Vasquez	4	1,083	41	52	55
I-270 EB off-ramp to Vasquez SB	2	615	29	36	35
I-270 EB between Vasquez ramps N	3	1,047	37	47	55
Vasquez SB on-ramp to I-270 EB – loop ramp	1	180	13	17	25
Vasquez NB to I-270 EB on-ramp	1	430	9	11	25
I-270 EB between Vasquez ramps S	4	828	32	41	55
56th Avenue EB – south of Vasquez	2	108	4	5	30
56th Avenue WB – south of Vasquez	2	323	11	14	30
SH 6/Vasquez (S of I-270)[2]	6	733	41	37	45

Table B-1 Traffic Input Data

Roadway	Number of Lanes	Cars/ Lane Hour	Medium Trucks/ Lane/Hour	Heavy Trucks/ Lane/Hour	Posted Speed (mph)
SH 6/Vasquez (N of I-270)[2]	6	749	80	39	45
I-270 EB from Vasquez to Quebec	3	1,240	45	58	55
I-270 EB off-ramp to Quebec	1	1,070	57	73	25
SH 35/Quebec (N of I-270)[2]	4	1,369	47	20	45
SH 35/Quebec (N of I-70)[2]	6	951	50	61	30
Sandcreek EB – north of Quebec	1	384	11	14	45
Sandcreek WB – north of Quebec	1	227	6	8	45
I-270 EB from Quebec to I-70	2	1,310	42	53	55
I-70 EB[2]	6	2,298	96	117	55
I-70 EB (CDOT NAAG maximum volumes)[3]	6	1,829	77	94	55
I-270 WB from I-70 to Quebec	2	1,655	81	104	55
I-270 WB between Quebec off- and on-ramps	3	1,093	45	58	55
Quebec SB on-ramp to I-270 WB	2	545	20	25	55
I-270 WB from Quebec to Vasquez	4	1,073	43	55	55
I-270 WB off-ramp to Vasquez NB	1	540	62	78	35
Vasquez NB on-ramp to I-270 WB – loop ramp	1	1,000	35	45	25
I-270 WB between off- and on-ramps	3	1,210	37	47	55
I-270 WB between onramps	4	1,160	35	45	55
Vasquez SB on-ramp to I-270 WB	1	560	13	17	35
I-270 WB from Vasquez to York	4	1,298	39	49	55
I-270 WB off-ramp to I-76/York	2	765	24	31	40
I-270 WB off-ramp to York Street	2	210	11	14	35
York St/N of I-270 WB off-ramp – NB	2	505	20	25	35
York St/N of I-270 WB off-ramp – SB	2	379	15	19	35
I-270 WB off-ramp to I-76	2	550	13	17	40
I-270 WB from York to I-76	4	915	25	32	55
I-76 WB off-ramp to I-270 WB	1	410	18	22	35
I-270 WB from I-76 to I-25	4	1,013	30	38	55
I-270 WB off-ramp to I-25	2	725	18	22	55
I-270 WB west of I-25	3	867	28	35	55

Table B-1 Traffic Input Data

Roadway	Number of Lanes	Cars/ Lane Hour	Medium Trucks/ Lane/Hour	Heavy Trucks/ Lane/Hour	Posted Speed (mph)
Design Year Proposed Action Express Lane Operating Option Noise Model Traffic Data (2040)[1]					
I-25 NB[3]	3	3,249	177	177	55
I-25 NB (CDOT NAAG maximum volume)[3]	3	1,804	98	98	55
I-25 SB on-ramp to I-270 EB	2	365	25	25	40
I-270 EB at I-25	2	1,395	46	59	55
I-270 EB from I-25 to I-76 GP	2	1120	59	76	55
I-270 EB from I-25 to I-76 EL	1	470	0	0	55
I-270 EB offramp to I-76 EB	1	800	18	22	40
I-76 (east of I-25)[2]	6	1,324	45	55	75
I-76 (east of I-270)[2]	4	2,495	168	205	75
I-76 (east of I-270 – CDOT NAAG maximum volume)[3]	4	1,488	50	62	75
I-270 EB between I-76 ramps N GP	2	1,120	59	76	55
I-270 EB between I-76 ramps N EL	1	470	0	0	55
I-76 WB off-ramp to I-270 EB – loop	1	10	0	0	55
I-270 EB between I-76 ramps S GP	2	1,120	59	76	55
I-270 EB between I-76 ramps S EL	1	470	0	0	55
I-76 EB on-ramp to I-270 EB	1	550	13	17	45
I-270 EB I-76 to York GP	3	933	44	56	55
I-270 EB I-76 to York EL	1	470	0	0	55
York on-ramp to I-270 EB	2	430	18	22	35
York St/S of I-270 EB on-ramp – NB	2	404	12	15	35
York St/S of I-270 EB on-ramp – SB	2	111	3	4	35
York St/N of I-270 EB on-ramp – NB	2	362	10	13	35
York St/N of I-270 EB on-ramp – SB	2	418	12	15	35
I-270 EB from York to Vasquez GP	3	1,213	56	71	55
I-270 EB from York to Vasquez EL	1	470	0	0	55
I-270 EB from York to Vasquez GP (starting north of Vasquez interchange)	3	1,100	56	71	55
I-270 EB from York to Vasquez EL (starting north of Vasquez interchange)	1	810	0	0	55

