

Noise Technical Report

New Pueblo Freeway

CDOT Project No. IM 0251-165

Project Control No. 12831

Colorado Department of Transportation

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Noise Technical Report – New Pueblo Freeway

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Introduction

This report describes the results of a noise study conducted for the New Pueblo Freeway Project, located in Pueblo, Colorado. The project extends for about 12 miles along Interstate 25 (I-25) from US 47 to Pueblo Boulevard, as shown in Figure 1. The study was conducted according to the Colorado Department of Transportation's (CDOT) *Noise Analysis and Abatement Guidelines* (2011). Noise levels were predicted along the entire corridor at representative residential, commercial, and parklands locations for existing conditions (Year 2003), No Action conditions (Year 2035), and Build conditions (Year 2035) using the Traffic Noise Model (TNM), v2.5. The accuracy of the TNM model was verified by ten noise measurement results along the corridor. Noise impacted areas were identified as those where the future levels were predicted to approach or exceed the Noise Abatement Criteria, or where future levels were predicted to exceed existing levels by 10 dBA or more. The feasibility and reasonableness of noise mitigation was assessed according to CDOT Noise Guidelines.

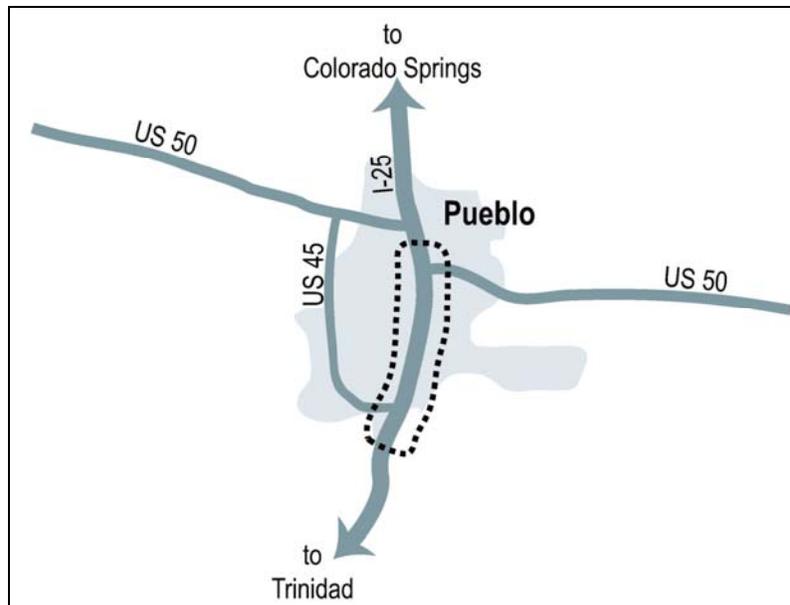


Figure 1: Project Location

Noise Analysis Guidelines

This analysis was conducted according to CDOT noise guidelines, which are set forth in the document entitled *CDOT Noise Analysis and Abatement Guidelines*, June 2011. The CDOT noise guidelines are consistent with those of the Federal Highway Administration (FHWA) (23 CFR 772) and have been approved by the FHWA for use on Federal-aid projects in Colorado. CDOT's guidelines establish noise abatement criteria and design and cost requirements for noise mitigation. The guidelines state that noise mitigation must be considered for any receptor or group of receptors where predicted traffic noise levels, using future traffic volumes and roadway conditions, equal or exceed CDOT's Noise Abatement Criteria (NAC) shown in Table 1. 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 dBA or more.

TABLE 1
CDOT Noise Abatement Criteria

Activity Category	$L_{eq}^{(2)}$ (dBA)	Activity Description
A	56 (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 ¹	66 (Exterior)	Residential.
C ¹	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	71 (Exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A-D or F.
F	n/a	Agricultural, 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	n/a	Undeveloped lands that are not permitted for development.

⁽¹⁾ Includes undeveloped lands permitted for this activity.

⁽²⁾ Hourly A-weighted sound level in dBA, reflecting a 1 dBA approach value below 23CFR772 values.

Wherever the NAC or increase criterion are met or exceeded, CDOT guidelines require that a mitigation analysis be conducted. This analysis entails first determining if proposed mitigation meets the following “feasibility” criteria:

- ❑ Absolute minimum noise reduction of 5 dBA at at least one receiver.
- ❑ No significant, “fatal flaw” maintenance or safety issues (e.g. sight distance reduction, shadowing/icing, interference with snow removal).
- ❑ Constructability (barrier must not pose significant environmental, engineering, or cost issues).

For mitigation measures that are considered feasible, the analysis considers the following “reasonableness” criteria:

- ❑ Noise reduction design goal of 7 dBA at a minimum of one benefitted receptor.
- ❑ Cost-benefit of no more than \$6,800 per benefitted receptor per decibel of reduction:
 - Calculated using a generic noise wall cost index of \$45 per square foot, and considering a benefitted receptor as one that receives at least 5 dB of noise reduction.
- ❑ Benefitted Receptors’ Desires (an initial benefitted receptor preference survey must be conducted during the environmental review stage of the project, and a final survey must be conducted during final design).

Noise Level Prediction Methodology

The TNM v2.5 model was used to predict existing and future noise levels, as well as the effects of potential mitigation measures. The TNM model calculates the hourly, A-weighted L_{eq} (equivalent noise level) at a receptor location given the noise emission level of automobiles, medium, and heavy trucks; the volume and speed of each of these vehicle types on each roadway of interest; the relative location of all roadways, receptors, and terrain features (i.e. natural and man-made barriers); and the type of terrain that exists between each receptor and each roadway. Roadway and terrain data were obtained from CAD files (2-foot elevation contours). The location and land-use of receptors were obtained by conducting a field survey. Traffic data was obtained from CH2M HILL and corresponds to Level-of-Service (LOS) “C” conditions. Refer to Attachment B for more details regarding the TNM input data used to predict noise levels on this project.

Existing Conditions and Data Collection

Existing noise conditions along the Corridor were predicted using TNM at 40 locations that are representative of the residences, parks, and commercial facilities located along the highway. The TNM model included Year 2003 Level of Service C traffic volumes and existing topography. Such existing topography includes the existing noise walls on the west side of I-25 from about Northern Ave. to Summit Ave., and the safety barriers along the centerline of I-25 and on the west side of I-25 between 24th St. and 28th St. Other significant existing topography modeled includes terrain on the west side of I-25 between Northern Ave. and terrain on the west side of I-25 between Summit Ave. and Abriendo Ave. The accuracy of the model was validated by comparing measured and predicted noise levels. The following sections describe the noise model validation results and the predicted noise levels for existing conditions.

Noise Model Validation

The noise model of existing conditions was validated by comparing measured and predicted noise levels at the ten locations labeled as M1 to M10 in Figure 2. Noise levels were predicted at each measurement location using TNM and the traffic volumes, speeds, and vehicle mix monitored during the noise measurements, which are listed in Attachment B. The TNM predictions utilized accurate topographical data to model the physical aspects of each location. The measured and predicted noise levels were then compared, as shown in Table 2. On average, the predicted noise levels were within 0.2 dBA of the measured levels, which is within the desired accuracy of ± 3 dBA. For all ten measurements, the predicted noise levels are between 2.1 dBA below and 1.8 dBA above measured levels. Overall, the model is predicting noise levels accurately on this project.

TABLE 2
Measured and Predicted Noise Levels (L_{eq} , dBA)

Site	Date	Time	Measured Level	Predicted Level	Predicted Minus Measured
M1	July 30, 2003	9:30am to 10:00 am	58.5	60.2	1.7
M2	July 30, 2003	9:30am to 10:00 am	66.5	66.2	-0.3
M3	July 30, 2003	9:30am to 10:00 am	73.2	72.8	-0.4
M4	July 30, 2003	8:45 am to 9:15 am	65.5	67.3	1.8
M5	August 6, 2003	9:15 am to 9:45 am	63.4	61.3	-2.1
M6	August 6, 2003	9:15 am to 9:45 am	62.7	61.5	-1.2
M7	August 6, 2003	9:15 am to 9:45 am	63.9	63.9	0.0
M8	August 6, 2003	9:15 am to 9:45 am	61.2	61.8	0.6
M9	August 12, 2003	1:00 pm to 1:30 pm	62.4	62.5	0.1
M10	August 19, 2003	9:15 am to 9:45 am	54.5	55.8	1.3

Existing Noise Levels

Existing (Year 2003) loudest-hour noise levels were predicted at the 40 representative locations shown in Figures 3 and 4. The primary purpose of predicting existing noise levels is to determine the increase in noise levels once the future noise levels (build alternatives and no-action) are predicted. If this predicted increase is at least 10 dBA, then a location is considered impacted by noise. The predicted loudest-hour noise levels for existing conditions are shown in Table 3.

