CHAPTER 5
CLARIFICATIONS TO THE REVISED EA

The Revised EA was signed by CDOT and FHWA on July 24, 2015, and since that time three informational updates have arisen that are reported in this chapter. The first is updated information on High-Occupancy Vehicle (HOV) use of C-470. The second is a set of corrections to informational Table 3-1 of the Revised EA. The third is updated information on the traffic noise analysis.

5.1 UPDATED INFORMATION ON C-470 HOV USE

In the C-470 Revised EA, Section 3.4, High Occupancy Use of Express Lanes, it was reported that, "CDOT is considering whether or not to permit high occupancy vehicles (HOVs) with three or more occupants (HOV3+) to use the express lanes in the Proposed Action without paying a toll, as will be the case on other express lane corridors in the Denver region by 2017."

Section 3.4 included a table of pros and cons regarding a potential HOV3+ toll exemption policy. Page 3-24 reported that the financial implications of such a policy would be studied in the near future. Toll revenues were only one of several factors under consideration, but are important due to their impact on the project's financial feasibility.

Since the Revised EA was completed and signed, a Level III Traffic and Revenue Study has been completed. This is an investment-grade study used to demonstrate with confidence to potential investors that future C-470 toll revenue would be adequate to repay the bonds/loans needed to finance the project. This study was completed by the Louis Berger Group, a full-service engineering, architecture, planning, environmental, program and construction management and economic development firm.

Subsequently, the task of assessing the financial impacts of an HOV3+ exemption policy was assigned to Ernst & Young, a well-known international accounting firm. Based on the traffic and revenue forecasts developed by Louis Berger Group, Ernst & Young has provided information concluding that an HOV3+ exemption policy for C-470 would reduce available project financing by up to $40 million. This includes both the cost of needed facilities and enforcement, as well as lost revenues from providing the free lane use. It also includes increased financing costs due to higher financial risk for the project.

The $40 million funding reduction due to the toll exemption policy is quite substantial for the $385 million C-470 Proposed Action and its $269 million imminent first phase of construction (the "Interim" project). Tolls are the principal source of financing for the project. An added $40 million cost would appear to make the Interim construction project financially infeasible.

Based on the results of the financial analysis, the Board of Directors of the High Performance Transportation Enterprise on October 14, 2015 recommended that the Colorado Transportation Commission (CTC) not allow an HOV-3+ exemption for the C-70 Tolled Express Lanes.

On October 15, 2015 the CTC passed a resolution determining not to include toll-free HOV3+ travel for the C-470 Tolled Express Lanes Project (see Appendix B of this Decision Document). The resolution noted that this decision is contingent upon a final determination from FHWA on a Proposed Action based on the C-470 Corridor Revised Environmental

Assessment. The resolution indicated that this decision could be revisited in the future if financial conditions change.

5.2 CORRECTION OF TABLE 3-1

During the 45-day public review process, two commenters brought to CDOT's attention three errors in Table 3-1 of the Revised EA. This table describes access conditions at various cross-streets. The information in this table was included in the Revised EA for description only and was not relied upon for any design or impact evaluation. The three corrections are noted in **bold** and **underlined** text in the table below.

(Corrected Table 3-1) Description of C-470 Existing Access Conditions

North-South Route	Access	Description (locations ordered from west to east)
Kipling Parkway	Full	Grade-separated interchange with signalized ramp terminal intersections.* Kipling Parkway crosses over C-470.
Wadsworth Boulevard	Full	Grade-separated interchange with signalized ramp terminal intersections. Crosses over C-470.
Platte Canyon Road	Partial	At-grade right-in, right out for westbound C-470 only. Platte Canyon Road does not cross C-470.
South Santa Fe Drive (US 85)	Full	Grade-separated interchange with signalized ramp terminal intersections, plus a flyover ramp from southbound Santa Fe to eastbound C-470. Santa Fe Drive crosses over C-470.
Erickson Road, not shown in Figure 3-2.	None	This collector street crosses under C-470 about one-third mile east of Santa Fe Drive.
Lucent Boulevard	~~None~~ **Full**	Lucent Boulevard crosses over C-470.
Broadway	Full	Grade-separated interchange with signalized ramp terminal intersections. Crosses ~~over~~ **under** C-470.
University Boulevard	Full	Grade-separated interchange with signalized ramp terminal intersections. Crosses ~~over~~ **under** C-470.
Colorado Boulevard	None	No access. Colorado Boulevard crosses over C-470.
Quebec Street	Full	Grade-separated interchange with signalized ramp terminal intersections. Quebec Street crosses over C-470.
Acres Green Drive, not shown in Figure 3-2.	None	Crosses under C-470 between Quebec Street and Yosemite Street. Acres Green Drive is classified as a collector street.
Yosemite Street	Partial	Grade-separated interchange with signalized ramp terminal intersections, with C-470 access only to and from the west. This is a half-diamond interchange. Crosses under C-470.
Interstate 25	Full	Multi-level freeway-to freeway interchange. Free-flowing with no traffic signals. I-25 mainline crosses over C-470.