Table B-1 Traffic Input Data

Roadway	Number of Lanes	Cars/ Lane Hour	Medium Trucks/ Lane/Hour	Heavy Trucks/ Lane/Hour	Posted Speed (mph)
I-270 EB offramp to Vasquez WB	1	1,040	57	73	35
I-270 EB between Vasquez ramps N	2	1,120	57	73	55
Vasquez SB on-ramp to I-270 EB – loop ramp	1	180	13	17	25
Vasquez NB to I-270 EB on-ramp	1	270	4	6	25
I-270 EB between Vasquez ramps S	3	800	44	56	55
56th Avenue EB – south of Vasquez	2	105	3	4	30
56th Avenue WB – south of Vasquez	2	242	8	10	30
SH 6/Vasquez (S of I-270)[2]	6	733	41	37	45
SH 6/Vasquez (N of I-270)[2]	6	749	80	39	45
I-270 EB from Vasquez to Quebec GP	2	1,330	66	84	55
I-270 EB from Vasquez to Quebec EL	1	810	0	0	55
I-270 EB off-ramp to Quebec	1	930	44	56	25
SH 35/Quebec (N of I-270)[2]	4	1,369	47	20	45
SH 35/Quebec (N of I-70)[2]	6	951	50	61	30
Sandcreek EB – north of Quebec	1	429	12	15	45
Sandcreek WB – north of Quebec	1	347	10	12	45
I-270 EB from Quebec to I-70	2	1,230	44	56	55
I-70 EB[2]	6	2,298	96	117	55
I-70 EB (CDOT NAAG maximum volumes)[3]	6	1,829	77	94	55
I-270 WB from I-70 to Quebec	2	1,335	59	76	55
I-270 WB from I-70 to Quebec GP	2	820	59	76	55
I-270 WB from I-70 to Quebec EL	1	1,030	0	0	55
Quebec SB on-ramp to I-270 WB	2	515	24	31	55
I-270 WB from Quebec to Vasquez	3	877	56	71	55
I-270 WB off-ramp to Vasquez NB	1	400	62	78	35
Vasquez NB on-ramp to I-270 WB – loop ramp	1	730	31	39	25
I-270 WB between off- and on-ramps GP	2	1,100	53	67	55
I-270 WB between off- and on-ramps EL	1	1,030	0	0	55
I-270 WB between off- and on-ramps	3	977	45	58	55
Vasquez SB on-ramp to I-270 WB	1	540	13	17	35

Table B-1 Traffic Input Data

Roadway	Number of Lanes	Cars/ Lane Hour	Medium Trucks/ Lane/Hour	Heavy Trucks/ Lane/Hour	Posted Speed (mph)
I-270 WB from Vasquez to York GP	3	1,157	51	65	55
I-270 WB from Vasquez to York EL	1	1,020	0	0	55
I-270 WB off-ramp to I-76/York	2	540	22	28	40
I-270 WB off-ramp to York Street	1	360	26	34	35
York St/N of I-270 WB off-ramp – NB	2	510	20	25	35
York St/N of I-270 WB off-ramp – SB	2	403	15	19	35
I-270 WB off-ramp to I-76	2	355	9	11	40
I-270 WB from York to I-76 GP	3	937	37	47	55
I-270 WB from York to I-76 EL	1	560	0	0	55
I-76 WB off-ramp to I-270 WB	1	390	18	22	35
I-270 WB from I-76 to I-25	4	940	31	39	55
I-270 WB off-ramp to I-25	2	575	20	25	55
I-270 WB west of I-25	3	867	29	37	55

1. Project-specific traffic data source: *I-270 Traffic Technical Report 2021.*
2. Non-project-specific traffic data source: *CDOT OTIS 2020.(I-25, I-76, and I-70 traffic provided to compare to maximum volumes in CDOT NAAG 2020.)*
3. Maximum traffic volumes: *CDOT NAAG 2020.* Since the CDOT NAAG only provides total maximum traffic volumes, the traffic mix was calculated as a ratio of the traffic mix from the traffic data that was available.

Table B-2. Modeled Noise Levels Not Considering Potential New Abatement

Receiver ID	Receiver Description	Activity Category/CDOT NAC (dBA)	Number of Receptors Represented by Receiver	Existing Condition (2016)	No Action (2040)	Proposed Action GP (2040)	Proposed Action GP Change from Existing (dB)	Proposed Action EL (2040)	Proposed Action EL Change from Existing (dB)	Proposed Action Causes Impact?
				L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)		L_{eq} (dBA)		(Yes or No)
R-001	Boyers Coffee at 7295 Washington St	E / 71	4	59.1	60.0	61.0	+1.9	60.9	+1.8	No
R-002	Residence at 950 E 73rd Ave	B / 66	1	58.6	59.6	60.7	+2.1	60.6	+2.0	No
R-003	Residence at 940 E 73rd Ave	B / 66	1	57.6	58.5	59.4	+1.8	59.4	+1.8	No
R-004	Residence at 1210 E 73rd Ave	B / 66	1	57.4	58.5	59.4	+2.0	59.8	+2.4	No
R-005	Residence at 1310 E 73rd Ave	B / 66	1	57.8	58.9	59.7	+1.9	60.1	+2.3	No
R-006	Residence at 6875 Columbine St	B / 66	1	68.6	69.3	70.5	+1.9	70.5	+1.9	Yes
R-007	Residence at 6875 Columbine St	B / 66	1	60.0	60.9	61.1	+1.1	61.1	+1.1	No
R-008	Residence at 6875 Columbine St	B / 66	1	58.8	59.6	59.5	+0.7	59.5	+0.7	No

Table B-2. Modeled Noise Levels Not Considering Potential New Abatement

Receiver ID	Receiver Description	Activity Category/CDOT NAC (dBA)	Number of Receptors Represented by Receiver	Existing Condition (2016)	No Action (2040)	Proposed Action GP (2040)	Proposed Action GP Change from Existing (dB)	Proposed Action EL (2040)	Proposed Action EL Change from Existing (dB)	Proposed Action Causes Impact?
				L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)		L_{eq} (dBA)		(Yes or No)
R-009	Residence at 6875 Columbine St	B / 66	1	53.8	54.6	54.9	+1.1	54.9	+1.1	No
R-010	Residence at 2521 E 68th Pl	B / 66	1	57.7	58.8	59.7	+2.0	59.7	+2.0	No
R-011	Residence at 6830 Columbine St	B / 66	1	60.3	61.3	62.3	+2.0	62.3	+2.1	No
R-012	Residence at 6822 Columbine St	B / 66	1	65.9	66.7	69.2	+3.3	68.9	+3.0	Yes
R-013	Residence at 6824 Columbine St	B / 66	1	59.1	60.1	60.5	+1.4	60.6	+1.5	No
R-014	Residence at 6820 York St	B / 66	1	61.1	62.1	62.2	+1.1	62.2	+1.1	No
R-015	Residence at 6776 York St	B / 66	1	58.0	59.1	58.7	+0.7	58.7	+0.7	No
R-016	Residence at 6780 York St	B / 66	1	60.9	62.0	63.2	+2.3	63.0	+2.1	No
R-017	Residence at 6750 York St	B / 66	1	69.1	69.8	72.2	+3.1	71.7	+2.6	Yes

