



## WB I-70 Peak Period Shoulder Lane

# NOISE TECHNICAL REPORT

October 26, 2018

Categorical Exclusion

NOISE TECHNICAL REPORT  
**WESTBOUND I-70  
PEAK PERIOD SHOULDER LANE**

*Prepared for:*



*Prepared by:*



October 26, 2018



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## Acronyms and Abbreviations

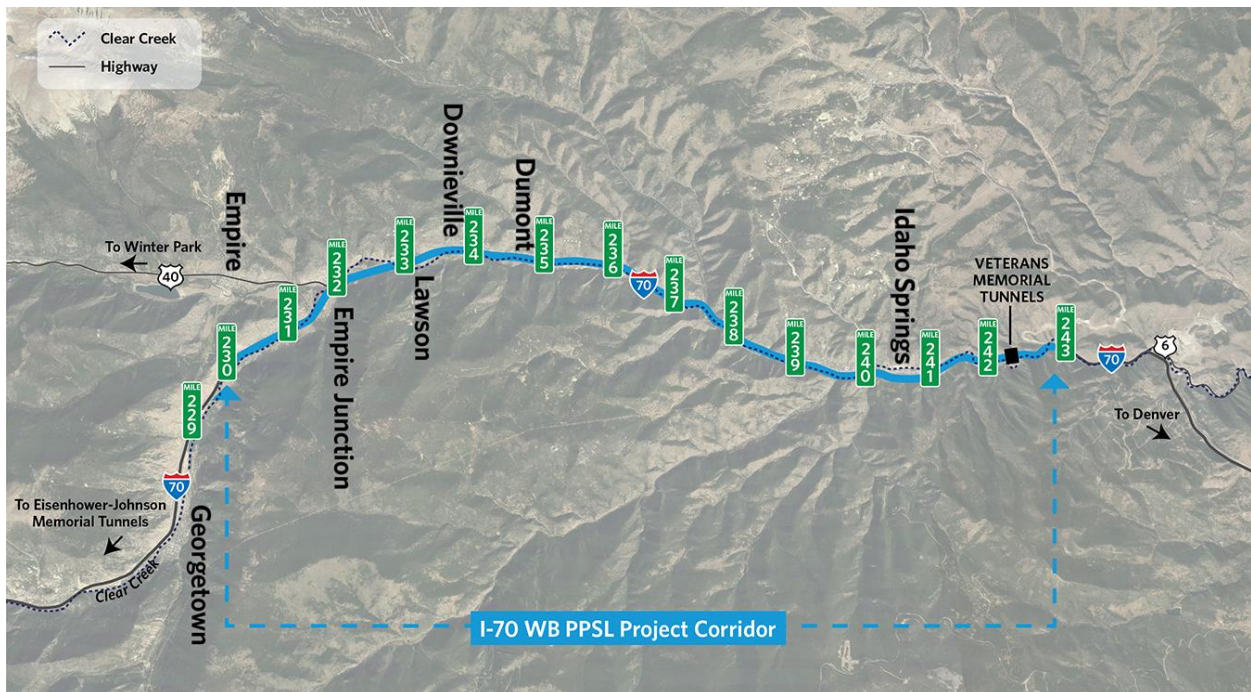
CDOT	Colorado Department of Transportation
CFR	Code of Federal Regulations
CR	County Road
CSS	Context Sensitive Solutions
dBA	A-weighted decibel
EA	Environmental Assessment
EB	eastbound
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
I-70	Interstate 70
MP	milepost
NAC	Noise Abatement Criteria
NEPA	National Environmental Policy Act
PPSL	Peak Period Shoulder Lane
PEIS	Programmatic Environmental Impact Statement
ROD	Record of Decision
SH	State Highway
US 40	U.S. Highway 40
WB	westbound



## Section 1. Purpose of the Report

The Federal Highway Administration (FHWA), in cooperation with the Colorado Department of Transportation (CDOT), is preparing a Categorical Exclusion for proposed changes to the westbound (WB) lanes of Interstate 70 (I-70) between approximately milepost (MP) 230 and MP 243, in Clear Creek County, Colorado (Proposed Action Figure 1). The Proposed Action includes the addition of a 12-mile tolled Peak Period Shoulder Lane (PPSL) between east Idaho Springs and the U.S. Highway 40 (US 40)/I-70 interchange in the WB direction and improvements to the State Highway (SH) 103 interchange. The Proposed Action improves operations and travel time reliability in the WB direction of I-70 in the study area. Additionally, the improvements are consistent with the *I-70 Mountain Corridor Programmatic Environmental Impact Statement* (PEIS; CDOT 2011a), PEIS Record of Decision (ROD; FHWA 2011), Context Sensitive Solutions (CSS) on the I-70 Mountain Corridor (CDOT 2009) process, and other commitments of the PEIS and ROD. The Proposed Action fits within the definition of “expanded use of existing transportation infrastructure in and adjacent to the corridor” included in the “Non-Infrastructure Related Components” element within the Preferred Alternative’s Minimum Program of Improvements.

Figure 1. Project Corridor



Source: HDR 2018.

This document discusses the regulatory setting and describes the affected environment and the impacts of the Proposed Action on noise within the study area. The Proposed Action has been classified as a Type III noise project that does not require a traffic noise impact assessment. However, because of concerns regarding noise in the study area, this document has been completed for the Proposed Action. This document also identifies mitigation measures, including applicable measures identified in the I-70 Mountain Corridor PEIS and ROD, which reduce impacts during construction and operation.



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## Section 2. Summary of Noise from Previous National Environmental Policy Act Analyses

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### 2.1 How was Noise Treated in the I-70 Mountain Corridor PEIS and ROD (Tier 1)?

The FHWA and CDOT prepared the I-70 Mountain Corridor PEIS and ROD (CDOT 2011a) to present the major findings of the I-70 Mountain Corridor National Environmental Policy Act (NEPA) process. The *I-70 Mountain Corridor PEIS Noise Technical Report* supported the PEIS by identifying:

- Methods used to identify existing conditions in the corridor and estimate potential noise impacts of proposed alternatives.
- Applicable state and federal noise regulations.
- Description of existing noise conditions in the Corridor.
- Estimated noise impacts from the Action Alternatives evaluated in the I-70 Mountain Corridor PEIS.
- Noise analysis considerations for Tier 2 processes.
- Mitigation strategies to reduce highway and transit noise impacts.

The portion of the I-70 Mountain Corridor studied in the PEIS extends between Glenwood Springs on the west and the Denver metropolitan area on the east; the WB PPSL study area is located within these boundaries.

Direct impacts on noise related to the Action Alternatives included:

- Increased corridor noise levels by approximately 4 dB because of increased traffic volumes from the Preferred Alternative.
- Increased corridor noise levels because of the addition of bus and rail systems.
- Increased corridor noise levels because of construction.

Indirect noise impacts were related to the induced growth that the completed project brings to the area and included:

- Increased traffic on major access routes to transit stations.
- Noise from growth in general.

The I-70 Mountain Corridor PEIS and ROD described the following considerations for noise analysis as part of subsequent Tier 2 processes:

- Noise analysis considerations for Tier 2 processes will include a more robust analysis of potential noise impacts and mitigation based on the configuration of proposed highway improvements, associated traffic projections, and refined field noise measurements taken at potentially affected receptor locations.
- Noise analysis considered in the Tier 2 processes will be conducted in accordance with required regulations; that is, following CDOT noise impact assessment methodology for highway



improvements, and Federal Transit Administration noise impact assessment methods for rail improvements.