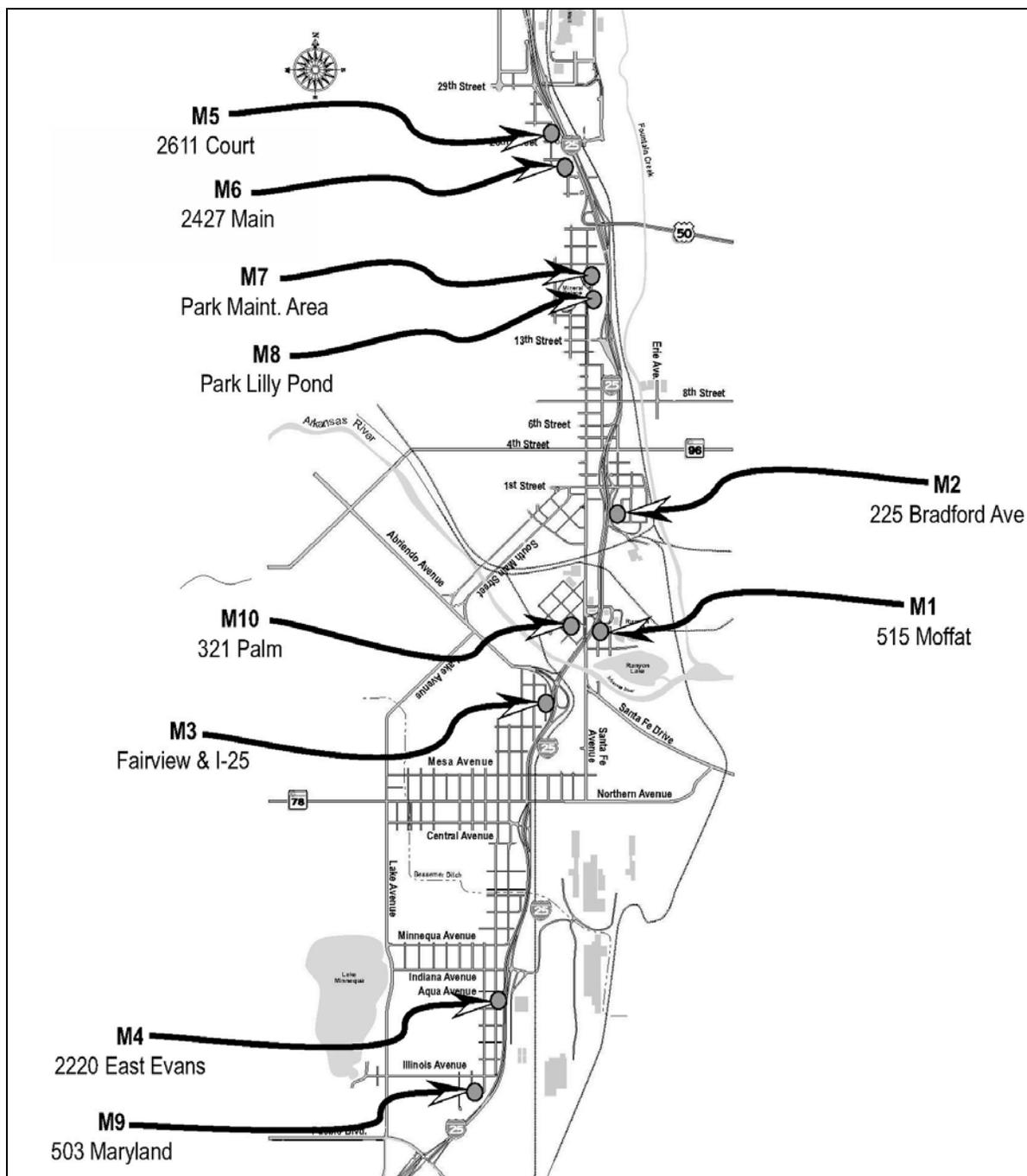


Figure 2: Noise Measurement Locations

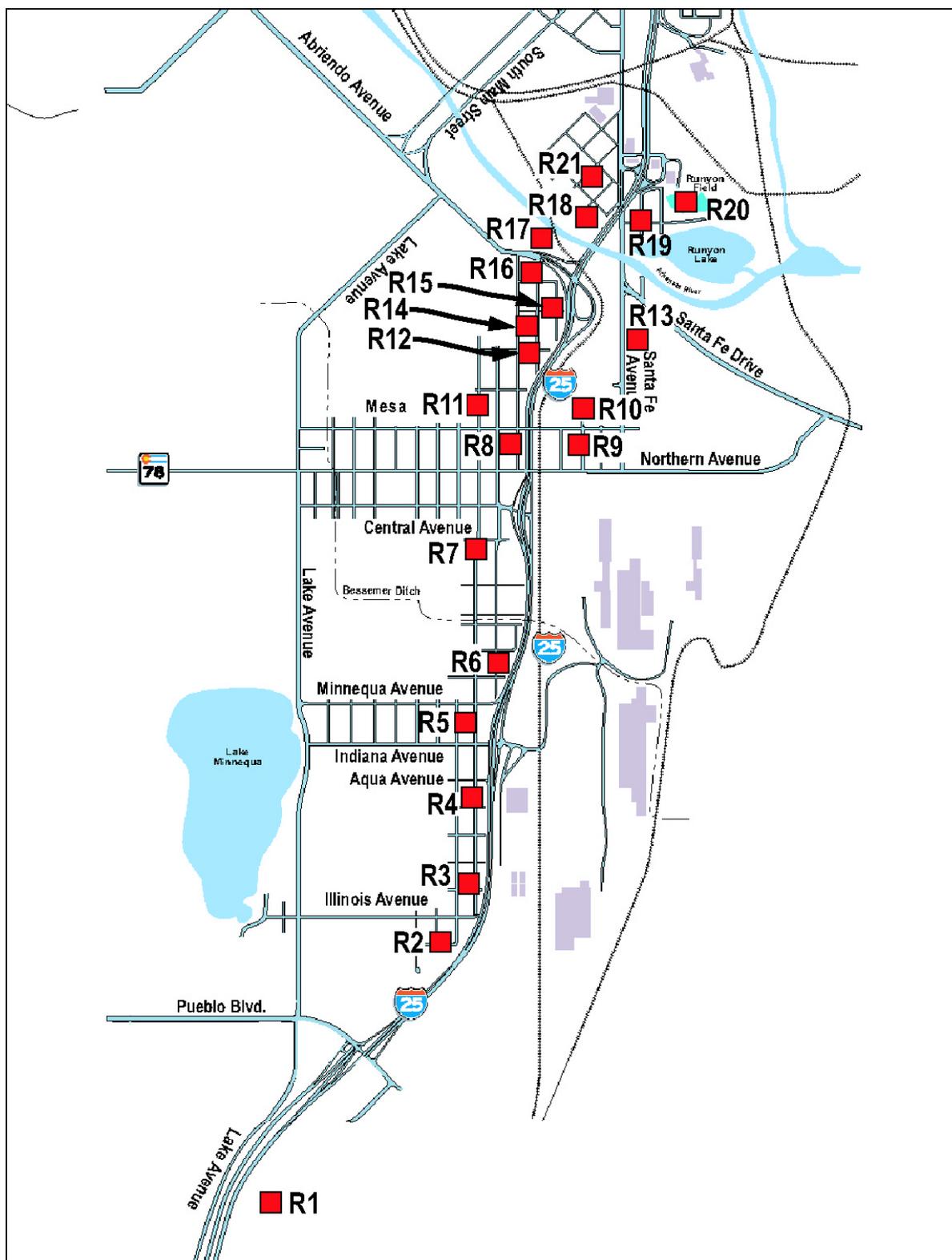


Figure 3: Location of Noise Level Predictions (R1 to R21)

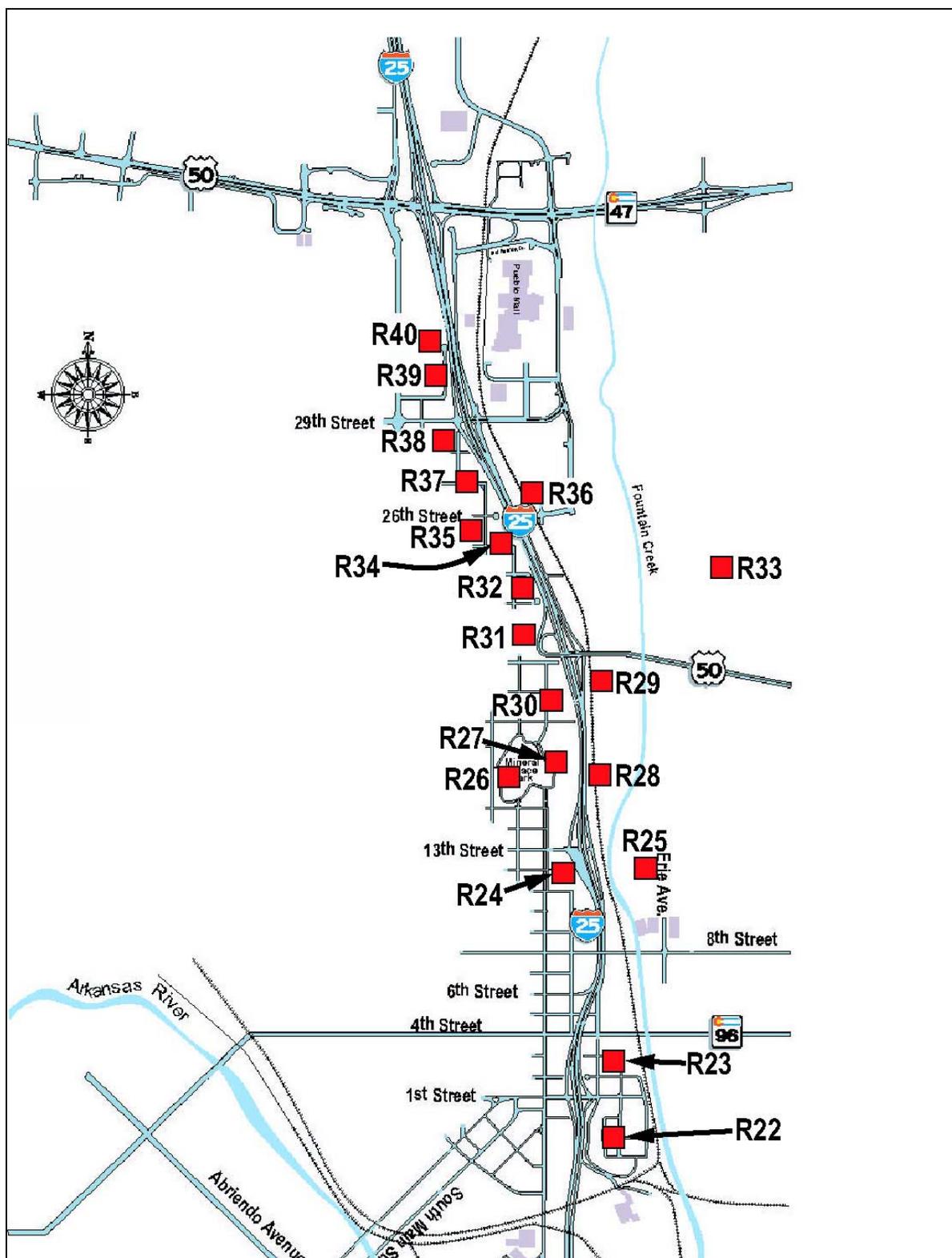


Figure 4: Location of Noise Level Predictions (R22 to R40)

TABLE 3

Existing (2003) Loudest-Hour Noise Levels - dBA

Noise Receptor #	Type	General Location	Row	Noise Level
R1	Commercial	S. of Pueblo Blvd	1st	62
R2	Park	J.J. Raigoza Park	1st	64
R3	Residential	Iowa and Evans	1st	64
R4	Residential	Aqua and Evans	1st	70
R5	Residential	Minnequa and Evans	1st	61
R6	Residential	Emerson and Abriendo	1st	69
R7	Residential	Sprague and Routt	3rd	51
R8	Residential	Mesa and Elm	1st	56
R9	Residential	Mesa and Taylor	2nd	58
R10	Park	Benedict Park	1st	56
R11	Residential	Arroyo and Abriendo	2nd	51
R12	Residential	Summit and Box Elder	1st	54
R13	Residential	Santa Fe Ave N. of Arroyo	1st	62
R14	Residential	Fairview and Box Elder	2nd	53
R15	Residential	Fairview and Currie	2nd	58
R16	Residential	Bicknell and Box Elder	1st	57
R17	Residential	Bellevue	1st	58
R18	Residential	B St and Rush	1st	65
R19	Residential	Locust and Moffat	1st	64
R20	Park	Runyan Fields	1st	55
R21	Residential	C St and Palm	1st	60
R22	Residential	Goat Hill Area - Bradford	1st	65
R23	Residential	Kelly and 2nd St	2nd	61
R24	Commercial	12th St and Santa Fe Ave	1st	63
R25	Residential	12th St and Erie	1st	54
R26	Park	Mineral Palace Park	1st	58
R27	Park	Mineral Palace Park	1st	65
R28	Park	Mineral Palace Park - East of I-25	1st	67
R29	Open Land	Open Field - SE Corner of I-25 and US 50B	1st	61
R30	Residential	20th St and Santa Fe Ave	1st	65
R31	Residential	22nd St and Main	1st	63
R32	Residential	24th and Main	1st	67
R33	Residential	Chinook Lane Area	1st	49
R34	Residential	25th St and Main	1st	63
R35	Residential	25th St and Court	2nd	57
R36	Commercial	25th St and Santa Fe Ave	1st	63
R37	Residential	27th St and Court	1st	64
R38	Residential	28th St and Grand	1st	64
R39	Undeveloped	Tony's Mobile Home Park	1st	67
R40	Undeveloped	Bonneville Mobile Home Park	1st	69

Noise Impacts

As described in the “Noise Analysis Guidelines” section above, a home or business located along the Corridor is considered “impacted” by noise under CDOT guidelines when either of two conditions exist: (1) when the predicted design-year, loudest-hour noise level equals or exceeds 66 dBA for Category B and C receivers and 71 dBA for Category E receivers (refer to Table 1), and (2) when the design-year noise level is predicted to exceed the existing level by 10 dBA or more. Accordingly, impact was assessed for each proposed alternative (No-Action, Existing Alignment, and Modified Alignment) by predicting existing and future noise levels at each of the 40 representative locations discussed above. The following sub-sections describe the noise impacts for each alternative.