* The grade-separated intersections listed here are diamond interchanges unless otherwise noted.

5.3 UPDATED INFORMATION ON THE C-470 TRAFFIC NOISE ANALYSIS

Many comments regarding traffic noise were received during the public review period for the Revised EA, as 99 of the 132 commenters referenced traffic noise. All public comments have received a response in this Decision Document and can be found in Chapter 3 (Public Input).

In particular, multiple representatives of the Highlands Ranch Neighborhood Coalition (HRNC) stated concern with whether or not the Revised EA traffic noise analysis was prepared in compliance with the established CDOT Noise Analysis Abatement Guidelines (January 2015). Appendix C of that CDOT guidance is a 2006 report titled CDOT Traffic Noise Model User's Guide for Colorado DOT Projects, a part of which outlines processes that may be used to validate the noise model.

At issue is that the Revised EA traffic noise analysis did not include long-term noise measurement to identify the loudest-noise hour noise level and associated traffic volume for use in validating the noise model. This is one of the processes outlined in the Appendix C report mentioned earlier. Instead, another method allowed by the CDOT Noise Analysis Abatement Guidelines was used in the Revised EA traffic analysis. The following updated information is provided to address this public concern.

Technical Response regarding Compliance

CDOT maintains that the traffic noise analysis for the C-470 Corridor Revised Environmental Assessment (EA) did follow the 2015 Noise Analysis and Abatement Guidelines, including all appendices. One of HRNC's comments states that "CDOT failed to conduct or use any long-term monitoring data to validate their model, which is clearly required in the User Guide". To help clarify CDOT's position it is important to explain that the 2015 guidance and appendices describe multiple parameters for validating a noise model, and defines that process, including both short-term and long-term measurement options.

Model Validation: Validating a noise model is described in the Section 3.2.2 and 3.3 of the CDOT Noise Analysis Abatement Guidelines. This option includes collecting short-term noise measurements and associated traffic volumes, speeds, and vehicle mix. The collection of relevant data will allow the modeling of the same conditions as was observed during the measurement exercise and does not require the analyst to attempt to measure during the worst noise hour. This data is incorporated into the noise model, and the model predicts a decibel level for that condition. Per Section 3.3 of the guidance, if the model-predicted decibel level is within 3 dB(A) of the field measurement, the model is considered validated.

Another option for validating a noise model is described in Appendix C of the guidance (2006 User's Guide), and includes collecting long-term (i.e., 24-hour) noise measurements to identify the loudest-noise hour over multiple days. Associated traffic volumes, speeds, and vehicle mix are collected in conjunction with these noise measurements. From this effort, a loudest hour is determined and the associated traffic conditions are identified. This traffic data is incorporated into the noise model, and the model predicts a decibel level for that condition. Per guidance, if the model-predicted decibel level is within 3 dB(A) of the field measurement, the model is considered validated.

CDOT validated the TNM model using short-term measurements.

Predicting Future Noise Levels for the No-Action Alternative and Proposed Action: CDOT took a conservative approach for predicting loudest hour noise conditions. The loudest hour for noise occurs when the highest volume of traffic is traveling at the highest free flow speed for the particular roadway. This is often not the peak hour, when heavy traffic volumes result in lower speeds. For the C-470 Proposed Action this would be a theoretical point in time when the express, general purpose, and auxiliary lanes are all carrying the highest possible traffic volumes while maintaining free flow speeds.

On C-470, demand for express lanes (tolled) would not peak until the general purpose and auxiliary lanes are congested. Congested general purpose and auxiliary lanes would have lower travel speeds and thus would not represent the loudest or worst hours for noise. The same can be said for the other scenario when the general purpose and auxiliary lanes are running at free flow speed with high traffic volumes, resulting in less demand for the express lanes.

To predict the loudest possible noise condition for existing, no-build and the Proposed Action, all lanes of C-470, including cross streets, were modeled with a theoretical maximum traffic volume per lane per facility type, (i.e., freeway, non-freeway multiple lane, and two-lane roadway), at the posted speed. These values, presented in the 2015 CDOT Noise Abatement Guidelines (Page 19, Exhibit 4), were determined to produce the worst noise hour scenario for modeling purposes.

Long-Term Noise Measurements Conducted in October 2015

While CDOT maintains that the traffic noise analysis for the Revised EA did follow the 2015 Noise Analysis and Abatement Guidelines in validating the noise model, CDOT understands and respects the comments received from the public stating concern that the Revised EA traffic noise analysis did not include long-term measurements. So in an effort to address concerns raised by the public in specific areas and provide additional validation for the traffic noise analysis, CDOT collected long-term noise measurements and associated traffic volumes at two locations in the corridor for four weekdays in October 2015. The monitoring locations are both within Highlands Ranch Metro District property. Details of how these locations were determined can be found in **Appendix C** of this Decision Document.