- Information about noise studies, methodologies, and modeling results will be included in any public involvement efforts associated with Tier 2 processes.

Noise mitigation strategies described in the I-70 Mountain Corridor PEIS and ROD included:

- Noise walls
- Noise berms
- Small concrete barriers (“Jersey barriers”)
- Acquiring properties to form a buffer zone
- Alteration of horizontal alignment
- Alteration of vertical alignment
- Engine compression brakes
- Noise insulation of buildings
- Pavement type
- Active noise control

Noise mitigation strategies during construction identified in the I-70 Mountain Corridor PEIS and ROD included:

- Limiting work to certain hours of the day where possible
- Requiring the use of well-maintained equipment (particularly with respect to mufflers)
- Modifying backup alarm systems within acceptable safety guidelines
- Locating haul roads
- Providing public outreach

## 2.2 How was Noise Treated in the Twin Tunnels Expansion Projects (Tier 2)?

The FHWA, in cooperation with CDOT, prepared an Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) for proposed changes to the eastbound (EB) lanes of I-70 and the EB eastbound bore of the Twin Tunnels between MP 241 and MP 244 in Clear Creek County (CDOT 2012a). Capacity improvements extended from MP 241.1 on the west to MP 244.5 on the east, and the project limits extended to MP 238.5 on the west side, where signage was added. The Twin Tunnels Proposed Action limits are partially within the WB PPSL Proposed Action limits, which extend to MP 243 on the west. Overlap between the two Proposed Actions runs from MP 238.5 on the west side to MP 243 on the east side.

CDOT prepared a Categorical Exclusion for the Twin Tunnels for the WB lanes of I-70 which is the same study area as the Twin Tunnels EA and FONSI (EB). Findings from this study were similar to the findings from Twin Tunnels EA and FONSI completed for the EB direction.

Findings from the noise assessment (CDOT 2012b) were as follows:



- **No Action Alternative.** While average daily traffic will increase by the year 2035 and periods of congestion will be longer, the worst noise hour will remain at the same point in time when the highest traffic volumes are able to travel at the highest posted speed. No difference in noise levels and no changes to the existing noise environment were found from the 2035 No Action Alternative as the same roadway configuration, number of lanes, and speeds result in the same worst noise hour traffic volumes.
- **Proposed Action.** The Proposed Action is assumed to be similar to the six-lane widening (55 miles per hour) alternative evaluated in the PEIS, but with widening in the eastbound direction only. The effects of a managed lane operating during peak hours were evaluated; however, off-peak traffic hours when the managed lane will operate as a general purpose lane coincides with the worst noise hour. The Proposed Action was shown to have no difference to the worst-hour noise impacts with or without tolling as the worst noise hour will not change between alternatives. A noise berm was determined to be reasonable and feasible and was constructed at the west tunnel portal to provide mitigation for the Scott Lancaster Memorial Bridge and Trail.
- **Effects of the Detour.** The effects of detouring eastbound I-70 traffic to the adjacent frontage road (CR 314) during tunnel construction were evaluated. While the detour alignment is closer to many of the noise receptors, the predicted noise levels for all receptors were lower than existing levels because of the slower 35-mile-per-hour speed of the detour and reduced speeds on eastbound I-70 immediately prior to the detour.
- **Construction.** The project was predicted to have several temporary noise impacts during construction. These impacts are associated with detouring eastbound traffic around the Twin Tunnels site, excavation of the tunnel via blasting, and standard construction techniques.
- **Indirect Effects.** No indirect effects were anticipated.

### 2.3 How was Noise Treated in the EB I-70 PPSL Categorical Exclusion (Tier 2)?

The FHWA, in cooperation with CDOT, prepared a Categorical Exclusion for proposed changes to the EB lanes of I-70 between approximately MP 230 and MP 243 in Clear Creek County (CDOT 2014). The EB PPSL noise technical memorandum discussed the regulatory setting and described the affected environment and the impacts of the Proposed Action on noise within the identified study area. The WB PPSL study area is located within the study boundaries of the EB PPSL Categorical Exclusion.

CDOT and FHWA prepared a Memorandum of Understanding determining that the EB I-70 PPSL met the criteria of a Type III project established in Part 772 of Title 23 of the Code of Federal Regulations (23 CFR 772). Type III projects do not require analysis for highway traffic noise impacts. The determination was based on the following information:

- The project was a temporary occupancy of the shoulder and not considered by FHWA to qualify as a permanent through lane or capacity addition. The operation of the PPSL is limited to 20 percent of the annual days per year including holidays (73 days) or 7.5 percent of the annual hourly time. The operation is planned for Saturdays and Sundays during the months from December through March and July through September, and on holidays throughout the year.
- There were no new auxiliary lanes or acceleration and deceleration lanes.





- There were no new additional interchange ramps, nor were there relocation of ramps. The minor ramp improvements done as part of the EB PPSL project were sliver widening to some acceleration ramps, minor shifts in two deceleration ramps (loop ramps shifted to the inside), and changes to the connecting streets at Exit 241, including conversions to two roundabouts.
- The project did not include changes to the vertical profile of I-70.
- The project did not remove or alter shielding, such as a berm.
- No alteration of any highway lanes resulted in a halving of distance between the nearest edge of the eastbound lanes and existing sensitive receptors.

CDOT has conducted noise monitoring before and after the EB PPSL project was constructed. This biannual monitoring is consistent with the commitments in the House Bill 1041 application for the EB PPSL project and because noise increases were a concern that had been expressed in two public meetings for the EB PPSL project. Approximately every six months, once in the winter and once in the summer, noise measurements are collected at 14 noise sensitive receptor locations in the study area. These measurements are taken during both peak period and off-peak period, which helps characterize the noise environmental when the express lane is both in use and not in use. Noise measurements indicated that the EB PPSL did not result in a perceptible change in noise levels at the majority of monitoring locations. In locations where perceptible changes have occurred it has been attributed to increases in traffic volumes on both on I-70 and the frontage road, as many of the monitoring locations are affected by traffic on both facilities, rather than because of implementation of the EB PPSL. Another cause is some of the monitoring locations have shifted. As land uses have changed, some locations have had to move anywhere from 80 to 320 feet from where the baseline measurements were taken, thereby affecting the ability to accurately compare against the original measurements. In general, the EB PPSL does not appear to have perceptibly influenced traffic noise levels at sensitive receptors throughout the corridor.

In addition to the ongoing monitoring, site-specific noise monitoring was done to measure noise reduction after installation of the concrete Type 7 barrier with glare screen. The results of this monitoring indicated a perceptible decrease in noise.

The noise measurements collected as part of the WB PPSL noise assessment are similar to the existing sound levels observed as part of the EB PPSL noise study. The WB PPSL project does not meet FHWA requirements for a detailed analysis of highway traffic noise and noise impacts and is therefore classified as a Type III project, per Code of Federal Regulations 772.

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## Section 3. What Process was Followed to Analyze Noise?

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### 3.1 Methodology

Although not required by the regulations defined in 23 CFR 772 and CDOT Noise Analysis and Abatement Guidelines, noise measurements were collected in the study area (CDOT 2015). Noise levels were measured at 15 noise-sensitive receptor locations in the study area. Field noise measurements were conducted in August, 2017, on warm, dry, mostly low wind (less than 10 miles per hour) days using a Quest integrating/logging Type II level sound meter.