No Action Alternative

Noise levels from I-25 will change between existing and 2035 No-Action conditions due to changes in traffic volume and speed. Traffic volume is projected to increase all along the corridor as the result of growth in the area. However, as traffic volumes increase, traffic congestion occurs, which results in a decrease in traffic speed. As a result, noise levels will either increase or decrease depending on location and time of day. Traffic noise is loudest when there is a significant amount of traffic traveling at relatively high speeds. This is referred to as Level-of-Service C (LOS C) conditions. When more traffic is added to the flow, noise levels will increase as long as there is no decrease in speed. At some point, the capacity of the highway will be exceeded, resulting in a decrease in speeds and noise levels. Therefore, the loudest hour occurs just before and just after periods of congestion.

Table 4 shows the predicted noise levels under the No-Action alternative at the 40 representative locations. Refer to Figures 3 and 4 for the locations of these predictions. Noise levels throughout the corridor are predicted to increase by 0 to 1 dBA between existing and No Action conditions. The predicted levels reflect the fact that much of the corridor is already either near or at capacity in terms of loudest hour noise levels.

As the No Action Alternative does not include any construction, no noise mitigation will be provided under this Alternative.

TABLE 4

Predicted Loudest-Hour Noise Levels For Existing Conditions and No Action Alternative - dBA

Noise Receptor #	General Location	Existing (2003)	No-Action (2035)	Change
R1	S. of Pueblo Blvd	62	63	1
R2	J.J. Raigoza Park	64	65	1
R3	Iowa and Evans	64	65	1
R4	Aqua and Evans	70	71	1
R5	Minnequa and Evans	61	62	1
R6	Emerson and Abriendo	69	70	1
R7	Sprague and Routt	51	52	1
R8	Mesa and Elm	56	57	1
R9	Mesa and Taylor	58	59	1
R10	Benedict Park	56	57	1
R11	Arroyo and Abriendo	51	52	1
R12	Summit and Box Elder	54	55	1
R13	Santa Fe Ave N. of Arroyo	62	63	1
R14	Fairview and Box Elder	53	54	1
R15	Fairview and Currie	58	59	1
R16	Bicknell and Box Elder	57	58	1
R17	Bellevue	58	59	1
R18	B St and Rush	65	66	1
R19	Locust and Moffat	64	65	1
R20	Runyan Fields	55	56	1
R21	C St and Palm	60	61	1
R22	Goat Hill Area - Bradford	65	66	1
R23	Kelly and 2nd St	61	62	1
R24	12th St and Santa Fe Ave	63	63	0
R25	12th St and Erie	54	54	0
R26	Mineral Palace Park	58	58	0
R27	Mineral Palace Park	65	65	0
R28	Mineral Palace Park - East of I-25	67	67	0
R29	Open Field - SE Corner of I-25 and US 50B	61	61	0
R30	20th St and Santa Fe Ave	65	66	1
R31	22nd St and Main	63	64	1
R32	24th and Main	67	68	1
R33	Chinook Lane Area	49	50	1
R34	25th St and Main	63	64	1
R35	25th St and Court	57	58	1
R36	25th St and Santa Fe Ave	63	64	1
R37	27th St and Court	64	65	1
R38	28th St and Grand	64	65	1
R39	Tony's Mobile Home Park	67	68	1
R40	Bonneville Mobile Home Park	69	70	1

Modified I-25 Alignment Alternative

The areas where noise impact is predicted for the Modified I-25 Alignment Alternative are shown in Figure 5. The predicted noise levels under this alternative are shown in Table 5. The impacts are due to the respective NAC levels being met or exceeded. The maximum noise level increase for this alternative was 7 dBA, which is below the 10 dBA increase criterion. For some areas the noise levels are predicted to decrease as the corridor is shifted further away or a barrier is created due to a ramp, but for the majority of areas the noise levels are predicted to increase by an average of about 3 dBA. Noise mitigation analyses for each impacted area are discussed in the Noise Mitigation section, below.

Existing I-25 Alignment Alternative

A comparison between the Existing and Modified I-25 Alignment Alternatives show that the build alignments are identical from about 1st Street to the north. Thus, the differences in noise impacts are to the south of 1st Street, where the Existing I-25 Alignment stays near or along existing I-25, and the Modified I-25 Alignment shifts to the east and existing I-25 turns into an extension of Santa Fe Avenue.

The areas where noise impact is predicted for the Existing I-25 Alignment Alternative are shown in Figure 6. The predicted noise levels are shown in Table 6. The impacts are due to the respective NAC levels being met or exceeded. Also, the predicted noise level increases in some areas are more than 10 dBA, which is an impact. For some areas the noise levels are predicted to decrease as the corridor is shifted further away, but for the majority of areas the noise levels are predicted to increase by 4 dBA on average. Noise mitigation analyses for each impacted area are discussed in the Noise Mitigation section, below.

TABLE 5

Predicted Loudest-Hour Noise Levels For Existing Conditions and Modified I-25 Alignment Alternative - dBA

Noise Receptor #	General Location	Existing (2003)	Mod I-25 Align Alt (2035)	Change
R1	S. of Pueblo Blvd	62	62	0
R2	J.J. Raigoza Park	64	69	5
R3	Iowa and Evans	64	67	3
R4	Aqua and Evans	70	69	-1
R5	Minnequa and Evans	61	63	2
R6	Emerson and Abriendo	69	65	-4
R7	Sprague and Routt	51	56	5
R8	Mesa and Elm	56	57	1
R9	Mesa and Taylor	58	63	5
R10	Benedict Park	56	64	8
R11	Arroyo and Abriendo	51	54	3
R12	Summit and Box Elder	54	58	4
R13	Santa Fe Ave N. of Arroyo	62	62	0
R14	Fairview and Box Elder	53	60	7
R15	Fairview and Currie	58	63	5
R16	Bicknell and Box Elder	57	60	3
R17	Bellevue	58	61	3
R18	B St and Rush	65	60	-5
R19	Locust and Moffat	64	68 ¹	4
R20	Runyan Fields	55	63	8
R21	C St and Palm	60	61	1
R22	Goat Hill Area - Bradford	65	71	6
R23	Kelly and 2nd St	61	67	6
R24	12th St and Santa Fe Ave	63	68	5
R25	12th St and Erie	54	59	5
R26	Mineral Palace Park	58	62 ²	4
R27	Mineral Palace Park	65	69	4
R28	Mineral Palace Park - East of I-25	67	69	2
R29	Open Field - SE Corner of I-25 and US 50B	61	68	7
R30	20th St and Santa Fe Ave	65	67	2
R31	22nd St and Main	63	59	-4
R32	24th and Main	67	59	-8
R33	Chinook Lane Area	49	54	5
R34	25th St and Main	63	62	-1
R35	25th St and Court	57	58	1
R36	25th St and Santa Fe Ave	63	66	3
R37	27th St and Court	64	65	1
R38	28th St and Grand	64	64	0
R39	Tony's Mobile Home Park	67	71 ³	4
R40	Bonneville Mobile Home Park	69	74 ³	5

¹ Property acquired for CDOT ROW, thus no noise impact.² Other portions of park are above 66 dBA and impacted.³ No longer a residential property.