Table B-2. Modeled Noise Levels Not Considering Potential New Abatement

Receiver ID	Receiver Description	Activity Category/CDOT NAC (dBA)	Number of Receptors Represented by Receiver	Existing Condition (2016)	No Action (2040)	Proposed Action GP (2040)	Proposed Action GP Change from Existing (dB)	Proposed Action EL (2040)	Proposed Action EL Change from Existing (dB)	Proposed Action Causes Impact?
				L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)		L_{eq} (dBA)		(Yes or No)
R-018	Residence at 6875 Columbine St	B / 66	1	56.6	57.1	57.6	+1.0	57.5	+0.9	No
R-019	Residence at 2521 E 68th Pl	B / 66	1	57.7	58.5	59.0	+1.3	59.0	+1.3	No
R-020	Residence at 2561 E 68th Pl	B / 66	1	55.7	56.6	57.2	+1.5	57.2	+1.5	No
R-021	Residence at 6840 York St	B / 66	1	55.9	56.9	57.4	+1.5	57.4	+1.5	No
R-022	Residence at 6861 Elizabeth St	B / 66	1	53.8	54.5	55.4	+1.6	55.4	+1.6	No
R-023	Residence at 2510 E 68th Pl	B / 66	1	52.0	52.9	54.8	+2.8	54.4	+2.4	No
R-024	Residence at 6881 Race St	B / 66	1	63.7	64.7	65.5	+1.8	65.6	+1.9	No
R-025	Residence at 6880 Race St	B / 66	1	59.6	60.5	61.3	+1.7	61.3	+1.7	No
R-026	Residence at 6850 Race Street	B / 66	1	59.0	59.9	60.2	+1.2	60.3	+1.3	No

Table B-2. Modeled Noise Levels Not Considering Potential New Abatement

Receiver ID	Receiver Description	Activity Category/CDOT NAC (dBA)	Number of Receptors Represented by Receiver	Existing Condition (2016)	No Action (2040)	Proposed Action GP (2040)	Proposed Action GP Change from Existing (dB)	Proposed Action EL (2040)	Proposed Action EL Change from Existing (dB)	Proposed Action Causes Impact?
				L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)		L_{eq} (dBA)		(Yes or No)
R-027	Residence at 2060 E 68th Pl	B / 66	1	55.6	56.4	57.0	+1.4	56.9	+1.3	No
R-028	Residence at 2080 E 68th Pl	B / 66	1	56.9	57.8	58.4	+1.5	58.4	+1.5	No
R-029	Residence at 2101 E 68th Ave	B / 66	1	55.1	56.0	56.7	+1.6	56.6	+1.5	No
R-030	Residence at 2141 E 68th Ave	B / 66	1	57.2	58.2	59.2	+2.0	59.1	+1.9	No
R-031	Residence at 2161 E 68th Ave	B / 66	1	58.5	59.6	61.2	+2.7	61.1	+2.6	No
R-032	Residence at 6851 Race St	B / 66	1	56.1	57.2	57.5	+1.4	57.5	+1.4	No
R-033	Residence at 6830 Race St	B / 66	1	57.8	58.7	59.5	+1.7	59.6	+1.8	No
R-034	Residence at 2081 E 68th Ave	B / 66	1	50.9	51.9	52.9	+2.0	52.9	+2.0	No
R-035	Residence at 2061 E 68th Ave	B / 66	1	52.2	53.1	53.8	+1.6	53.8	+1.6	No

Table B-2. Modeled Noise Levels Not Considering Potential New Abatement

Receiver ID	Receiver Description	Activity Category/CDOT NAC (dBA)	Number of Receptors Represented by Receiver	Existing Condition (2016)	No Action (2040)	Proposed Action GP (2040)	Proposed Action GP Change from Existing (dB)	Proposed Action EL (2040)	Proposed Action EL Change from Existing (dB)	Proposed Action Causes Impact?
				L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)		L_{eq} (dBA)		(Yes or No)
R-036	Residence at 2240 E 68th Ave	B / 66	1	55.5	56.7	58.0	+2.5	58.0	+2.5	No
R-037	Residence at 2220 E 68th Ave	B / 66	1	54.0	55.2	56.5	+2.5	56.5	+2.5	No
R-038	Residence at 6841 Race St	B / 66	1	54.2	55.1	55.5	+1.3	55.5	+1.3	No
R-039	Residence at 2031 E 68th Ave	B / 66	1	54.8	55.7	56.0	+1.2	56.0	+1.2	No
R-040	Residence at 2041 E 68th Ave	B / 66	1	52.3	53.2	53.6	+1.3	53.6	+1.3	No
R-041	Residence at 2070 E 68th Ave	B / 66	1	51.8	52.7	53.4	+1.6	53.4	+1.6	No
R-042	Residence at 2100 E 68th Ave	B / 66	1	52.4	53.4	54.2	+1.8	54.3	+1.9	No
R-043	Residence at 6702 York St	B / 66	1	66.1	67.3	67.8	+1.7	67.7	+1.6	Yes