The following paragraphs from the January 2015 CDOT *Noise Analysis and Abatement Guidelines* explain the technical terminology for the units of measurement collected in the field.

Because sound travels in waves, there are also varying frequencies associated with each sound event. The human ear does not respond equally to all frequencies. Filtering of these frequencies must be done in order to obtain accurate measurements and descriptions of highway traffic noise, because this noise is comprised of many frequencies. The filtering (weighting of frequencies) of the “A” scale on sound-level meters most closely approximates the average frequency response of the human ear, and is the scale that is used for traffic noise analyses. Decibel units described in this manner are referred to as A-weighted decibels (dBA).

As sound intensity tends to fluctuate with time, a method is required to describe a noise source, such as a highway, in a steady state condition. The descriptor most commonly used in environmental noise analysis is the equivalent steady state sound level, or Leq. This value is representative of the same amount of acoustic energy that is contained in a time-varying sound measurement over a specified period. For highway traffic noise analyses in Colorado, that time period is one hour, and the value then reflects the hourly equivalent sound level.

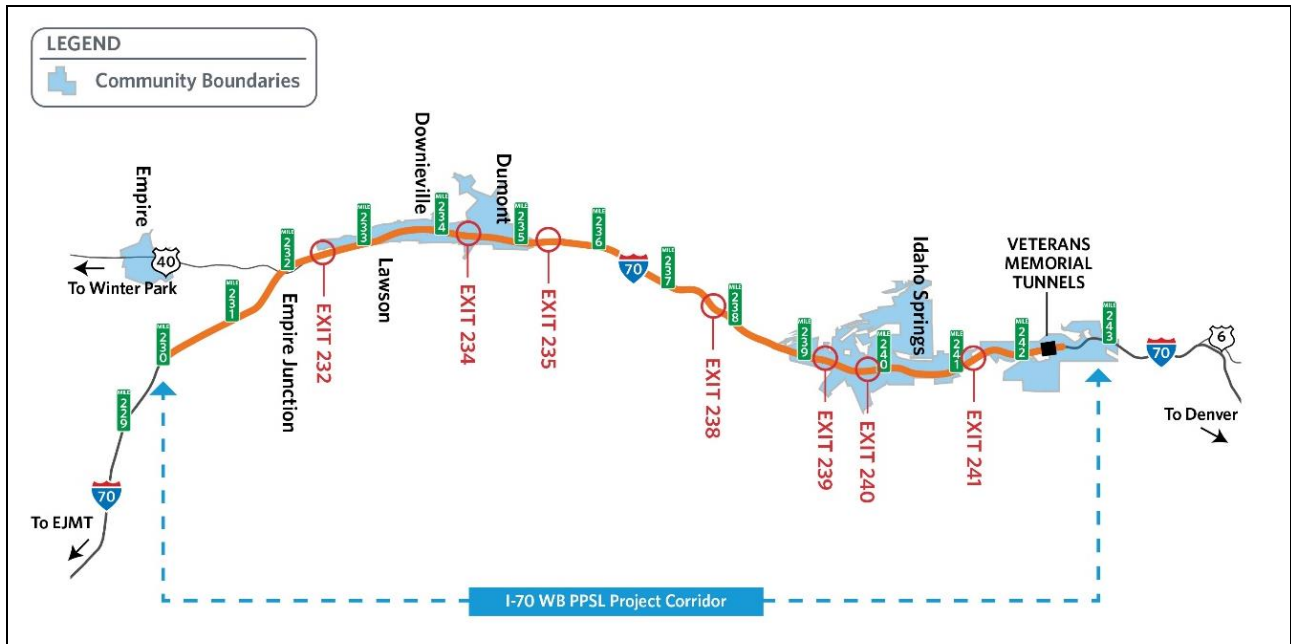
### 3.2 Study Area

The study area for the WB PPSL project encompasses CDOT right-of-way along I-70 in both directions from MP 243 to MP 230 and areas immediately adjacent to the right-of-way. This study area was used to evaluate the **direct** effects of the Proposed Action.

For transportation and socioeconomic impacts, the study area for **indirect** effects includes Clear Creek County and the communities of Idaho Springs, Downieville-Lawson-Dumont, and the town of Empire. This area is broadly defined and includes the communities and other areas that would be **indirectly** affected by the Proposed Action. The indirect effects study area includes the communities shown in Figure 2.

For the remaining resources, the study area for **indirect** effects generally includes a 0.25-mile buffer around the study area. This area encompasses the communities and other areas that would be indirectly affected by the Proposed Action.

Figure 2. Study Area Communities



### 3.3 Regulations

This section identifies the relevant federal and state regulations, guidelines and/or laws that apply to highway traffic noise. The Proposed Action involves the use of state and federal funds and thus is subject to both federal regulations and state noise guidelines.

#### 3.3.1 Federal

The regulations that govern highway traffic noise for federal aid and federal action projects are contained in 23 CFR 772. These regulations describe the methods that must be followed in the evaluation and abatement of highway traffic noise in federal aid and federal action highway projects. The regulations require each state highway agency to prepare and adopt written guidelines specific to that state which must demonstrate compliance with 23 CFR 772.

#### 3.3.2 State

CDOT's Noise Analysis and Abatement Guidelines (CDOT 2015) describe the CDOT policy and program to implement 23 CFR 772. These guidelines establish noise abatement criteria and design and cost requirements for noise mitigation. Traffic noise impacts occur when noise levels, for different categories of land uses and activities, meet or exceed the CDOT Noise Abatement Criteria (NAC) shown in Table 1.



**Table 1. CDOT Noise Abatement Criteria**

Activity Category	Activity Leq(h) <sup>1</sup>	Evaluation Location	Activity Description
A	56	Exterior	Lands on which the 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 <sup>2</sup>	66	Exterior	Residential
C <sup>2</sup>	66	Exterior	Active sports areas, amphitheatres, 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	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 <sup>2</sup>	71	Exterior	Hotels, motels, time-share resorts, vacation rental properties, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	NA	Exterior	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, ship yards, utilities (water resources, water treatment, electrical), and warehousing.
G	NA	Exterior	Undeveloped lands that are not permitted for development.

<sup>1</sup>Hourly A-weighted sound level in dBA, reflecting a 1-dBA approach value below 23 CFR 772 values

<sup>2</sup>Includes undeveloped lands permitted for this activity category

The guidelines also state that noise mitigation must be considered for any receptors where predicted noise levels for future conditions are greater than existing noise levels by 10 dB(A) or more.

All highway projects that are developed in conformance with the CDOT guidelines also conform with federal regulations and FHWA noise standards.

### 3.4 Public Involvement

Individuals from local jurisdictions, communities, state and federal agencies, and special interest groups were a part of an 18-member Project Leadership Team and a 48-member Technical Team that is guiding the NEPA process.





Many suggestions and concerns have been identified during the Concept Development Process and the NEPA process, including neighborhood and business concerns (from Idaho Springs; Downieville, Dumont, and Lawson neighborhoods; businesses throughout the corridor, and others).

Comments received specific to noise include:

- More data is needed on noise in the corridor.
- Noise mitigation is needed east of the Idaho Springs historic district.
- Traffic noise reduction is needed.
- There will be more traffic noise if I-70 is elevated.
- Residents of the 1900 block of Miner Street in Idaho Springs have been requesting for 35 years that CDOT build a noise wall.
- Construction noise at night has previously been an issue.
- Noise from rumble strips during construction is an issue.
- Noise barriers in the Downieville-Lawson-Dumont area should be placed on both sides of the road
- In the Dumont-Lawson area, noise barriers and a jake brake law should be considered.
- The rumble strip in the Dumont-Lawson area should be pushed to the edge of the road.