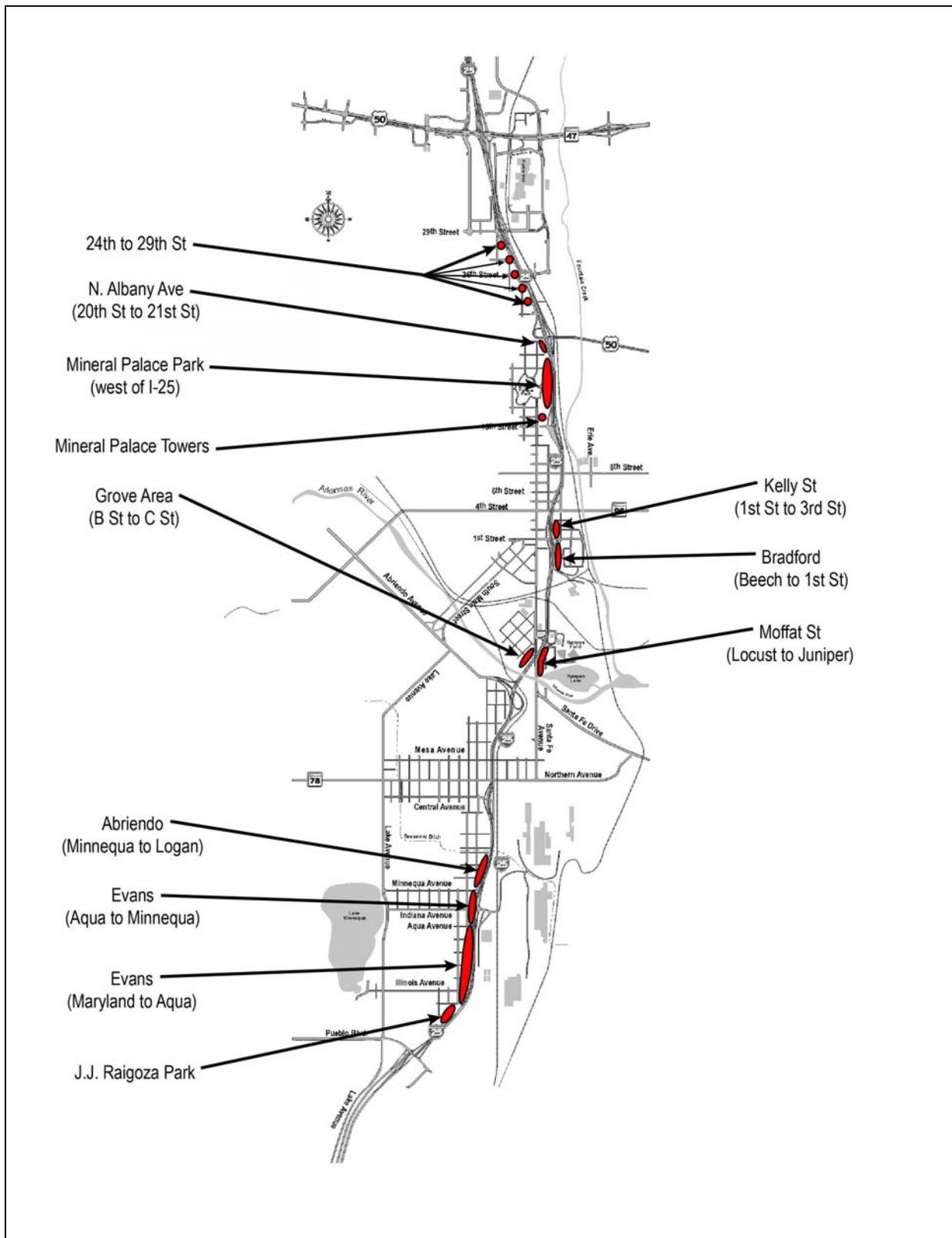


Figure 6: Existing I-25 Alignment Alternative Noise Impacts for the Design-Year 2035

TABLE 6

Predicted Loudest-Hour Noise Levels For Existing Conditions and Existing I-25 Alignment Alternative - dBA

Noise Receptor #	General Location	Existing (2003)	Ex I-25 Align Alt (2035)	Change
R1	S. of Pueblo Blvd	62	64	2
R2	J.J. Raigoza Park	64	69	5
R3	Iowa and Evans	64	67	3
R4	Aqua and Evans	70	74	4
R5	Minnequa and Evans	61	66	5
R6	Emerson and Abriendo	69	71	2
R7	Sprague and Routt	51	55	4
R8	Mesa and Elm	56	62	6
R9	Mesa and Taylor	58	62	4
R10	Benedict Park	56	64	8
R11	Arroyo and Abriendo	51	56	5
R12	Summit and Box Elder	54	66	12
R13	Santa Fe Ave N. of Arroyo	62	60	-2
R14	Fairview and Box Elder	53	65	12
R15	Fairview and Currie	58	70 ¹	12
R16	Bicknell and Box Elder	57	62	5
R17	Bellevue	58	62	4
R18	B St and Rush	65	67	2
R19	Locust and Moffat	64	66	2
R20	Runyan Fields	55	58	3
R21	C St and Palm	60	64	4
R22	Goat Hill Area - Bradford	65	71	6
R23	Kelly and 2nd St	61	67	6
R24	12th St and Santa Fe Ave	63	68	5
R25	12th St and Erie	54	59	4
R26	Mineral Palace Park	58	61 ²	3
R27	Mineral Palace Park	65	68	3
R28	Mineral Palace Park - East of I-25	67	69	2
R29	Open Field - SE Corner of I-25 and US 50B	61	68	3
R30	20th St and Santa Fe Ave	65	66	1
R31	22nd St and Main	63	59	-4
R32	24th and Main	67	59	-4
R33	Chinook Lane Area	49	54	3
R34	25th St and Main	63	62	1
R35	25th St and Court	57	58	1
R36	25th St and Santa Fe Ave	63	66	3
R37	27th St and Court	64	65	1
R38	28th St and Grand	64	63	1
R39	Tony's Mobile Home Park	67	69	3
R40	Bonneville Mobile Home Park	69	72	3

¹ Property acquired for CDOT ROW, thus no noise impact.² Other portions of park are above 66 dBA and impacted.

Cumulative Noise Impacts

A *cumulative* noise impact occurs when the noise level increases due to the currently proposed project are added to the increases of previous projects in the area and/or future ones that are likely to occur. The one area within the New Pueblo Freeway project study area where such an impact occurs is the residential neighborhood along the west side of I-25, north of US 50B. Modifications to this area within the last 10 years included the removal of some homes and the addition of an acceleration lane. As discussed in the Noise Mitigation section, below, mitigation is being considered for this area as the result of direct impacts.

Construction Noise Impacts

Construction for the build alternatives will generate noise from diesel-powered earth moving equipment such as dump trucks and bulldozers, back-up alarms on certain equipment, compressors, and pile drivers (near bridge abutments and retaining walls, if necessary). Construction noise at off-site receptor locations will usually be 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. Impact equipment such as rock drills and pile drivers can generate louder noise levels and localized ground vibration. Construction noise impacts, while temporary, can be mitigated by limiting work to daylight hours and requiring the contractor to use well-maintained equipment (particularly with respect to mufflers).

Noise Mitigation

A noise mitigation analysis was conducted for each of the areas considered impacted under each of the proposed build alternatives. The analyses were conducted according to the *CDOT Noise Analysis and Abatement Guidelines*, June 2011, as described in the Noise Analysis Guidelines section, above. The range of typical mitigation options includes shifting the highway away from residences, depressing the highway into the ground, and constructing barriers along the highway. The latter is considered the only feasible alternative for this project due to the developed nature of the corridor. The following sections describe the determination of the feasibility and reasonableness of providing noise walls for each impacted area. A unit cost of \$45 per square foot was used to estimate the cost of walls. Noise mitigation was not analyzed for the No Action Alternative, as this alternative does not fund any construction or mitigation.

Modified I-25 Alignment Alternative Noise Mitigation

As shown in Figure 5, above, a total of eight areas are considered impacted by noise under the Modified I-25 Alignment Alternative. In three cases, one wall protects more than one area, for a total of four noise walls required to protect all eight impacted areas. Table 7, below, summarizes the results of the mitigation analyses conducted for each wall. The following sections describe the analysis of each area in more detail. All four walls meet CDOT's 2011 *Noise Analysis and Abatement Guidelines* and are recommended for inclusion in the Project pending the outcome of the Benefitted Receptors' Preference Survey to be conducted as part of the Final Environmental Impact Statement (FEIS) public outreach process.

TABLE 7

Summary of Noise Mitigation Analysis for the Modified I-25 Alignment Alternative

Property	Wall Length (feet)	Wall Height (feet)	Wall Area (feet ²)	Cost (\$)	Number of Benefitted Receptors	Average Reduction (dBA)	Cost Benefit (\$/Rec/dB)
Residences between 24 th and 29 th Streets	2,870	20 ¹	49,220 ²	\$2,214,900	52 ³	6.3	\$6,790
Residences near Albany Avenue, Mineral Palace Park, and Mineral Palace Towers	2,998	18	53,964	\$2,428,380	53 ⁴	6.9	\$6,671
Residences along Kelly and Bradford Streets	1,791	15	26,865	\$1,208,925	44	6.6	\$4,149
Residences on Evans (Maryland to Aqua) and J.J. Raigoza Park	4,838	18 ⁵	86,286	\$3,882,870	101 ⁶	8.3	\$4,614

¹ The main wall is 20 feet tall, while the wall between the ramp and the mainline is 18 feet tall.

² This includes a reduction in area equivalent to what the proposed Jersey Barrier would have provided.

³ Includes one receptor in each retention basin, as these are often used recreationally.

⁴ Includes Mineral Palace Towers and Albany area residences, as well as Mineral Palace Park receptors – see TNM file for specific locations.

⁵ The main wall is 18 feet tall, while the wall between the ramp and the mainline is 16 feet tall.

⁶ Includes both residences and park receptors.

Residences from 24th St to 29th St (West of I-25)

There is a relatively large single-family residential development on the west side of I-25, extending from approximately 24th Street to 29th Street. This is an established neighborhood that pre-dates I-25. In the late 1990's, as part of the I-25/US50/SH47 Project, the row of homes closest to I-25 in this area was removed and replaced with detention basins. This created additional exposure to I-25 for the remaining residences.

As shown in Figure 7, it is physically possible to construct two noise walls within the CDOT ROW in this area. One along I-25 mainline from about US 50B to the southbound on-ramp at 29th Street, and the other that overlaps the first wall and continues along I-25 mainline to about 29th St. Together, these noise walls are 2,870 feet long. The mainline wall was modeled at a height of 20 feet, and the ramp wall at a height of 18 feet. The walls are predicted to achieve a noise reduction of 8 dBA at front-row receptors. There do not appear to be any fatal-flaw maintenance or safety issues associated with the walls. Therefore, the walls are considered feasible.

Together, the walls are predicted to benefit 52 receptors (48 residences and four locations in the detention basins that represent active recreation areas), with an average noise level reduction at benefitted receptors of 6.3 dBA. Therefore, the cost per receptor per dBA of reduction is \$6,790, which is considered reasonable.

In consideration of all these factors, these walls are considered reasonable and feasible, and are recommended for inclusion in the Modified I-25 Alignment Alternative pending the outcome of the Benefitted Receptors' Preference Survey to be conducted as part of the FEIS public outreach process.