Table B-2. Modeled Noise Levels Not Considering Potential New Abatement

Receiver ID	Receiver Description	Activity Category/CDOT NAC (dBA)	Number of Receptors Represented by Receiver	Existing Condition (2016)	No Action (2040)	Proposed Action GP (2040)	Proposed Action GP Change from Existing (dB)	Proposed Action EL (2040)	Proposed Action EL Change from Existing (dB)	Proposed Action Causes Impact?
				L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)		L_{eq} (dBA)		(Yes or No)
R-044	Residence at 6700 York St	B / 66	1	64.0	65.2	66.1	+2.1	66.1	+2.1	Yes
R-045	Residence at 6690 York St	B / 66	1	62.0	63.0	64.8	+2.8	64.7	+2.7	No
R-046	Residence at 6680 York St	B / 66	1	60.4	61.5	63.2	+2.8	63.2	+2.8	No
R-047	Trailhead at Sand Creek Greenway (Spur at O'Brian Canal)	C / 66	1	67.8	69.0	70.0	+2.2	70.1	+2.3	Yes
R-048	Trail pavilion at Sand Creek Greenway	C / 66	1	65.0	66.4	67.3	+2.3	67.3	+2.3	Yes
R-049	Trailhead at Sand Creek Greenway	C / 66	1	67.3	67.7	71.6	+4.3	71.7	+4.4	Yes
R-050	Trail Pavilion at Sand Creek Greenway	C / 66	1	69.1	69.5	69.3	+0.2	69.6	+0.5	Yes
R-051	Trail pavilion at Wetland Loop	C / 66	1	60.6	61.5	63.2	+2.6	63.0	+2.4	No

Table B-2. Modeled Noise Levels Not Considering Potential New Abatement

Receiver ID	Receiver Description	Activity Category/CDOT NAC (dBA)	Number of Receptors Represented by Receiver	Existing Condition (2016)	No Action (2040)	Proposed Action GP (2040)	Proposed Action GP Change from Existing (dB)	Proposed Action EL (2040)	Proposed Action EL Change from Existing (dB)	Proposed Action Causes Impact?
				L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)		L_{eq} (dBA)		(Yes or No)
R-052	Residence at 5410 Krameria St	B / 66	1	65.5	66.6	68.1	+2.6	67.9	+2.4	Yes
R-053	Residence at 5401 Leyden St	B / 66	1	63.8	64.9	67.4	+3.6	67.2	+3.4	Yes
R-054	Residence at 6318 E 54th Ave	B / 66	1	66.9	67.9	71.2	+4.3	71.0	+4.1	Yes
R-055	Residence at 6320 E 54th Ave	B / 66	1	66.7	67.7	70.8	+4.1	70.5	+3.8	Yes
R-056	Residence at 6330 E 54th Ave	B / 66	1	66.6	67.6	71.0	+4.4	70.8	+4.2	Yes
R-057	Residence at 6411 E 53rd Way	B / 66	1	60.7	61.8	63.0	+2.3	62.7	+2.0	No
R-058	Residence at 6411 E 53rd Way	B / 66	1	65.4	66.4	69.7	+4.3	69.5	+4.1	Yes

Table B-2. Modeled Noise Levels Not Considering Potential New Abatement

Receiver ID	Receiver Description	Activity Category/CDOT NAC (dBA)	Number of Receptors Represented by Receiver	Existing Condition (2016)	No Action (2040)	Proposed Action GP (2040)	Proposed Action GP Change from Existing (dB)	Proposed Action EL (2040)	Proposed Action EL Change from Existing (dB)	Proposed Action Causes Impact?
				L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)		L_{eq} (dBA)		(Yes or No)
R-059	Residence at 6415 E 53rd Way	B / 66	1	64.4	65.5	67.9	+3.5	67.7	+3.3	Yes
R-060	Residence at 6470 E 53rd Way	B / 66	1	67.0	68.0	71.4	+4.4	71.1	+4.1	Yes
R-061	Residence at 6481 E 53rd Way	B / 66	1	61.6	62.7	64.2	+2.6	63.9	+2.3	No
R-062	Residence at 5360 Magnolia St	B / 66	1	60.2	61.4	63.0	+2.8	62.6	+2.4	No
R-063	Residence at 5370 Monaco St	B / 66	1	58.3	59.5	61.2	+2.9	60.8	+2.5	No
R-064	Residence at 5366 Magnolia St	B / 66	1	63.0	64.0	63.9	+0.9	63.6	+0.6	No
R-065	Residence at 5360 Magnolia St	B / 66	1	66.4	67.4	68.2	+1.8	67.8	+1.4	Yes

Table B-2. Modeled Noise Levels Not Considering Potential New Abatement

Receiver ID	Receiver Description	Activity Category/CDOT NAC (dBA)	Number of Receptors Represented by Receiver	Existing Condition (2016)	No Action (2040)	Proposed Action GP (2040)	Proposed Action GP Change from Existing (dB)	Proposed Action EL (2040)	Proposed Action EL Change from Existing (dB)	Proposed Action Causes Impact?
				L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)		L_{eq} (dBA)		(Yes or No)
R-066	Residence at 5431 Krameria St	B / 66	1	58.5	59.7	60.8	+2.3	60.5	+2.0	No
R-067	Residence at 5411 Leyden St	B / 66	1	59.5	60.7	62.0	+2.5	61.8	+2.3	No
R-068	Residence at 5400 Leyden St	B / 66	1	59.1	60.1	61.7	+2.6	61.4	+2.3	No
R-069	Residence at 5410 Leyden St	B / 66	1	56.4	57.5	58.6	+2.2	58.3	+1.9	No
R-070	Residence at 5401 Locust St	B / 66	1	58.1	59.2	60.8	+2.7	60.4	+2.3	No
R-071	Residence at 5400 Locust St	B / 66	1	56.6	57.7	59.1	+2.5	58.8	+2.2	No
R-072	Residence at 5401 Monaco St	B / 66	1	54.3	55.3	57.0	+2.7	56.6	+2.3	No
R-073	Residence at 5400 Monaco St	B / 66	1	55.0	56.1	57.5	+2.5	57.1	+2.1	No