### 3.5 Agency Coordination Conducted

The NEPA WB PPSL team coordinated with CDOT's Noise Program Manager and representatives from FHWA to develop the approach for assessing highway traffic noise impacts in this study. An interagency meeting with CDOT, FHWA, and representatives from the NEPA WB PPSL team was held on July 19, 2017.

CDOT has initiated coordination with federal and state agencies, local stakeholders, and working groups, and will continue that coordination throughout the project.

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## Section 4. Description of the Proposed Action

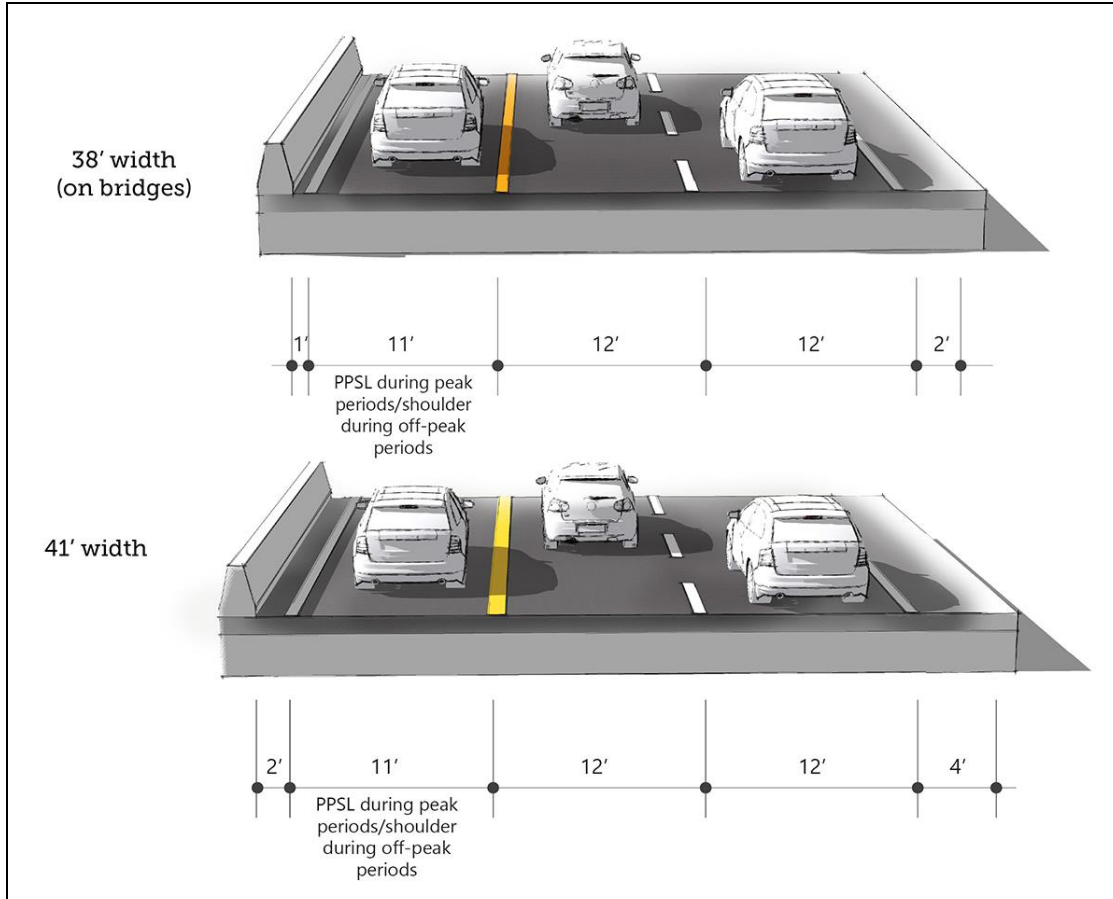
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The WB PPSL project adds an approximate 12-mile tolled PPSL on WB I-70 between the Veterans Memorial Tunnels (just west of MP 243) and the US 40/I-70 interchange (MP 232). The lane entrance begins approximately 500 feet east of the Veterans Memorial Tunnels portal. The WB PPSL maximizes the use of the existing alignment and infrastructure in order to minimize any new impacts within the study area. The 11-foot lane is open for use only during peak periods, and otherwise serves as the shoulder of the interstate. Use of the WB PPSL is prohibited for trucks, buses, or any vehicle over 25 feet long. Overhead signs showing the lane status and toll rate are located throughout the corridor and at the entrance point.

An ingress/entrance point for traffic coming onto WB I-70 from Idaho Springs is provided approximately 2,500 feet west of Exit 239. An egress point for traffic exiting to Downieville is provided about 4,400 feet east of Exit 235, and an egress point for traffic exiting to US 40 is provided approximately 4,400 feet east of Exit 232.

The WB PPSL ends approximately 1/2 mile west of Exit 232. Figure 3 illustrates the typical cross sections of the Proposed Action.

**Figure 3. WB PPSL Proposed Action Typical Cross Sections**



Source: HDR 2018.

Improvements include:

**I-70 Modifications.** The general purpose lanes and shoulder of WB I-70 are resurfaced and widened in select locations on the existing alignment between approximately MP 241.5 and MP 232 to accommodate a lane on the shoulder during peak travel periods. Drainage enhancements include a storm system for minor and major storm events and water quality facilities. At SH 103, I-70 is slightly realigned to enhance safety and improve drainage.

**SH 103 Interchange Improvements.** Ramp improvements address sight distance problems. The pedestrian sidewalk is improved by adding lighting and a decorative paving buffer adjacent to the existing sidewalk on the SH 103 bridge over I-70. This sidewalk connects to a new sidewalk buffered from 13th Avenue between the interchange ramp and Idaho Street in Idaho Springs.

**Safety Pull-Outs.** A total of seven new safety pull-outs are built—five along WB I-70 and two along EB I-70. One existing safety pull-out on EB I-70 is improved. The intention of these is to provide a space for vehicles to use if they experience a break down and for law enforcement to use.



**Rockfall Mitigation.** Rockfall mitigation measures are added at five locations to reduce the chance of rocks or other debris from falling on travel lanes or shoulders and reduce the potential for crashes and travel disruptions. Rockfall mitigation measures are included in the WB direction at MP 239, MP 238.4, MP 237.1, and MP 236.4, and in the EB direction at MP 240.3.

**Active Traffic Management.** Dynamic signage informs drivers so the WB PPSL is appropriately used to reduce congestion. This innovative design improves mobility.

**Fiber Optic Upgrades.** Fiber optics are designed to accommodate future emerging technologies for autonomous and connected vehicles, improving driver information and emergency response capabilities.

**Dumont Port-of-Entry Interchange.** Merge area improvements to the Dumont interchange acceleration lane includes restriping of I-70 to reduce merge conflicts between truck traffic and the general-purpose lane traffic.



*Dynamic signage*

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## Section 5. What are the Noise Resources in the Study Area?