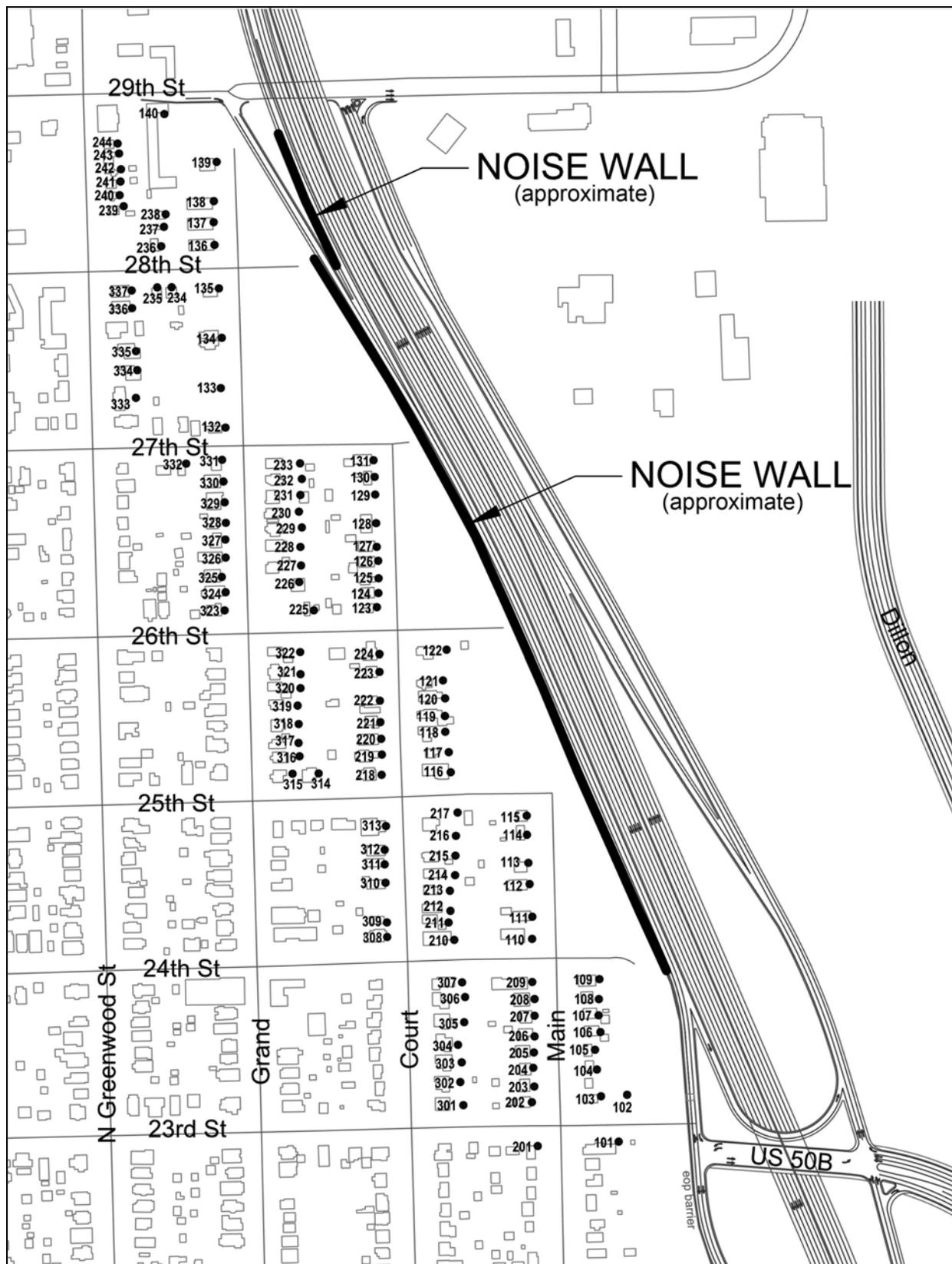


Figure 7: Modified I-25 Alignment Alternative – 24th to 28th St (West of I-25) Noise Wall Analysis Location

Residences along N. Albany Ave., Mineral Palace Park, and Mineral Palace Towers

This area consists of a mix of residences and parkland. There are single family homes in the Albany Street area that pre-date I-25. The historic and much used Mineral Palace Park is located to the south of these residences, and south of the park are the Mineral Palace Towers multi-unit residences. The park is proposed to undergo a redevelopment, a rendering of which is shown in Figure 8.

One long barrier (wall and/or earthen berm) with four segments is proposed to reduce noise levels at all of these receptors. The location of the proposed barrier is shown in Figure 9. In total, the barrier is 2,998 feet long and was modeled at a height of 18 feet. The barrier is predicted to achieve a noise reduction of more than 10 dBA at locations in the park closest to the wall, 9 dBA at front-row residences in the Albany Street area, and 5 dBA at the Mineral Palace Towers. There do not appear to be any fatal-flaw maintenance or safety issues associated with the barrier. Therefore, the barrier is considered feasible.

In total, the barrier is predicted to benefit 53 receptors (11 active use areas in the park, Mineral Palace Towers, and 41 residences), with an average noise level reduction at benefitted receptors of 6.9 dBA. Therefore, the cost per receptor per dBA of reduction is \$6,671, which is considered reasonable.

In consideration of all these factors, the barrier is considered reasonable and feasible, and is recommended for inclusion in the Modified I-25 Alignment Alternative pending the outcome of the Benefitted Receptors' Preference Survey to be conducted as part of the FEIS public outreach process.



Figure 8: Proposed Redevelopment of Mineral Palace Park

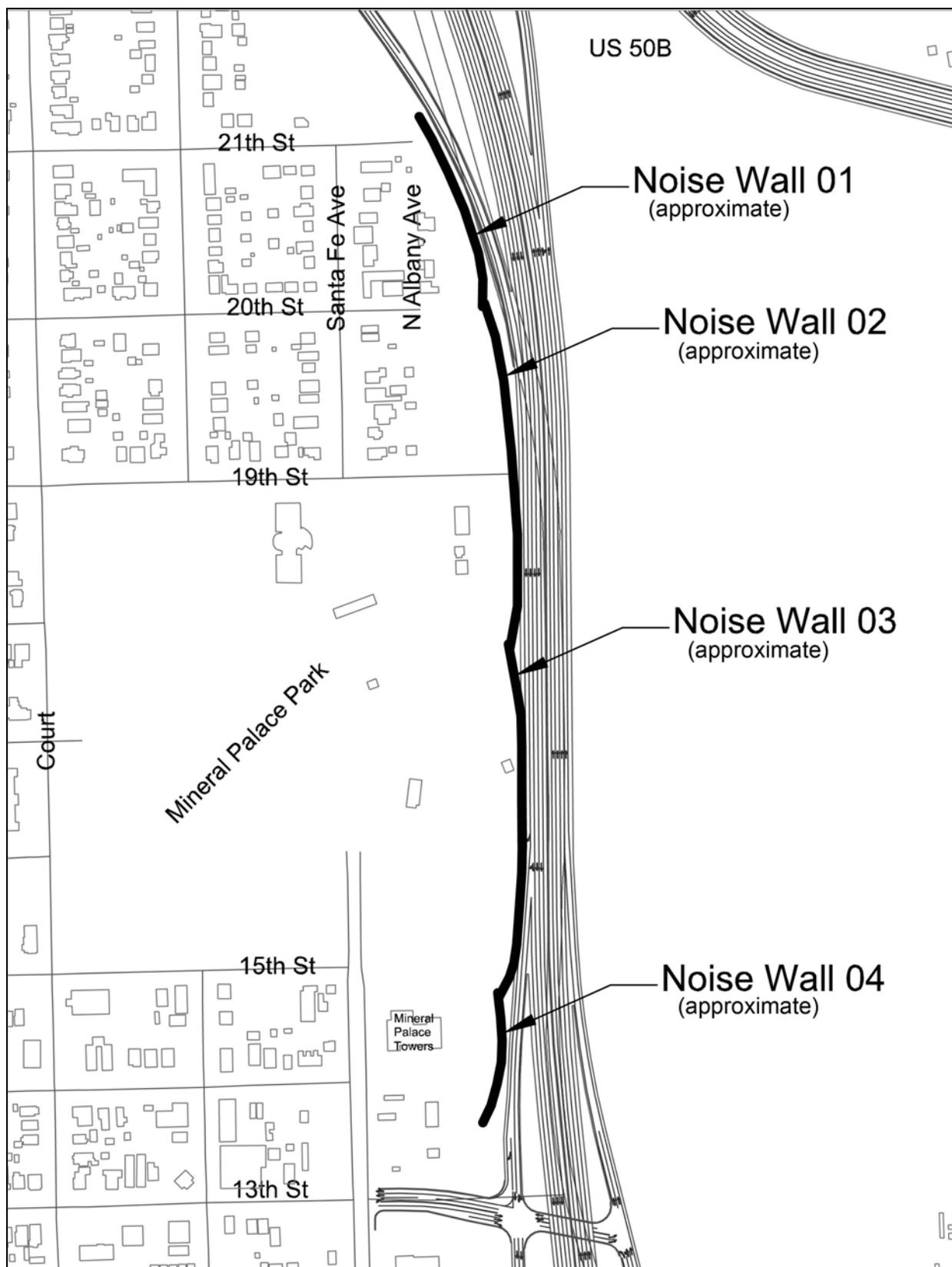


Figure 9: Modified I-25 Alignment Alternative – Albany/Mineral Palace Park/Towers Noise Wall Analysis Locations

Residences along Bradford and Kelly Streets (Beech to 3rd St.)

As shown in Figure 10, it is physically possible to construct a noise wall within the CDOT ROW in this area to protect the single-family residences that line Kelly and Bradford Streets on the east side of I-25 from Beech to 4th Streets. The proposed wall is shown in Figure 10. It is 1,791 feet long and 15 feet tall. The wall is predicted to achieve a noise reduction of almost 10 dBA at front-row receptors. There do not appear to be any fatal-flaw maintenance or safety issues associated with the wall. Therefore, the wall is considered feasible.

The wall is predicted to benefit 44 single-family residences, with an average noise level reduction at benefitted receptors of 6.6 dBA. Therefore, the cost per receptor per dBA of reduction is \$4,149, which is considered reasonable.

In consideration of all these factors, the wall is considered reasonable and feasible, and is recommended for inclusion in the Modified I-25 Alignment Alternative pending the outcome of the Benefitted Receptors' Preference Survey to be conducted as part of the FEIS public outreach process.