Table B-2. Modeled Noise Levels Not Considering Potential New Abatement

Receiver ID	Receiver Description	Activity Category/CDOT NAC (dBA)	Number of Receptors Represented by Receiver	Existing Condition (2016)	No Action (2040)	Proposed Action GP (2040)	Proposed Action GP Change from Existing (dB)	Proposed Action EL (2040)	Proposed Action EL Change from Existing (dB)	Proposed Action Causes Impact?
				L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)		L_{eq} (dBA)		(Yes or No)
R-074	Residence at 5401 Magnolia St	B / 66	1	53.5	54.6	55.9	+2.4	55.6	+2.1	No
R-075	Residence at 5350 Magnolia St	B / 66	1	58.6	59.7	60.6	+2.0	60.3	+1.7	No
R-076	Residence at 5331 Niagara St	B / 66	1	53.0	54.0	55.3	+2.3	55.0	+2.0	No
R-077	Residence at 5471 Krameria St	B / 66	1	55.8	56.8	59.0	+3.2	58.7	+2.9	No
R-078	Residence at 5450 Krameria St	B / 66	1	55.7	56.8	57.4	+1.7	57.2	+1.5	No
R-079	Residence at 5460 Krameria St	B / 66	1	52.0	53.0	54.9	+2.9	54.6	+2.6	No
R-080	Residence at 5435 Leyden St	B / 66	1	55.0	56.0	58.0	+3.0	57.8	+2.8	No

Table B-2. Modeled Noise Levels Not Considering Potential New Abatement

Receiver ID	Receiver Description	Activity Category/CDOT NAC (dBA)	Number of Receptors Represented by Receiver	Existing Condition (2016)	No Action (2040)	Proposed Action GP (2040)	Proposed Action GP Change from Existing (dB)	Proposed Action EL (2040)	Proposed Action EL Change from Existing (dB)	Proposed Action Causes Impact?
				L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)		L_{eq} (dBA)		(Yes or No)
R-081	Residence at 5443 Leyden St	B / 66	1	53.5	54.7	56.8	+3.3	56.6	+3.1	No
R-082	Residence at 5451 Leyden Street	B / 66	1	53.5	54.6	56.5	+3.0	56.3	+2.8	No
R-083	Residence at 5420 Leyden St	B / 66	1	54.7	55.8	57.1	+2.4	56.8	+2.1	No
R-084	Recreational at 5430 Leyden St	C / 66	5	51.1	52.0	53.6	+2.5	53.3	+2.2	No
R-085	Residence at 5440 Leyden St	B / 66	1	53.4	54.4	56.0	+2.6	55.7	+2.3	No
R-086	Residence at 5450 Leyden Street	B / 66	1	52.1	53.1	54.9	+2.8	54.6	+2.5	No
R-087	Residence at 5411 Locust St	B / 66	1	54.1	55.1	56.8	+2.7	56.4	+2.3	No
R-088	Residence at 5421 Locust St	B / 66	1	52.0	53.0	54.5	+2.5	54.1	+2.1	No

Table B-2. Modeled Noise Levels Not Considering Potential New Abatement

Receiver ID	Receiver Description	Activity Category/CDOT NAC (dBA)	Number of Receptors Represented by Receiver	Existing Condition (2016)	No Action (2040)	Proposed Action GP (2040)	Proposed Action GP Change from Existing (dB)	Proposed Action EL (2040)	Proposed Action EL Change from Existing (dB)	Proposed Action Causes Impact?
				L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)		L_{eq} (dBA)		(Yes or No)
R-089	Residence at 5431 Locust St	B / 66	1	51.1	52.0	54.1	+3.0	53.8	+2.7	No
R-090	Residence at 5441 Locust Street	B / 66	1	51.4	52.2	54.1	+2.7	53.8	+2.4	No
R-091	Residence at 5412 Locust St	B / 66	1	53.8	54.9	56.5	+2.7	56.2	+2.4	No
R-092	Residence at 5420 Locust St	B / 66	1	53.1	54.1	55.6	+2.5	55.3	+2.2	No
R-093	Residence at 5421 Monaco Street	B / 66	1	52.3	53.3	54.6	+2.3	54.3	+2.0	No
R-094	Residence at 5406 Monaco Street	B / 66	1	53.8	54.9	56.2	+2.4	55.9	+2.1	No
R-095	Residence at 5380 Magnolia St	B / 66	1	54.8	55.9	56.4	+1.6	56.2	+1.4	No
R-096	Residence at 5390 Magnolia St	B / 66	1	53.7	54.8	55.3	+1.6	55.1	+1.4	No

Table B-2. Modeled Noise Levels Not Considering Potential New Abatement

Receiver ID	Receiver Description	Activity Category/CDOT NAC (dBA)	Number of Receptors Represented by Receiver	Existing Condition (2016)	No Action (2040)	Proposed Action GP (2040)	Proposed Action GP Change from Existing (dB)	Proposed Action EL (2040)	Proposed Action EL Change from Existing (dB)	Proposed Action Causes Impact?
				L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)		L_{eq} (dBA)		(Yes or No)
R-097	Residence at 5351 Niagara St	B / 66	1	52.9	53.9	55.1	+2.2	54.8	+1.9	No
R-098	Residence at 5371 Niagara St	B / 66	1	52.6	53.6	54.6	+2.0	54.3	+1.7	No
R-099	Residence at 6800 E 52nd Pl	B / 66	1	68.4	69.3	72.3	+3.9	71.8	+3.4	Yes
R-100	Residence at 6820 E 52nd Pl	B / 66	1	68.6	69.6	72.8	+4.2	72.3	+3.7	Yes
R-101	Residence at 6830 E 52nd Pl	B / 66	1	68.2	69.2	71.7	+3.5	71.3	+3.1	Yes
R-102	Residence at 6860 E 52nd Pl	B / 66	1	67.4	68.3	68.1	+0.7	67.7	+0.3	Yes
R-103	Residence at 5251 Oneida St	B / 66	1	68.0	68.9	72.6	+4.6	72.2	+4.2	Yes
R-104	Residence at 5250 Oneida St	B / 66	1	64.9	65.9	69.5	+4.6	69.1	+4.2	Yes
R-105	Residence at 6870 E 52nd Pl	B / 66	1	57.5	58.4	61.0	+3.5	60.6	+3.1	No