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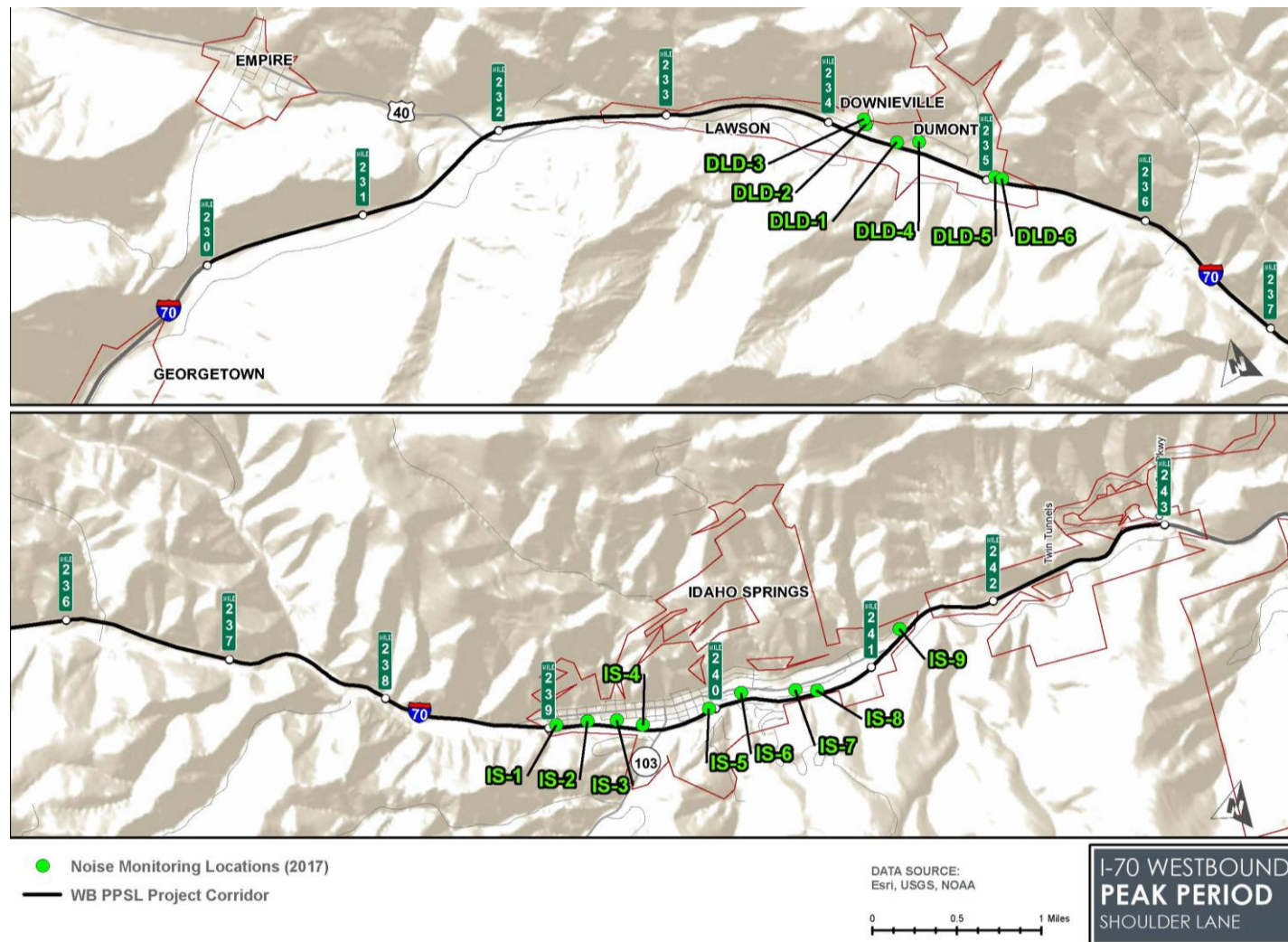
Land uses in the study area are residential, recreational and commercial. Some areas have a greater density of homes than others. Although the Proposed Action is a Type III project that does not require a noise analysis, noise measurements were taken in the study area. Noise measurements were taken in order to be consistent with the commitments in the Senate Bill 1041 application for the EB PPSL project and because noise increases were a public concern that had been expressed in two public meetings. Existing noise levels at noise sensitive receptors adjacent to the study area were determined by taking short-term (10-minute) sound-level measurements at 15 locations within the study area. Noise monitoring locations are shown in Figure 4 and the measurement results are listed in Table 2. Data sheets showing aerial imagery of the site, field data, and measurement results are included in Appendix A of this technical report.

There is one existing noise wall in the study area that was originally built under a Type II noise wall program. The Proposed Action requires that about 500 feet of this wall is moved slightly away from the travel lane to improve sight distance.

Table 2 shows that CDOT's NAC is exceeded during peak traffic hours at 11 of the 15 noise measurement locations. The noise measurements collected as part of the WB PPSL noise assessment are similar to the sound levels observed as part of the EB PPSL noise study. This indicates that while noise sensitive receptors in the study area currently demonstrate noise levels greater than CDOT's NAC it is unlikely that the WB PPSL would cause a perceptible increase in sound levels from current conditions.



Figure 4. Noise Measurement Locations in the WB PPSL Study Area



DLD = Downieville Lawson Dumont

IS = Idaho Springs





**Table 2. Measured Noise Levels in the WB PPSL Study Area**

Monitoring Location	Approximate Address	Activity Category	Land Use	Date	Time <sup>1</sup>	Measured Noise Level (dBA) <sup>2,3,4</sup>
DLD-1	Lawson—Mobile Home Park	B	Residential	8/09/2017	8:20—8:41	<b>70.6</b>
DLD-2	Downieville—CR 308 and Mountain Street	B	Residential	8/09/2017	8:48—9:09	61.3
DLD-3	Downieville—Mountain Street	B	Residential	8/09/2017	9:21—9:42	59.5
DLD-4	Dumont—CR 260	B	Residential	8/18/2017	8:58—9:19	<b>69.4</b>
DLD-5	Dumont—CR 308 and Highway 6	B	Residential	8/10/2017	9:01—9:22	<b>66.8</b>
DLD-6	Dumont—CR 308	B	Residential	8/10/2017	9:26—9:47	<b>70.1</b>
IS-1	Idaho Springs—Miner Street West	B	Residential	8/11/2017	8:15—8:36	64.4
IS-2	Idaho Springs—Mobile Home Park West	B	Residential	8/11/2017	8:45—9:06	<b>69.4</b>
IS-3	Idaho Springs—Mobile Home Park East	B	Residential	8/11/2017	9:13—9:34	<b>66.1</b>
IS-4	Idaho Springs—Football Field East	C	Recreational	8/11/2017	9:38—9:59	<b>72.5</b>
IS-5	Idaho Springs—Harold A. Anderson Park	C	Recreational	8/17/2017	8:13—8:34	<b>70.0</b>
IS-6	Idaho Springs—Miner Street and 20 <sup>th</sup> Avenue	B	Residential	8/17/2017	8:49—9:10	<b>69.2</b>
IS-7	Idaho Springs—Miner Street and 25 <sup>th</sup> Avenue	B	Residential	8/17/2017	9:15—9:36	65.2
IS-8	Idaho Springs—Edwards Street and 27 <sup>th</sup> Place	B	Residential	8/17/2017	9:40—10:01	<b>76.4</b>
IS-9	Idaho Springs—Skate park	C	Recreational	8/18/2017	8:16—8:37	<b>74.0</b>

<sup>1</sup> Represents the time range over which the two 10-minute measurements were taken

<sup>2</sup> dBA A-weighted decibel

<sup>3</sup> Locations that exceed the CDOT NAC are shown in bold

<sup>4</sup> Measured levels are the average of the two 10-minute noise measurements



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## Section 6. What are the Environmental Consequences?