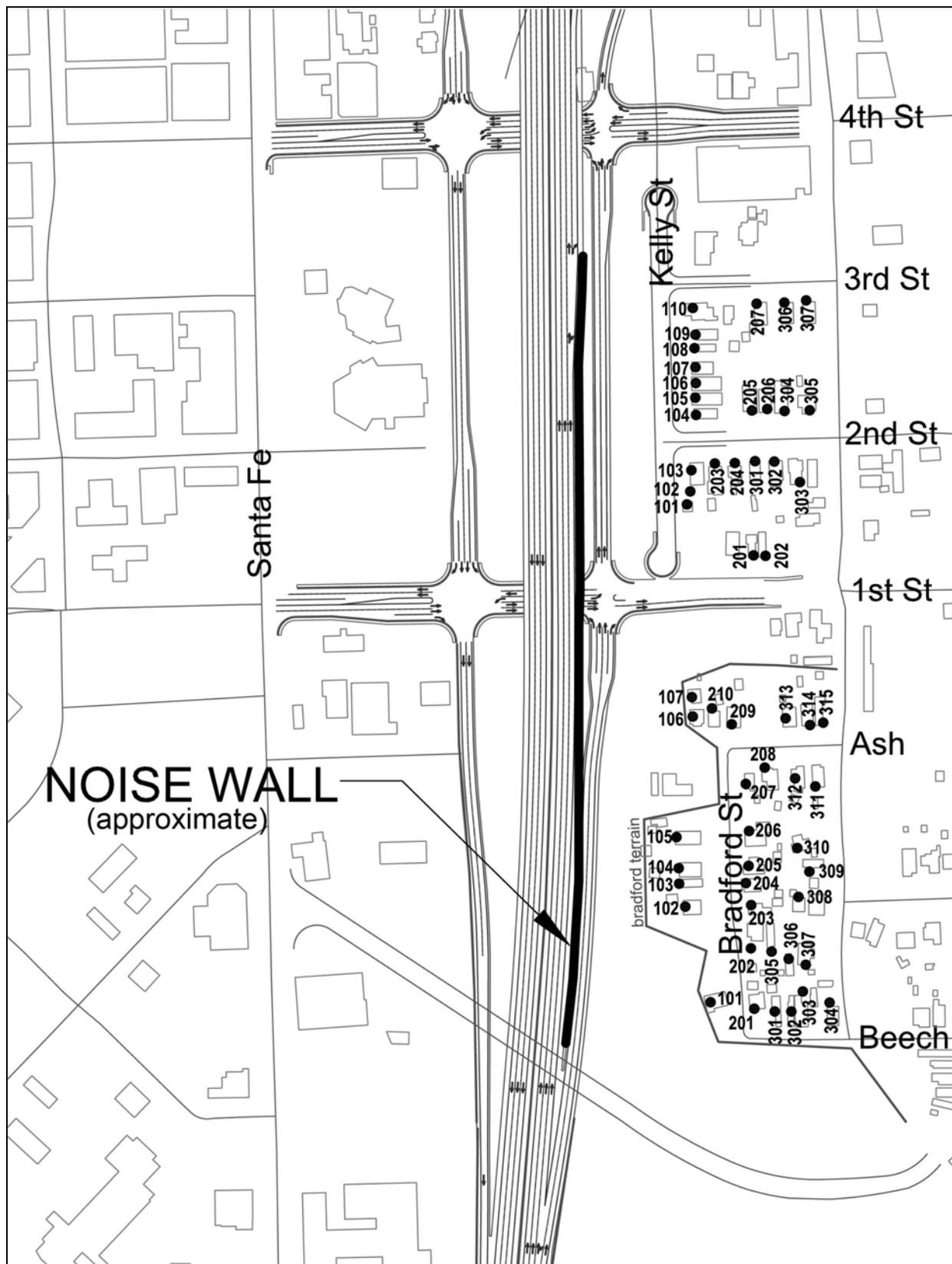


Figure 10: Modified I-25 Alignment Alternative – Bradford St. and Kelly St. Noise Wall Analysis Locations

Residences along Evans (Maryland to Indiana) and JJ Raigoza Park

A large, established single-family neighborhood exists on the west side of I-25, between Indiana and Maryland Streets. South of Maryland Street is JJ Raigoza Park, which is a well-used neighborhood park with tennis and basketball courts, a playground, and restrooms. The park is currently undergoing a tree planting program.

Two barriers are proposed to reduce noise levels in the neighborhood and at the park, as shown in Figure 11. In total, the walls are 4,838 feet long. The mainline wall is 18 feet tall, and the ramp wall is 16 feet tall. The walls are predicted to achieve a noise reduction of more than 12 dBA at front row residences, and between 5 and 10 dBA in the park. There do not appear to be any fatal-flaw maintenance or safety issues associated with the walls. Therefore, the walls are considered feasible.

In total, the walls are predicted to benefit 101 receptors (4 active use areas in the park and 97 residences), with an average noise level reduction at benefitted receptors of 8.3 dBA. Therefore, the cost per receptor per dBA of reduction is \$4,614, which is considered reasonable.

In consideration of all these factors, these walls are considered reasonable and feasible, and are recommended for inclusion in the Modified I-25 Alignment Alternative pending the outcome of the Benefitted Receptors' Preference Survey to be conducted as part of the FEIS public outreach process.

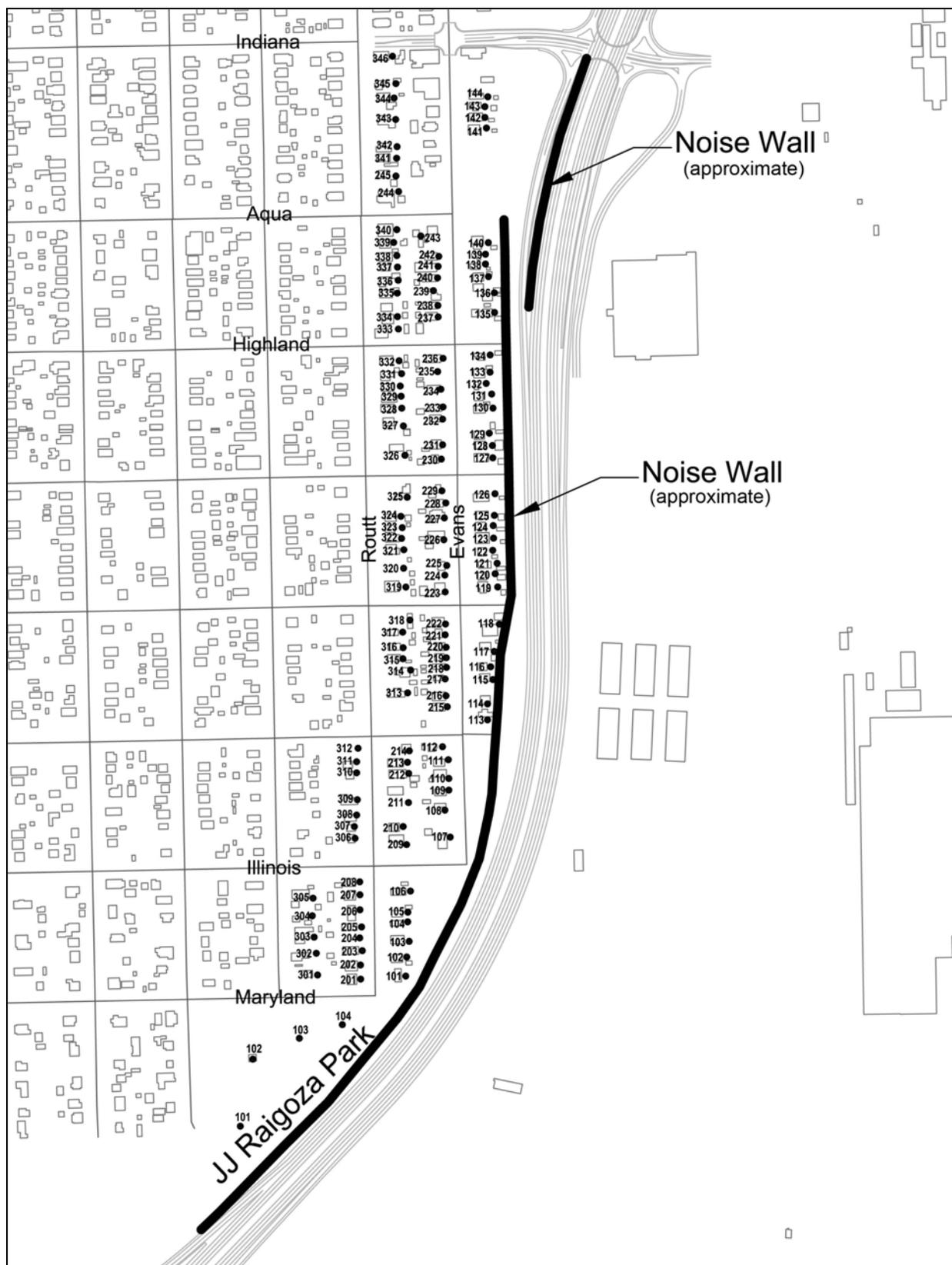


Figure 11: Modified I-25 Alignment Alternative – Evans (Maryland to Indiana) Noise Wall Analysis Location

Existing I-25 Alignment Alternative Noise Mitigation

As shown in Figure 6, above, a total of 12 areas are considered impacted by noise under the Existing I-25 Alignment Alternative. For the 24th to 29th Street area, the Mineral Palace/Albany area, and the Kelly/Bradford Street area the mitigation results are identical to those discussed above. Three areas are different or are impacted only under the Existing Alignment Alternative, including the single-family residences on Palm Street, the single-family residences on Moffat Street, and the residences and park on the west side of I-25 from JJ Raigoza Park to Jones Street. Table 8, below, summarizes the results of the mitigation analyses conducted for each wall analyzed as part of the Existing Alignment Alternative. The following sections describe the analysis of each of the three new areas in more detail. The Palm Street and Moffat Street walls do not meet CDOT guidelines, and are not recommended. All other barriers and walls meet CDOT's 2011 *Noise Analysis and Abatement Guidelines* and are recommended for inclusion in the Project pending the outcome of the Benefitted Receptors' Preference Survey to be conducted as part of the FEIS public outreach process.

TABLE 8
Summary of Noise Mitigation Analysis for the Modified I-25 Alignment Alternative

Property	Wall Length (feet)	Wall Height (feet)	Wall Area (feet ²)	Cost (\$)	Number of Benefitted Receptors	Average Reduction (dBA)	Cost Benefit (\$/Rec/dB)
Residences between 24 th and 29 th Streets	2,870	20 ¹	49,220 ²	\$2,214,900	52 ³	6.3	\$6,790
Residences near Albany Avenue, Mineral Palace Park, and Mineral Palace Towers	2,998	18	53,964	\$2,428,380	53 ⁴	6.9	\$6,671
Residences along Kelly and Bradford Streets	1,791	15	26,865	\$1,208,925	44	6.6	\$4,149
Residences along Palm Street	516	20	10,320	\$464,400	0	0	n/a ⁵
Residences along Moffat Street	971	20	19,420	\$873,900	7	5.4	\$23,058
Residences on West Side of I-25 from JJ Raigoza Park to Jones Street	6,833	18	122,994	\$5,534,730	157	8.1	\$4,377

¹ The main wall is 20 feet tall, while the wall between the ramp and the mainline is 18 feet tall.

² This includes a reduction in area equivalent to what the proposed Jersey Barrier would have provided.

³ Includes one receptor in each retention basin, as these are often used recreationally.

⁴ Includes Mineral Palace Towers and Albany area residences, as well as Mineral Palace Park receptors – see TNM file.

⁵ The cost-benefit goes to infinity given that there are zero benefitted receptors.

Residences on Palm Street (B St. to C St.)

As shown in Figure 12, it is physically possible to construct a noise wall within the CDOT ROW in this area to protect the single-family residences that line Palm Street on the west side of I-25 from B to C Streets. The wall analyzed is 516 feet long and 20 feet tall. The wall is predicted to achieve a noise reduction of only 4 dBA at most at any receptor. The reason for the relatively low reduction is the fact that noise from traffic on nearby Santa Fe Drive will not be reduced by the wall. CDOT policy states that a wall shall not be included in a project if 5 dBA of reduction cannot be achieved at at least one receptor. Therefore, this wall is considered infeasible and is not recommended for inclusion in the Existing I-25 Alignment Alternative.