Table B-2. Modeled Noise Levels Not Considering Potential New Abatement

Receiver ID	Receiver Description	Activity Category/CDOT NAC (dBA)	Number of Receptors Represented by Receiver	Existing Condition (2016)	No Action (2040)	Proposed Action GP (2040)	Proposed Action GP Change from Existing (dB)	Proposed Action EL (2040)	Proposed Action EL Change from Existing (dB)	Proposed Action Causes Impact?
				L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)		L_{eq} (dBA)		(Yes or No)
R-106	Fast food restaurants at 5101 Quebec St	E / 71	4	63.7	65.1	65.7	+2.0	65.7	+2.0	No
R-107	Trail bench at Northfield Pond Park (Park Creek Metro District)	C / 66	1	62.3	63.5	63.8	+1.5	63.7	+1.4	No
R-108	Trail bench at Northfield Pond Park (Park Creek Metro District)	C / 66	2	60.8	61.9	62.3	+1.5	62.1	+1.3	No
R-109	Trail bench at Northfield Pond Park (Park Creek Metro District)	C / 66	2	60.1	60.6	62.0	+1.9	61.7	+1.6	No
R-110	Trail crossing along Clear Creek Trail	C / 66	1	67.7	68.6	69.6	+1.9	70.0	+2.3	Yes

Table B-2. Modeled Noise Levels Not Considering Potential New Abatement

Receiver ID	Receiver Description	Activity Category/CDOT NAC (dBA)	Number of Receptors Represented by Receiver	Existing Condition (2016)	No Action (2040)	Proposed Action GP (2040)	Proposed Action GP Change from Existing (dB)	Proposed Action EL (2040)	Proposed Action EL Change from Existing (dB)	Proposed Action Causes Impact?
				L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)		L_{eq} (dBA)		(Yes or No)
R-111	Trail crossing along Clear Creek Trail	C / 66	1	69.8	70.7	71.4	+1.6	72.0	+2.2	Yes
R-112	Trail crossing along South Platte River Greenway Trail	C / 66	1	71.2	72.3	73.1	+1.9	73.2	+2.0	Yes
R-113	Trail crossing along South Platte River Greenway Trail	C / 66	1	71.2	72.2	73.6	+2.4	73.4	+2.2	Yes
R-114	Trail crossing along Sand Creek Greenway Trail	C / 66	1	74.9	76.0	76.1	+1.2	76.0	+1.1	Yes
R-115	Trail crossing along Sand Creek Greenway Trail	C / 66	1	76.9	77.9	78.0	+1.1	77.9	+1.0	Yes
R-116	Trail crossing along Sand Creek Greenway Trail	C / 66	1	65.4	66.5	66.5	+1.1	66.5	+1.1	Yes

Table B-2. Modeled Noise Levels Not Considering Potential New Abatement

Receiver ID	Receiver Description	Activity Category/CDOT NAC (dBA)	Number of Receptors Represented by Receiver	Existing Condition (2016)	No Action (2040)	Proposed Action GP (2040)	Proposed Action GP Change from Existing (dB)	Proposed Action EL (2040)	Proposed Action EL Change from Existing (dB)	Proposed Action Causes Impact?
				L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)		L_{eq} (dBA)		(Yes or No)
R-117	Trail crossing along Sand Creek Greenway Trail	C / 66	1	67.6	68.7	68.9	+1.3	68.9	+1.3	Yes

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APPENDIX C TNM NOISE MODELING RESULTS

TNM files, which contain model inputs and outputs, were submitted electronically to CDOT

Table C-1 Modeled Noise Levels with and without Potential New Abatement (Barrier 1)

Receiver ID (Behind Abatement)	Receiver Description	Number of Receptors per Receiver	Are Receptors Benefited? (Yes or No)	Proposed Action GP Operating Option (2040) (dBA for Leq/dB for Insertion Loss)			Proposed Action EL Operating Option (2040) (dBA for Leq / dB for Insertion Loss)		
				Leq without Abatement	Leq with Abatement	Insertion Loss	Leq without Abatement	Leq with Abatement	Insertion Loss
R-052	Residence at 5410 Krameria St	1	Yes	68.1	58.7	9.4	67.9	58.5	9.4
R-053	Residence at 5401 Leyden St	1	Yes	67.4	58.6	8.8	67.3	58.3	9.0
R-054	Residence at 6318 E 54th Ave	1	Yes	71.2	59.2	12.0	71.0	59.0	12.0
R-055	Residence at 6320 E 54th Ave	1	Yes	70.8	59.5	11.3	70.6	59.2	11.4
R-056	Residence at 6330 E 54th Ave	1	Yes	71.0	59.7	11.3	70.8	59.4	11.4
R-057	Residence at 6411 E 53rd Way	1	Yes	63.0	55.4	7.6	62.7	55.2	7.5
R-058	Residence at 6411 E 53rd Way	1	Yes	69.7	60.1	9.6	69.5	59.8	9.7
R-059	Residence at 6415 E 53rd Way	1	Yes	67.9	59.4	8.5	67.7	59.1	8.6
R-060	Residence at 6470 E 53rd Way	1	Yes	71.4	60.3	11.1	71.2	60.0	11.2
R-061	Residence at 6481 E 53rd Way	1	Yes	64.2	57.0	7.2	63.9	56.8	7.1
R-062	Residence at 5360 Magnolia St	1	Yes	63.0	56.2	6.8	62.6	55.9	6.7
R-063	Residence at 5370 Monaco St	1	Yes	61.2	54.5	6.7	60.8	54.2	6.6
R-064	Residence at 5366 Magnolia St	1	Yes	63.9	56.8	7.1	63.6	56.6	7.0
R-065	Residence at 5360 Magnolia St	1	Yes	68.2	63.0	5.2	67.9	62.6	5.3
R-066	Residence at 5431 Krameria St	1	Yes	60.8	54.2	6.6	60.5	53.9	6.6
R-067	Residence at 5411 Leyden St	1	Yes	62.0	56.2	5.8	61.8	55.9	5.9
R-068	Residence at 5400 Leyden St	1	Yes	61.7	55.4	6.3	61.4	55.1	6.3

Table C-1 Modeled Noise Levels with and without Potential New Abatement (Barrier 1)