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### 6.1 Type III Project Classification

The Colorado Division of the FHWA has determined that the Proposed Action is a Type III project as established in 23 CFR 772.5. Therefore, the project requires no analysis for highway traffic noise impacts. Type III projects do not involve construction of new through lanes or auxiliary lanes (other than turn lanes), substantial changes in horizontal or vertical alignment of the roadway, exposure of noise sensitive land uses to a new or existing highway noise source, or any other activity classified as a Type I or Type II project. This determination was based on the following information:

- The project is a temporary occupancy of the shoulder and not considered by FHWA to qualify as a permanent through lane or capacity addition.
- No alteration of any highway lanes would result in a halving of the distance between the nearest edge of the westbound lanes and existing sensitive receptors.
- The project does not include changes in the vertical profile of I-70.
- The project does not remove shielding, which would expose the line-of-sight between the receptor and the traffic noise source.
- There are no new auxiliary lanes or acceleration and deceleration lanes.
- There are no additional interchange ramps nor is there relocation of ramps.

There is one existing noise wall originally built under a Type II noise wall program, which may be affected by the project. If the wall is affected by the project it will need to be replaced at an appropriate location.

Noise analysis is required if changes to the Proposed Action result in reclassification to a Type I project.

Incidental noise reduction benefits may occur in Idaho Springs because concrete barriers (not intended for noise abatement) are planned on the outside shoulder in areas where I-70 is elevated. These barriers are concrete Type 9 barriers with a glare screen on top, and are about 56 inches high. They are not noise barriers. Modeling using TNM was performed as part of the EB I-70 PPSL environmental clearance. This modeling indicated that a 45-inch barrier could provide 2 dBA to 4 dBA incidental noise reduction at the residences nearest to I-70 where the line-of-sight between the receptor location and vehicle traffic on I-70 was blocked (CDOT 2014). A 4 dBA insertion loss because of the barrier could be barely perceptible to some individuals. Similar noise reductions are expected following the implementation of the Proposed Action.

#### 6.1.1 What Effects Occur During Construction?

A 500-foot section of the existing noise wall in Idaho Springs is moved approximately 4 feet north of the travel lane to improve sight distance. This does not impact the effectiveness of the wall. Temporary increases in noise occur during construction.

Standard construction techniques generate noise from diesel-powered earth moving equipment such as dump trucks and bulldozers, back-up alarms on certain equipment, and compressors. Construction noise



at off-site receptor locations is dependent on the loudest one or two pieces of equipment operating at the moment. Noise levels from diesel-powered equipment range from 80 to 95 dBA at a distance of 50 feet.

Construction noise is not likely to pose a health risk or damage peoples' sense of hearing, but it can adversely affect peoples' quality of life (FHWA 2006). Construction noise has the potential to disturb noise sensitive receptors in the project study area. However, the impacts of construction noise are temporary in nature and will cease once the WB PPSL is in operation.

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## Section 7. What Mitigation Is Needed?

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### 7.1 Mitigation

The Proposed Action has been classified as a Type III project. Therefore, no analysis of highway traffic noise impacts or mitigation of potential impacts is required.

Construction noise impacts could be mitigated as described in Table 2.



Table 3. Mitigation Tracking

Mitigation Category	Impact from NEPA Document	Commitment From Mitigation Table In Source Document (Use Exact Wording from Table in Source Document)	Responsible Branch	Timing/Phase of Construction Mitigation to be Constructed
Noise	Construction noise impacts	<ul style="list-style-type: none"><li>▪ Limit work to certain hours of the day where possible.</li><li>▪ Require the use of well-maintained equipment (particularly with respect to mufflers).</li><li>▪ Modify backup alarm systems within acceptable safety guidelines.</li><li>▪ Locate haul roads away from noise sensitive receptors.</li><li>▪ Provide public outreach to inform residents in area of any noise producing activities.</li></ul>	CDOT Engineering and Contractor	During Construction





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## Section 8. References

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- CDOT. 2009. Context Sensitive Solutions on the I-70 Mountain Corridor. Accessed January 22, 2018, at: <https://www.codot.gov/projects/contextsensitivesolutions>.
- — —. 2011a. Final Programmatic Environmental Impact Statement. I-70 Mountain Corridor. March.
- — —. 2011b. I-70 Mountain Corridor PEIS Noise Technical Report. March.
- — —. 2012a. CDOT Project CO703-379, Twin Tunnels Environmental Assessment and Section 4f Evaluation, Clear Creek County. June.
- — —. 2012b. CDOT Project CO703-379, Twin Tunnels Environmental Assessment, Noise Memorandum. May.
- — —. 2014. EB I-70 Peak Period Shoulder Lane Categorical Exclusion. April.
- — —. 2015. CDOT Noise Analysis and Abatement Guidelines. January.
- FHU. 2013. Investigation into Effective Traffic Noise Abatement Design Solutions for Mountain Corridors. July
- FHWA. 2006. Construction Noise Handbook. August.
- HDR. 2017. Noise Monitoring Report EB I-70 Peak Period Shoulder Lane. April.



Appendix A.

## Noise Monitoring Data Sheets



**Ambient Noise Monitoring Data Sheet**

<b>Date:</b> 8/9/17	<b>Client:</b> CDOT
<b>Location:</b> DLD-1	<b>Project Number:</b> 11719106
<b>Location Coordinates:</b> 39.76565812, -105.60987362	<b>Project Title:</b> WB I-70 Peak Period Shoulder Lane
<b>By:</b> Jake Fritz	<b>Noise Source:</b> I-70

<b>Equipment</b>	<b>Type</b>	<b>Serial #</b>
Sound Level Meter	Quest 3M 2200	KOK040010
Microphone	QE7052	KOK040010
Calibrator	QC-10	QIG090200

**SLM SETTINGS:** Fast  
**WEIGHTING:** A

<b>Weather Description</b>	<b>Temp (°F)</b>	<b>Wind (mph)</b>	<b>RH (%)</b>
Sunny	63	-	-

	<b>Reading 1</b>	<b>Reading 2</b>
<b>Measurement #</b>	DLD-1	DLD-1
<b>L<sub>eq</sub> (dBA)</b>	70.8	70.3
<b>Start Time</b>	0820	0831
<b>Duration</b>	10 minutes	10 minutes

Calibration results before: Pass and after 113.9 Dba

**Monitoring Location Sketch:**





**Ambient Noise Monitoring Data Sheet**

<b>Date:</b> 8/9/17	<b>Client:</b> CDOT
<b>Location:</b> DLD-2	<b>Project Number:</b> 11719106
<b>Location Coordinates:</b> 39.76662180, -105.61369979	<b>Project Title:</b> WB I-70 Peak Period Shoulder Lane
<b>By:</b> Jake Fritz	<b>Noise Source:</b> I-70

Equipment	Type	Serial #
Sound Level Meter	Quest 3M 2200	KOK040010
Microphone	QE7052	KOK040010
Calibrator	QC-10	QIG090200

**SLM SETTINGS:** Fast  
**WEIGHTING:** A

Weather Description	Temp (°F)	Wind (mph)	RH (%)
Sunny	64	-	-

	Reading 1	Reading 2
<b>Measurement #</b>	DLD-2	DLD-2
<b>L<sub>eq</sub> (dBA)</b>	61.5	61.0
<b>Start Time</b>	0848	0859
<b>Duration</b>	10 minutes	10 minutes