Residences along Moffat St (Locust to Juniper St)

As shown in Figure 12, it is physically possible to construct a noise wall within the CDOT ROW in this area to protect the single-family residences that line Moffat Street on the east side of I-25. The wall is 971 feet long and 20 feet tall. The wall is predicted to achieve a noise reduction of approximately 5 dBA at front-row receptors. There do not appear to be any fatal-flaw maintenance or safety issues associated with the wall. Therefore, the wall is considered feasible. The wall is predicted to benefit 7 single-family residences, with an average noise level reduction at benefitted receptors of 5.4 dBA. Therefore, the cost per receptor per dBA of reduction is \$23,058, which is considered unreasonable. In consideration of all these factors, the wall is unreasonable and is not recommended for inclusion in the Existing I-25 Alignment Alternative.

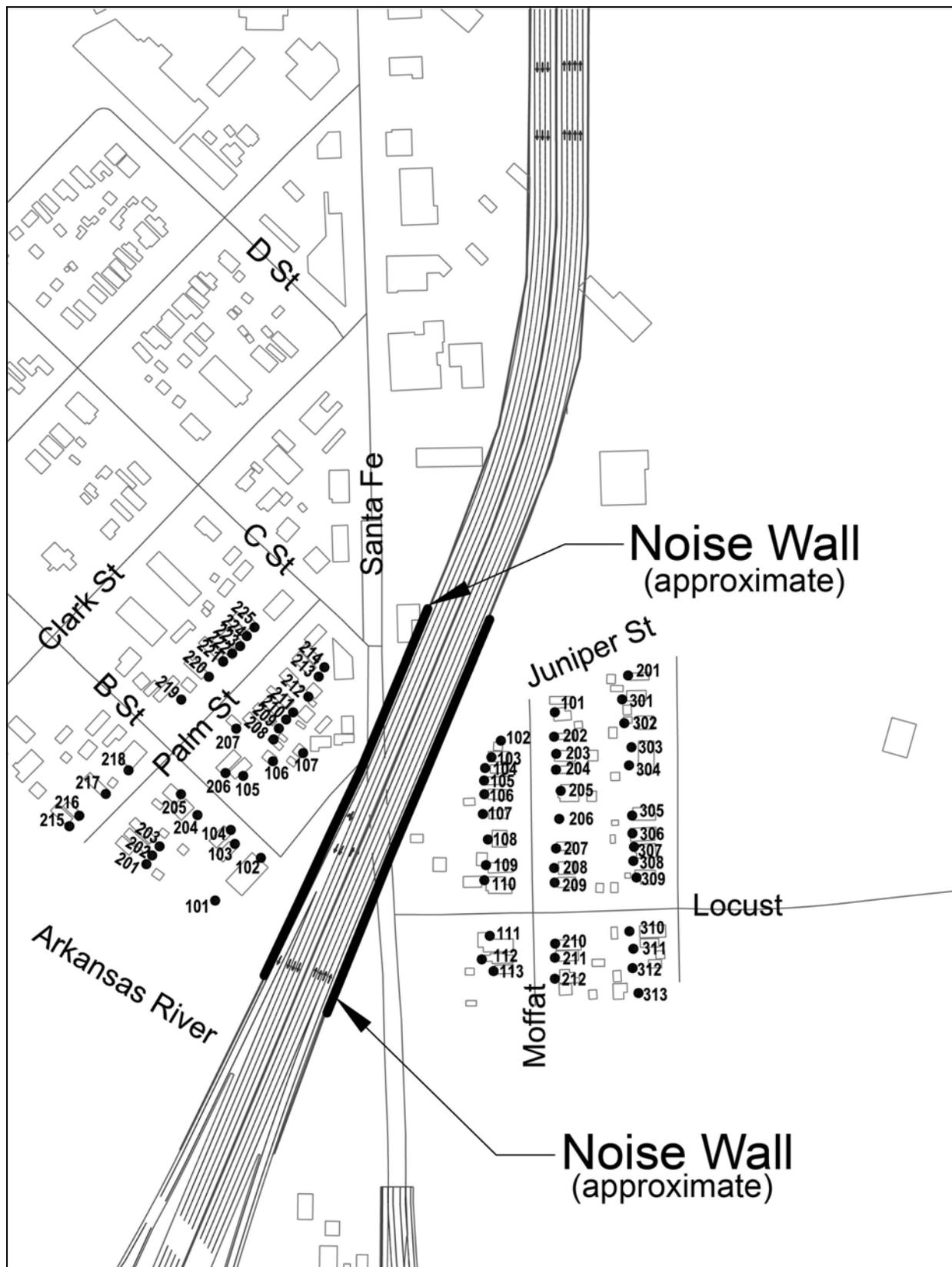


Figure 12: Existing I-25 Alignment Alternative – Palm Street and Moffat Street Noise Wall Analysis Locations

Residences along West Side of I-25 from JJ Raigoza Park to Jones Street

As shown in Figures 13a and 13b, there is a large, established single-family residential neighborhood on the west side of I-25 from Jones Street south to Maryland Street. South of Maryland Street is JJ Raigoza Park, which is a well-used neighborhood park with tennis and basketball courts, a playground, and restrooms. The park is currently undergoing a tree planting program.

Three barriers are proposed to reduce noise levels in the neighborhood and at the park, as shown in Figure 13. In total, the walls are 6,833 feet long and 18 feet tall. The walls are predicted to achieve a noise reduction of more than 12 dBA at front row residences, and between 5 and 10 dBA in the park. There do not appear to be any fatal-flaw maintenance or safety issues associated with the walls. Therefore, the walls are considered feasible.

In total, the walls are predicted to benefit 157 receptors (4 active use areas in the park and 153 residences), with an average noise level reduction at benefitted receptors of 8.1 dBA. Therefore, the cost per receptor per dBA of reduction is \$4,377, which is considered reasonable.

In consideration of all these factors, these walls are considered reasonable and feasible, and are recommended for inclusion in the Existing I-25 Alignment Alternative pending the outcome of the Benefitted Receptors' Preference Survey to be conducted as part of the FEIS public outreach process.

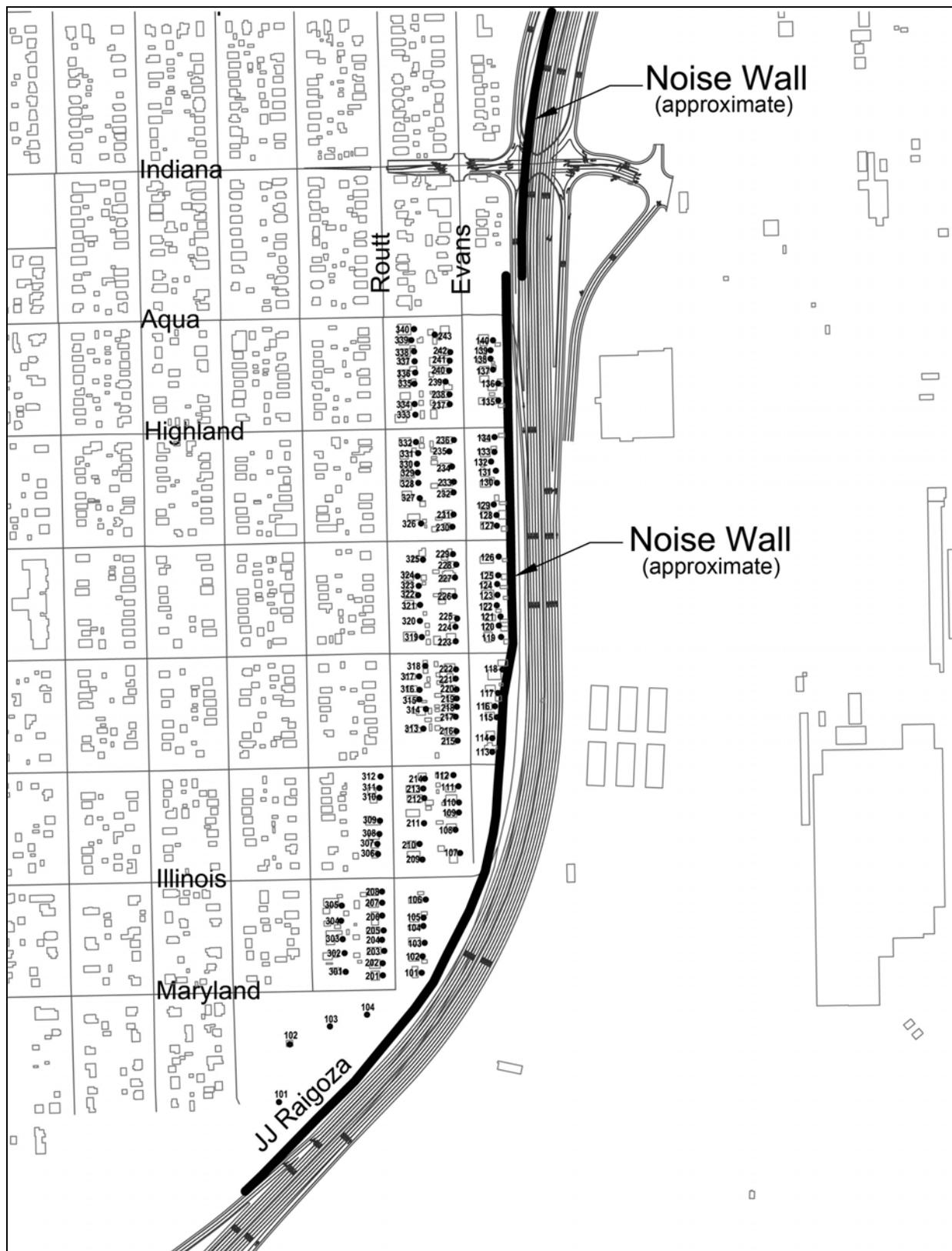


Figure 13a: Existing I-25 Alignment Alternative – JJ Raigoza to Indiana Noise Wall Analysis Location