Receiver ID (Behind Abatement)	Receiver Description	Number of Receptors per Receiver	Are Receptors Benefited? (Yes or No)	Proposed Action GP Operating Option (2040) (dBA for Leq/dB for Insertion Loss)			Proposed Action EL Operating Option (2040) (dBA for Leq / dB for Insertion Loss)		
				Leq without Abatement	Leq with Abatement	Insertion Loss	Leq without Abatement	Leq with Abatement	Insertion Loss
R-069	Residence at 5410 Leyden St	1	Yes	58.6	52.4	6.2	58.3	52.0	6.3
R-070	Residence at 5401 Locust St	1	Yes	60.8	54.7	6.1	60.4	54.4	6.0
R-071	Residence at 5400 Locust St	1	Yes	59.1	53.3	5.8	58.8	53.0	5.8
R-072	Residence at 5401 Monaco St	1	Yes	57.0	52.0	5.0	56.6	51.6	5.0
R-073	Residence at 5400 Monaco St	1	Yes	57.5	51.9	5.6	57.1	51.5	5.6
R-074	Residence at 5401 Magnolia St	1	Yes	55.9	50.5	5.4	55.6	50.0	5.6
R-075	Residence at 5350 Magnolia St	1	Yes	60.6	55.2	5.4	60.3	54.9	5.4
R-076	Residence at 5331 Niagara St	1	No	55.3	52.1	3.2	55.0	51.7	3.3
R-077	Residence at 5471 Krameria St	1	No	59.0	57.6	1.4	58.7	57.3	1.4
R-078	Residence at 5450 Krameria St	1	Yes	57.4	51.9	5.5	57.2	51.7	5.5
R-079	Residence at 5460 Krameria St	1	Yes	54.9	49.7	5.2	54.6	49.4	5.2
R-080	Residence at 5435 Leyden St	1	No	58.0	53.8	4.2	57.8	53.6	4.2
R-081	Residence at 5443 Leyden St	1	No	56.8	52.2	4.6	56.6	52.0	4.6
R-082	Residence at 5451 Leyden St	1	No	56.5	53.5	3.0	56.3	53.2	3.1
R-083	Residence at 5420 Leyden St	1	No	57.1	52.0	5.1	56.8	51.5	5.3
R-084	Recreational at 5430 Leyden St	5	No	53.6	50.7	2.9	53.3	50.2	3.1
R-085	Residence at 5440 Leyden St	1	No	56.0	52.2	3.8	55.7	51.9	3.8

Table C-1 Modeled Noise Levels with and without Potential New Abatement (Barrier 1)

Receiver ID (Behind Abatement)	Receiver Description	Number of Receptors per Receiver	Are Receptors Benefited? (Yes or No)	Proposed Action GP Operating Option (2040) (dBA for Leq/dB for Insertion Loss)			Proposed Action EL Operating Option (2040) (dBA for Leq / dB for Insertion Loss)		
				Leq without Abatement	Leq with Abatement	Insertion Loss	Leq without Abatement	Leq with Abatement	Insertion Loss
R-086	Residence at 5450 Leyden St	1	No	54.9	51.5	3.4	54.6	51.1	3.5
R-087	Residence at 5411 Locust St	1	Yes	56.8	51.5	5.3	56.4	51.2	5.2
R-088	Residence at 5421 Locust St	1	No	54.5	49.8	4.7	54.1	49.4	4.7
R-089	Residence at 5431 Locust St	1	No	54.1	51.3	2.8	53.8	50.9	2.9
R-090	Residence at 5441 Locust St	1	No	54.1	51.0	3.1	53.8	50.6	3.2
R-091	Residence at 5412 Locust St	1	Yes	56.5	51.4	5.1	56.2	51.0	5.2
R-092	Residence at 5420 Locust St	1	Yes	55.6	50.5	5.1	55.3	50.2	5.1
R-093	Residence at 5421 Monaco St	1	No	54.6	49.9	4.7	54.3	49.5	4.8
R-094	Residence at 5406 Monaco St	1	No	56.2	51.6	4.6	55.9	51.3	4.6
R-095	Residence at 5380 Magnolia St	1	No	56.4	52.2	4.2	56.2	51.9	4.3
R-096	Residence at 5390 Magnolia St	1	No	55.3	51.4	3.9	55.1	51.0	4.1
R-097	Residence at 5351 Niagara St	1	No	55.1	51.9	3.2	54.8	51.5	3.3
R-098	Residence at 5371 Niagara St	1	No	54.6	51.8	2.8	54.3	51.5	2.8

Notes:

Ave = avenue
E = east
Pl = place
St = street

Table C-2. Modeled Noise Levels with and without Potential New Abatement (Barrier 2)

Receiver ID (behind abatement)	Receiver Description	Number of Receptors per Receiver	Are Receptors Benefited? (Yes or No)	Proposed Action GP Operating Option (2040) (dBA for Leq/dB for Insertion Loss)			Proposed Action EL Operating Option (2040) (dBA for Leq/dB for Insertion Loss)		
				Leq without Abatement	Leq with Abatement	Insertion Loss	Leq without Abatement	Leq with Abatement	Insertion Loss
R-099	Residence at 6800 E 52nd Pl	1	Yes	72.3	66.6	5.7	71.9	66.2	5.7
R-100	Residence at 6820 E 52nd Pl	1	Yes	72.6	64.8	7.8	72.3	64.7	7.6
R-101	Residence at 6830 E 52nd Pl	1	Yes	71.5	63.5	8.0	71.3	63.6	7.7
R-102	Residence at 6860 E 52nd Pl	1	Yes	68.1	62.9	5.2	67.7	62.7	5.0
R-103	Residence at 5251 Oneida St	1	Yes	72.6	64.6	8.0	72.2	64.3	7.9
R-104	Residence at 5250 Oneida St	1	Yes	69.5	64.4	5.1	69.1	64.1	5.0
R-105	Residence at 6870 E 52nd Pl	1	No	60.7	58.8	1.9	60.6	58.7	1.9

Notes:
Ave = avenue
E = east
Pl = place
St = street

APPENDIX D NOISE ABATEMENT EVALUATION WORKSHEETS (CDOT FORM 1209)

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COLORADO DEPARTMENT OF TRANSPORTATION

NOISE ABATEMENT EVALUATION WORKSHEET

Project Name & Subaccount Code: I-270 Improvements 23198

Noise Abatement ID: Barrier 1

A. FEASIBILITY:

1. Can the noise barrier reduce noise by 5 dB for at least three impacted receptors? ☑ YES ☐ NO ☐ NA
2. Is there a fatal flaw that keeps the noise barrier from being built? ☐ YES ☑ NO ☐ NA
   If the answer is YES, select the most relevant fatal flaw.