Calibration results before: Pass and after 113.9 Dba

**Monitoring Location Sketch:**





### Ambient Noise Monitoring Data Sheet

<b>Date:</b> 8/9/17	<b>Client:</b> CDOT
<b>Location:</b> DLD-3	<b>Project Number:</b> 11719106
<b>Location Coordinates:</b> 39.76700013, -105.61404957	<b>Project Title:</b> WB I-70 Peak Period Shoulder Lane
<b>By:</b> Jake Fritz	<b>Noise Source:</b> I-70

Equipment	Type	Serial #
Sound Level Meter	Quest 3M 2200	KOK040010
Microphone	QE7052	KOK040010
Calibrator	QC-10	QIG090200

**SLM SETTINGS:** Fast  
**WEIGHTING:** A

Weather Description	Temp (°F)	Wind (mph)	RH (%)
Sunny	65	-	-

Measurement #	Reading 1	Reading 2
1	DLD-3	DLD-3
<b>Leq (dBA)</b>	59.2	59.7
<b>Start Time</b>	0921	0932
<b>Duration</b>	10 minutes	10 minutes

Calibration results before: Pass and after 113.9 Dba

**Monitoring Location Sketch:**







**Ambient Noise Monitoring Data Sheet**

<b>Date:</b> 8/18/17	<b>Client:</b> CDOT
<b>Location:</b> DLD-4	<b>Project Number:</b> 11719106
<b>Location Coordinates:</b> 39.76608048, -105.607423344	<b>Project Title:</b> WB I-70 Peak Period Shoulder Lane
<b>By:</b> Jake Fritz	<b>Noise Source:</b> I-70

Equipment	Type	Serial #
Sound Level Meter	Quest 3M 2200	KOK040010
Microphone	QE7052	KOK040010
Calibrator	QC-10	QIG090200

**SLM SETTINGS:** Fast  
**WEIGHTING:** A

Weather Description	Temp (°F)	Wind (mph)	RH (%)
Sunny	64	1.9	-

	Reading 1	Reading 2
<b>Measurement #</b>	DLD-4	DLD-4
<b>L<sub>eq</sub> (dBA)</b>	68.7	70.0
<b>Start Time</b>	0858	0909
<b>Duration</b>	10 minutes	10 minutes

Calibration results before: Pass and after 113.9 Dba

**Monitoring Location Sketch:**





**Ambient Noise Monitoring Data Sheet**

<b>Date:</b> 8/10/17	<b>Client:</b> CDOT
<b>Location:</b> DLD-5	<b>Project Number:</b> 11719106
<b>Location Coordinates:</b> 39.76442460, -105.59823805	<b>Project Title:</b> WB I-70 Peak Period Shoulder Lane
<b>By:</b> Jake Fritz	<b>Noise Source:</b> I-70

Equipment	Type	Serial #
Sound Level Meter	Quest 3M 2200	KOK040010
Microphone	QE7052	KOK040010
Calibrator	QC-10	QIG090200

**SLM SETTINGS:** Fast

**WEIGHTING:** A

Weather Description	Temp (°F)	Wind (mph)	RH (%)
Sunny	65	-	-

	Reading 1	Reading 2
<b>Measurement #</b>	DLD-5	DLD-5
<b>L<sub>eq</sub> (dBA)</b>	66.4	67.1
<b>Start Time</b>	0901	0912
<b>Duration</b>	10 minutes	10 minutes

Calibration results before: Pass and after 113.8 Dba

**Monitoring Location Sketch:**





**Ambient Noise Monitoring Data Sheet**

<b>Date:</b> 8/10/17	<b>Client:</b> CDOT
<b>Location:</b> DLD-6	<b>Project Number:</b> 11719106
<b>Location Coordinates:</b> 39.76440557, -105.59743380	<b>Project Title:</b> WB I-70 Peak Period Shoulder Lane
<b>By:</b> Jake Fritz	<b>Noise Source:</b> I-70

Equipment	Type	Serial #
Sound Level Meter	Quest 3M 2200	KOK040010
Microphone	QE7052	KOK040010
Calibrator	QC-10	QIG090200

**SLM SETTINGS:** Fast  
**WEIGHTING:** A

Weather Description	Temp (°F)	Wind (mph)	RH (%)
Sunny	65	-	-

	Reading 1	Reading 2
<b>Measurement #</b>	DLD-6	DLD-6
<b>L<sub>eq</sub> (dBA)</b>	69.4	70.8
<b>Start Time</b>	0926	0937
<b>Duration</b>	10 minutes	10 minutes

Calibration results before: Pass and after 113.9 Dba

**Monitoring Location Sketch:**





**Ambient Noise Monitoring Data Sheet**

<b>Date:</b> 8/11/17	<b>Client:</b> CDOT
<b>Location:</b> IS-1	<b>Project Number:</b> 11719106
<b>Location Coordinates:</b> 39.74357363, -105.53136767	<b>Project Title:</b> WB I-70 Peak Period Shoulder Lane
<b>By:</b> Jake Fritz	<b>Noise Source:</b> I-70

Equipment	Type	Serial #
Sound Level Meter	Quest 3M 2200	KOK040010
Microphone	QE7052	KOK040010
Calibrator	QC-10	QIG090200

**SLM SETTINGS:** Fast  
**WEIGHTING:** A

Weather Description	Temp (°F)	Wind (mph)	RH (%)
Sunny	65	1.7	-

	Reading 1	Reading 2
<b>Measurement #</b>	IS-1	IS-1
<b>L<sub>eq</sub> (dBA)</b>	64.4	64.3
<b>Start Time</b>	0815	0826
<b>Duration</b>	10 minutes	10 minutes

Calibration results before: Pass and after 113.8 Dba

**Monitoring Location Sketch:**





**Ambient Noise Monitoring Data Sheet**

<b>Date:</b> 8/11/17	<b>Client:</b> CDOT
<b>Location:</b> IS-2	<b>Project Number:</b> 11719106
<b>Location Coordinates:</b> 39.74320172, -105.52790770	<b>Project Title:</b> WB I-70 Peak Period Shoulder Lane
<b>By:</b> Jake Fritz	<b>Noise Source:</b> I-70

Equipment	Type	Serial #
Sound Level Meter	Quest 3M 2200	KOK040010
Microphone	QE7052	KOK040010
Calibrator	QC-10	QIG090200

**SLM SETTINGS:** Fast

**WEIGHTING:** A

Weather Description	Temp (°F)	Wind (mph)	RH (%)
Sunny	64	0.7	-

	Reading 1	Reading 2
<b>Measurement #</b>	IS-2	IS-2
<b>L<sub>eq</sub> (dBA)</b>	69.4	69.4
<b>Start Time</b>	0845	0856
<b>Duration</b>	10 minutes	10 minutes

Calibration results before: Pass and after 113.9 Dba

**Monitoring Location Sketch:**







**Ambient Noise Monitoring Data Sheet**

<b>Date:</b> 8/11/17	<b>Client:</b> CDOT
<b>Location:</b> IS-3	<b>Project Number:</b> 11719106
<b>Location Coordinates:</b> 39.74262506, -105.52475122	<b>Project Title:</b> WB I-70 Peak Period Shoulder Lane
<b>By:</b> Jake Fritz	<b>Noise Source:</b> I-70

Equipment	Type	Serial #
Sound Level Meter	Quest 3M 2200	KOK040010
Microphone	QE7052	KOK040010
Calibrator	QC-10	QIG090200