The long-term monitoring effort began on Monday, October 19. After two days of monitoring, heavy rain conditions forced postponement of additional monitoring until the following week. Monitoring resumed on Wednesday, October 28 and concluded on Friday, October 30. The monitoring was conducted on public land behind residences on Meadow Creek Drive and Aberdeen Circle. Traffic volume, speed and composition data were collected in conjunction with the noise measurements, as needed for purposes of noise model validation.

A summary of the results is provided below in **Table 5-1**. The two monitoring sites yielded clearly different noise levels due to their distance from C-470 and due to effects of local topography. The Meadow Creek site yielded daily highest readings around 67 decibels, the highest being 67.6 decibels. Readings at the Aberdeen site yielded daily high readings mostly just under 61 decibels, the highest being 61.0 decibels. Audible daytime roof construction noise at the Aberdeen site interfered with traffic noise monitoring, resulting in some noise measurements being invalidated. This explains why the Day 3 and Day 4 highest (valid) readings at that site are reported for

Table 5-1
Summary of October 2015 Long-Term Noise Monitoring Results

	Hourly Average Noise Level, Leq(h), in dB(A)			
	Meadow Creek Drive		Aberdeen Circle	
	Noise	Hour	Noise	Hour
Day 1	67.4	6-7 pm	61.0	6-7 pm
Day 2	67.6	6-7 pm	60.9	6-7 pm
Day 3	66.6	4-5 pm	60.7	9-10 pm
Day 4	66.9	Noon-1 pm	60.5	9-10 pm
Loudest Hour Leq(h)	**67.6**			
Loudest Hour Total Vehicles	6,904			
Loudest Hour Vehicles per Lane	1726			
Loudest Hour % Heavy Trucks	0.2%			
Loudest Hour Traffic Speed	70-75 mph			

dB(A) means A- weighted decibels
Leq(h) means the total noise energy is converted to an equivalent average for a one-hour period
Meadow Creek site corresponds to I&R site LT-1 and Aberdeen site corresponds to I&R site LT-2

the hour of 9-10 pm. For more details about the monitoring effect, see **Appendix C, Long-term Traffic Noise Monitoring Technical Memorandum**.

For each monitoring site, the traffic volume, speed and composition data collected during the loudest recorded noise hour was input into the TNM noise model which had been prepared and used in the C-470 Revised EA traffic noise analysis.

Table 5-2 indicates that using traffic inputs from the long-term measurements analysis, the TNM model predicted noise levels of 65.8 to 66.7 dB(A) for the Meadow Creek site, depending on the modeled speed (faster traffic produces more noise).

These predictions are within 3 dB(A) of the monitored loudest hour level at the site, which was 67.6 dB(A). Similarly, at the Aberdeen site, the TNM model predicted noise levels of 60.6 to 61.5 dB(A), depending on speed. These Aberdeen site predictions were very close to the monitored loudest-hour level of 61.0 dB(A).

For both long-term monitoring sites, TNM-predicted values for the observed traffic volumes, speeds and composition that were within 3 dB(A) of the loudest-hour noise that was recorded through the field monitoring effort. These results meet the requirements for successful TNM model validation as specified in Section 3.3, TNM Model Validation, of CDOT's 2015 Traffic Noise

Table 5-2
Supplemental TNM Modeling Results

		Hourly Average Noise Level, Leq(h), in dB(A)			
Site	Monitored Noise	Modeled Speed	Modeled Noise	Difference from Monitored	Within 3 dB(A)?
Meadow Creek	67.6	70 mph	65.8	-1.8	Yes
		75 mph	66.7	-0.9	Yes
Aberdeen	61.0	70 mph	60.6	-0.4	Yes
		75 mph	61.5	+0.5	Yes

dB(A) means A- weighted decibels
Leq(h) means the total noise energy is converted to an equivalent average for a one-hour period

and Abatement Guidelines. The requirements were also met by the results of the Revised EA traffic noise analysis based on the short-term noise measurements documented in the July 2015 C-470 Traffic Noise Technical Report.

It has been noted in this section of the C-470 Decision Document that the purpose of long-term monitoring is to identify appropriate traffic inputs needed for model validation. Long-term monitoring results are not used for any other purpose including impact and mitigation analysis. The results of the October 2015 long-term monitoring effort support the model validation presented in the Revised EA.

CDOT and FHWA conclude that the traffic noise analysis for the C-470 Revised EA remains valid based upon this updated information, and therefore no changes are made to the mitigation recommendations provided in the Revised EA.