B. REASONABLENESS:

1. Can the proposed noise barrier reduce noise by 7 dB for at least two impacted receptors? ☑ YES ☐ NO ☐ NA
2. Is the Cost Benefit less than or equal to $34,000 per receptor? ☐ YES ☑ NO ☐ NA
3. Are more than 50% of responding benefited residents/owners in favor of the recommended noise abatement measure? ☐ YES ☐ NO ☑ NA ☐ To be determined - Survey not yet conducted

C. INSULATION CONSIDERATION:

1. For impacted Activity Category C receptors with exterior areas of frequent human use but potential to be Activity Category D receptors: Was a noise wall or berm determined to be feasible and reasonable? ☐ YES ☐ NO ☑ NA
2. If the answer to C1 is NO or there are no exterior areas of frequent human use, does the Activity Category D receptor interior have noise impacts? ☐ YES ☐ NO ☑ NA

D. ADDITIONAL CONSIDERATIONS:

Attempts to achieve a reasonable Barrier 1 design by lowering the wall to benefit only first-row residences and shortening the wall to benefit fewer impacted receptors were unsuccessful. Further attempts were made by realigning Barrier 1 within 5 feet of the right-of-way (ROW) line (closer to impacted residences) and designing a combination of overlapping walls along the I-270 edge of clear zone and ROW line were unsuccessful at achieving a feasible and reasonable wall design.

E. STATEMENT OF LIKELIHOOD:

1. Is noise barrier feasible? ☑ YES ☐ NO
2. Is noise barrier reasonable? ☐ YES, survey completed ☐ YES, survey pending ☑ NO ☐ NA
3. Will insulation of impacted Activity Category D receptor(s) be considered? ☐ YES ☐ NO ☑ NA
4. Is the noise barrier recommended? ☐ YES ☑ NO

F. ABATEMENT DECISION DESCRIPTION AND JUSTIFICATION:

Barrier 1 was modeled along I-270 WB adjacent to North Sand Creek Drive between Krameria Street and Magnolia Street. The barrier was optimized to 16 feet tall for 147 feet in length, 17 feet tall for 49 feet in length, and 18 feet tall for 1,702 feet in length. Barrier 1 would benfit 30 receptors, but the cost per benefited receptors would exceed and reasonable cost threshold of $34,000. Therefore, Barrier 1 is not recommended.

Completed by: Dana Ragusa Date: 19-Feb-2021

CDOT Form # 1209.1 (09/20)

COLORADO DEPARTMENT OF TRANSPORTATION

NOISE ABATEMENT EVALUATION WORKSHEET

Project Name & Subaccount Code: I-270 Improvements 23198

Noise Abatement ID: Barrier 2

A. FEASIBILITY:

1. Can the noise barrier reduce noise by 5 dB for at least three impacted receptors?
   ☑ YES ☐ NO ☐ NA
2. Is there a fatal flaw that keeps the noise barrier from being built? ☐ YES ☑ NO ☐ NA
   If the answer is YES, select the most relevant fatal flaw.

B. REASONABLENESS:

1. Can the proposed noise barrier reduce noise by 7 dB for at least two impacted receptors?
   ☑ YES ☐ NO ☐ NA
2. Is the Cost Benefit less than or equal to $34,000 per receptor? ☐ YES ☑ NO ☐ NA
3. Are more than 50% of responding benefited residents/owners in favor of the recommended noise abatement measure?
   ☐ YES ☐ NO ☑ NA ☐ To be determined - Survey not yet conducted

C. INSULATION CONSIDERATION:

1. For impacted Activity Category C receptors with exterior areas of frequent human use but potential to be Activity Category D receptors: Was a noise wall or berm determined to be feasible and reasonable? ☐ YES ☐ NO ☑ NA
2. If the answer to C1 is NO or there are no exterior areas of frequent human use, does the Activity Category D receptor interior have noise impacts? ☐ YES ☐ NO ☑ NA

D. ADDITIONAL CONSIDERATIONS:

Attempts to achieve a reasonable Barrier 2 design by shortening the wall to benefit fewer impacted receptors were unsuccessful. Further attempts were made by realigning Barrier 2 along the proposed I-270 westbound edge of the clear zone (closer to the roadway) were unsuccessful at achieving a feasible and reasonable wall design.

E. STATEMENT OF LIKELIHOOD:

1. Is noise barrier feasible? ☑ YES ☐ NO
2. Is noise barrier reasonable? ☐ YES, survey completed ☐ YES, survey pending ☑ NO ☐ NA
3. Will insulation of impacted Activity Category D receptor(s) be considered? ☐ YES ☐ NO ☑ NA
4. Is the noise barrier recommended? ☐ YES ☑ NO

F. ABATEMENT DECISION DESCRIPTION AND JUSTIFICATION:

Barrier 2 was modeled along I-270 WB adajcent to North Sandcreek Drive between Newport Street and Onedia Street. The barrier was optimized to 8 to 15 feet tall for 172 feet in length, 8 to 11 feet tall for 162 feet in length, and 8 to 9 feet tall for 162 feet in length. Barrier 2 would benfit 6 receptors, but the cost per benefited receptors would exceed and reasonable cost threshold of $34,000. Therefore, Barrier 2 is not recommended.

Completed by: Dana Ragusa Date: 19-Feb-2021

CDOT Form # 1209.1 (09/20)