**SLM SETTINGS:** Fast

**WEIGHTING:** A

Weather Description	Temp (°F)	Wind (mph)	RH (%)
Sunny	64	1.7	-

	Reading 1	Reading 2
<b>Measurement #</b>	IS-3	IS-3
<b>L<sub>eq</sub> (dBA)</b>	65.6	66.5
<b>Start Time</b>	0913	0924
<b>Duration</b>	10 minutes	10 minutes

Calibration results before: Pass and after 114.0 Dba

**Note:** Measurement location was near a detour for existing road construction.

**Monitoring Location Sketch:**





**Ambient Noise Monitoring Data Sheet**

<b>Date:</b> 8/11/17	<b>Client:</b> CDOT
<b>Location:</b> IS-4	<b>Project Number:</b> 11719106
<b>Location Coordinates:</b> 39.74161057, -105.52212108	<b>Project Title:</b> WB I-70 Peak Period Shoulder Lane
<b>By:</b> Jake Fritz	<b>Noise Source:</b> I-70

Equipment	Type	Serial #
Sound Level Meter	Quest 3M 2200	KOK040010
Microphone	QE7052	KOK040010
Calibrator	QC-10	QIG090200

**SLM SETTINGS:** Fast  
**WEIGHTING:** A

Weather Description	Temp (°F)	Wind (mph)	RH (%)
Sunny	65	2.8	-

	Reading 1	Reading 2
<b>Measurement #</b>	IS-4	IS-4
<b>L<sub>eq</sub> (dBA)</b>	72.2	72.7
<b>Start Time</b>	0938	0949
<b>Duration</b>	10 minutes	10 minutes

Calibration results before: Pass and after 113.9 Dba

**Monitoring Location Sketch:**





**Ambient Noise Monitoring Data Sheet**

<b>Date:</b> 8/17/17	<b>Client:</b> CDOT
<b>Location:</b> IS-5	<b>Project Number:</b> 11719106
<b>Location Coordinates:</b> 39.74148541, -105.51457201	<b>Project Title:</b> WB I-70 Peak Period Shoulder Lane
<b>By:</b> Jake Fritz	<b>Noise Source:</b> I-70

Equipment	Type	Serial #
Sound Level Meter	Quest 3M 2200	KOK040010
Microphone	QE7052	KOK040010
Calibrator	QC-10	QIG090200

**SLM SETTINGS:** Fast  
**WEIGHTING:** A

Weather Description	Temp (°F)	Wind (mph)	RH (%)
Sunny	65	1.2	-

	Reading 1	Reading 2
<b>Measurement #</b>	IS-5	IS-5
<b>L<sub>eq</sub> (dBA)</b>	69.8	70.1
<b>Start Time</b>	0813	0824
<b>Duration</b>	10 minutes	10 minutes

Calibration results before: Pass and after 114.0 Dba

**Monitoring Location Sketch:**





**Ambient Noise Monitoring Data Sheet**

<b>Date:</b> 8/17/17	<b>Client:</b> CDOT
<b>Location:</b> IS-6	<b>Project Number:</b> 11719106
<b>Location Coordinates:</b> 39.74202555, -105.51067421	<b>Project Title:</b> WB I-70 Peak Period Shoulder Lane
<b>By:</b> Jake Fritz	<b>Noise Source:</b> I-70

Equipment	Type	Serial #
Sound Level Meter	Quest 3M 2200	KOK040010
Microphone	QE7052	KOK040010
Calibrator	QC-10	QIG090200

**SLM SETTINGS:** Fast  
**WEIGHTING:** A

Weather Description	Temp (°F)	Wind (mph)	RH (%)
Sunny	65	1.7	-

	Reading 1	Reading 2
<b>Measurement #</b>	IS-6	IS-6
<b>L<sub>eq</sub> (dBA)</b>	68.2	70.2
<b>Start Time</b>	0849	0900
<b>Duration</b>	10 minutes	10 minutes

Calibration results before: Pass and after 114.0 Dba

**Note:** Measurement location was near a detour for existing road construction.

**Monitoring Location Sketch:**







**Ambient Noise Monitoring Data Sheet**

<b>Date:</b> 8/17/17	<b>Client:</b> CDOT
<b>Location:</b> IS-7	<b>Project Number:</b> 11719106
<b>Location Coordinates:</b> 39.74106092, -105.50479540	<b>Project Title:</b> WB I-70 Peak Period Shoulder Lane
<b>By:</b> Jake Fritz	<b>Noise Source:</b> I-70

Equipment	Type	Serial #
Sound Level Meter	Quest 3M 2200	KOK040010
Microphone	QE7052	KOK040010
Calibrator	QC-10	QIG090200

**SLM SETTINGS:** Fast

**WEIGHTING:** A

Weather Description	Temp (°F)	Wind (mph)	RH (%)
Sunny	65	1.2	-

	Reading 1	Reading 2
<b>Measurement #</b>	IS-7	IS-7
<b>L<sub>eq</sub> (dBA)</b>	68.2	62.2
<b>Start Time</b>	0915	0926
<b>Duration</b>	10 minutes	10 minutes

Calibration results before: Pass and after 114.1 dBA

**Monitoring Location Sketch:**







**Ambient Noise Monitoring Data Sheet**

<b>Date:</b> 8/17/17	<b>Client:</b> CDOT
<b>Location:</b> IS-8	<b>Project Number:</b> 11719106
<b>Location Coordinates:</b> 39.74050460, -105.50252111	<b>Project Title:</b> WB I-70 Peak Period Shoulder Lane
<b>By:</b> Jake Fritz	<b>Noise Source:</b> I-70

<b>Equipment</b>	<b>Type</b>	<b>Serial #</b>
Sound Level Meter	Quest 3M 2200	KOK040010
Microphone	QE7052	KOK040010
Calibrator	QC-10	QIG090200

**SLM SETTINGS:** Fast  
**WEIGHTING:** A

<b>Weather Description</b>	<b>Temp (°F)</b>	<b>Wind (mph)</b>	<b>RH (%)</b>
Sunny	65	1.3	-

	<b>Reading 1</b>	<b>Reading 2</b>
<b>Measurement #</b>	IS-8	IS-8
<b>L<sub>eq</sub> (dBA)</b>	77.7	75.0
<b>Start Time</b>	0940	0951
<b>Duration</b>	10 minutes	10 minutes

Calibration results before: Pass and after 114.0 dBA

**Monitoring Location Sketch:**





### Ambient Noise Monitoring Data Sheet

<b>Date:</b> 8/18/19	<b>Client:</b> CDOT
<b>Location:</b> IS-9	<b>Project Number:</b> 11719106
<b>Location Coordinates:</b> 39.74370521, -105.49184661	<b>Project Title:</b> WB I-70 Peak Period Shoulder Lane
<b>By:</b> Jake Fritz	<b>Noise Source:</b> I-70

Equipment	Type	Serial #
Sound Level Meter	Quest 3M 2200	KOK040010
Microphone	QE7052	KOK040010
Calibrator	QC-10	QIG090200

**SLM SETTINGS:** Fast  
**WEIGHTING:** A

Weather Description	Temp (°F)	Wind (mph)	RH (%)
Sunny	65	0.4	-

Measurement #	Reading 1	Reading 2
1	IS-9	IS-9
<b>L<sub>eq</sub> (dBA)</b>	73.3	74.7
<b>Start Time</b>	0816	0827
<b>Duration</b>	10 minutes	10 minutes

Calibration results before: Pass and after 113.9 Dba

**Monitoring Location Sketch:**