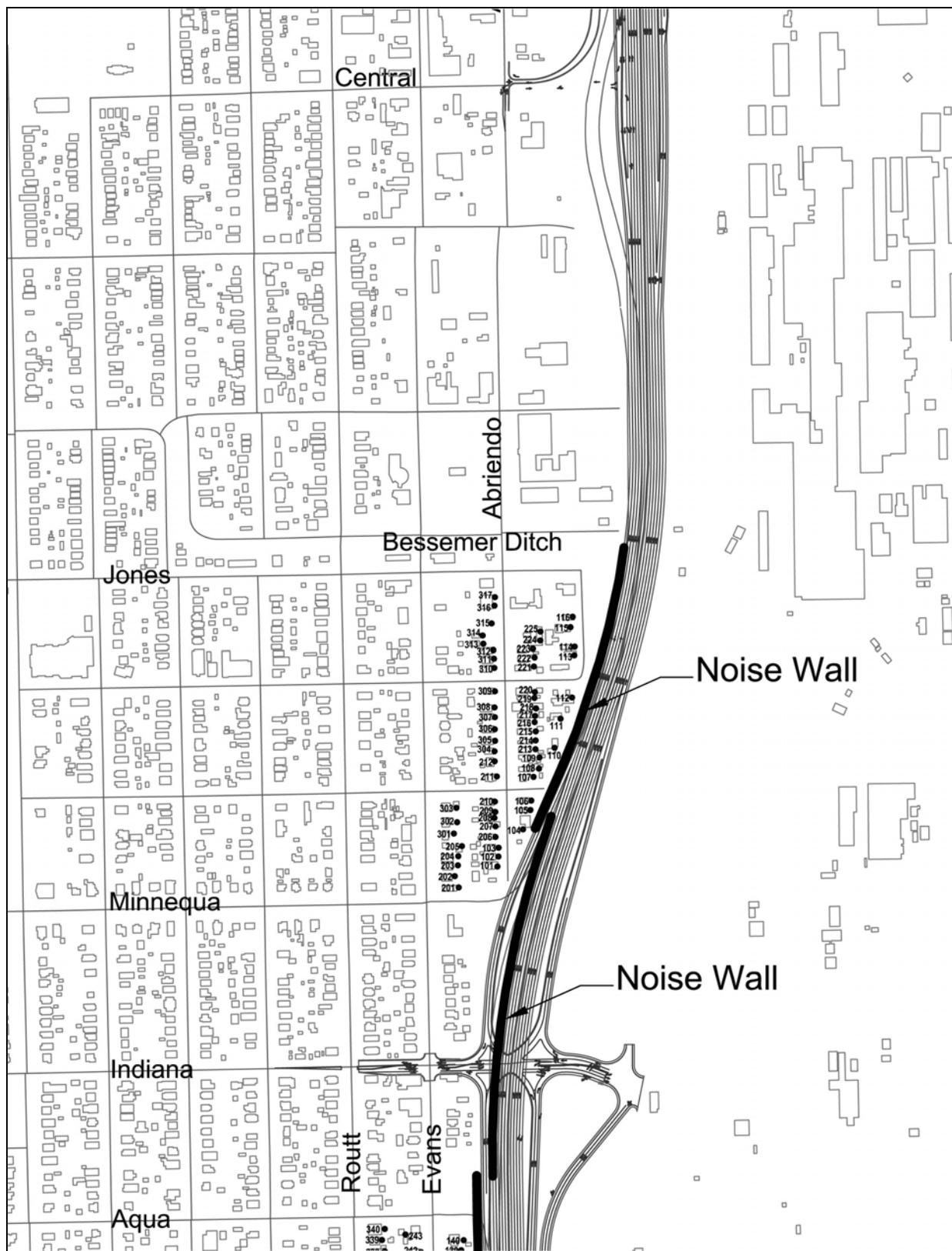


Figure 13b: Existing I-25 Alignment Alternative – Indiana to Jones Noise Wall Analysis Location

ATTACHMENT A
Relevant Noise Terminology

A-Weighted Sound (dBA) - A-weighting network was developed and is applied to either measured or predicted noise levels to mimic the ear's varying sensitivity to frequency. Resulting noise levels are expressed in dBA. Table A-1 shows the A-weighted noise levels of some common noise sources.

TABLE A-1
Typical Noise Levels

Noise Source	Noise Level (dBA)
Amplified rock band	115 – 120
Commercial jet takeoff at 200 feet	105 – 115
Community warning siren at 100 feet	95 – 105
Busy urban street	85 – 95
Construction equipment at 50 feet	75 – 85
Freeway traffic at 50 feet	65 – 75
Normal conversation at 6 feet	55 – 65
Typical office interior	45 – 55
Soft radio music	35 – 45
Typical residential interior	25 – 35
Typical whisper at 6 feet	15 – 25
Human breathing	5 – 15
Threshold of hearing	0 – 5

Decibel (dB) – A decibel is one-tenth of a Bel. For sound pressure levels, it is a measure on a logarithmic scale, which indicates the squared ratio of sound pressure to a reference sound pressure.

Equivalent Sound Level (L_{eq}) - The equivalent steady state sound level which in a stated period of time would contain the same acoustical energy as the time-varying sound level during the same period. The time period used for highway noise analysis is one hour. All noise levels described in this report are hourly, A-weighted L_{eq} 's.

Frequency (f) - The number of oscillations per second of a periodic wave sound expressed in units of Hertz (Hz). The value is the reciprocal ($1/x$) of the period of oscillations in seconds. The human ear is, in general, capable of detecting frequencies between 20 to 20,000 Hertz. The human ear is more sensitive to high frequency sounds than to low frequency sounds.

Noise – Unwanted sound, usually loud or unexpected.

Noise Receptors - Areas in which people are typically located, which include places such as residences, hotels, commercial buildings, parks, etc. Usually, one noise receptor location is used to analyze an area unless the area is quite large and covers various distances from the roadway. The noise receptor is typically located on the façade of a structure that faces the noise source or roadway.

Pascal (Pa) – A unit of pressure (in acoustics, normally RMS sound pressure) equal to one Newton per square meter (N/m^2). A reference pressure for a sound pressure level of 0 dB is 20 μ Pa (20 micro Pascal).

Sound – Caused by pressure fluctuations in the air. The range of sound pressures, which the human ear is capable of detecting, is very large (0.00002 to 200 Pascals). To facilitate easier discussion, sound pressures are described on a decibel (dB) scale.

Sound Absorption – This typically occurs when sound is converted to heat or another form of energy. A common sound absorptive material is fiberglass insulation.

Sound Pressure Level (SPL) – Sound pressure level in dB is equal to $10\text{Log}_{10}(p^2/p_o^2)$ where p is the instantaneous sound pressure and p_o is the reference sound pressure of 0.00002 Pa. This results in a scale of 0 dB (threshold of audibility) to 120 dB (threshold of pain).

Sound Reflection – The reflection of sound occurs when an object is able to significantly increase the impedance when compared to the surrounding air. This would require an object to be non-porous and to have enough density, stiffness and thickness.

Sound Transmission Loss (STL or TL) – The conversion of sound energy to another form of energy (usually heat) from one side of a barrier to the other.

ATTACHMENT B
Noise Model Input Data

TNM Default Parameters

TNM's built-in Reference Energy Mean Emission Levels (REMELs) were used on this project. Also, the standard temperature and relative humidity settings were used. "Lawn" was used as the default terrain type in all models. This is the most commonly used ground type in TNM, as it best matches the typical condition.

Traffic Volumes and Speeds

Validation traffic conditions are shown in Table B-1. Existing (2002) traffic volumes used in the analysis are shown in Tables B-2 to B-4. Existing I-25 Alignment Alternative (2035) traffic volumes are shown in Tables B-5 to B-7. Modified I-25 Alignment Alternative (2035) traffic volumes are shown in Tables B-8 to B-10. The No-Action (2035) traffic volumes are shown in Tables B-11 to B-13. The traffic volumes were provided by CH2M HILL. Note that the 2025 volumes were increased by 25% to model 2035 conditions. In order to model loudest-hour conditions, all of the volumes represent Maximum Level-of-Service (LOS) C conditions or better. That is, where traffic projections indicated that the LOS would be A, B, or C, all of which represent free-flowing conditions, the projected volumes were used directly. When traffic projections indicated that the LOS would be D, E, or F, which represents some degree of congestion and therefore lower speeds, the volumes were reduced to replicate Maximum LOS C conditions. Free-flow speeds were used in all of the predictions, which range from 30 m.p.h. for loop ramps, 40 m.p.h. for sideroads, and 55 m.p.h. to 70 m.p.h. along I-25. For a majority of the analysis, between 3% and 6% medium trucks, and 4% to 6% heavy trucks were used.

Table B-1

Validation (2003) Traffic Counts for Noise Modeling

Measurement Location	Date	Time	Roadway	Equivalent Hourly Volume			Speed
				Autos	Med	Hvy	
M1, M2, M3	July 30, 2003	9:30am to 10:00 am	I-25 NB	1252	52	62	55
			I-25 SB	1330	78	70	55
M4	July 30, 2003	8:45 am to 9:15 am	I-25 NB	760	16	48	55
			I-25 SB	686	68	44	55
M5, M6, M7, M8	August 6, 2003	9:15 am to 9:45 am	I-25 NB	1812	52	78	55
			I-25 SB	1704	56	74	55
M9	August 12, 2003	1:00 pm to 1:30 pm	I-25 NB	822	28	44	62
			I-25 SB	858	34	62	62
M10	August 19, 2003	9:15 am to 9:45 am	I-25 NB	1168	50	56	55
			I-25 SB	1156	40	44	55
			SantaFe NB&SB	1126	30	34	35

Table B-2

Existing (2002) I-25 Mainline Loudest-Hour Traffic Volumes

Section	Direction	Autos	Med	Hvy	Speed
US 50 / SH 47 to North	Northbound	1328	44	62	60
	Southbound	1328	44	62	60
29th St to US 50 / SH 47	Northbound	1515	51	70	60
	Southbound	1515	51	70	60
US 50B to 29th St	Northbound	2197	74	102	60
	Southbound	2197	74	102	60
13th St to SH50B	Northbound	2477	105	116	60
	Southbound	2477	105	116	60
1st St to 13th Street	Northbound	1679	71	79	55
	Southbound	1679	71	79	55
ILEX to 1st Street	Northbound	1647	109	120	55
	Southbound	1647	109	120	55
Abriendo to ILEX	Northbound	1689	112	123	55
	Southbound	1689	112	123	55
Central to Abriendo Ave	Northbound	1287	85	94	55
	Southbound	1287	85	94	55
Indiana to Central	Northbound	1130	46	79	60
	Southbound	1130	46	79	60
Illinois to Indiana	Northbound	878	36	61	65
	Southbound	878	36	61	65
Illinois to Pueblo Blvd	Northbound	932	38	65	70
	Southbound	932	38	65	70
Pueblo Blvd to South	Northbound	692	28	48	70
	Southbound	692	28	48	70

Table B-3
Existing (2002) Ramp Loudest-Hour Traffic Volumes

Ramp	Direction	Autos	Med	Hvy	Speed
Pueblo Blvd	NB On	468	11	71	40
	NB Off	73	9	15	40
	SB On	118	12	10	40
	SB Off	704	41	43	40
Indiana	NB On	375	24	17	40
	NB Off	49	3	6	40
	SB On	47	6	3	40
	SB Off	305	15	23	40
Central	NB On	391	15	15	40
	NB Off	123	18	11	40
	SB On	120	11	8	40
	SB Off	395	14	11	40
Abriendo	NB On	405	11	28	40
	NB Off	74	3	4	40
	SB On	82	5	4	40
	SB Off	453	16	14	40
ILEX	NB On	249	21	38	40
	NB Off	87	8	11	40
	SB On	146	10	7	40
	SB Off	282	31	40	40
1st St	NB On	303	21	16	40
	NB Off	343	14	22	40
	SB On	304	14	15	40
	SB Off	294	17	32	40
6th St	NB On	629	30	22	40
	SB Off	535	38	43	40
13th St	NB On	693	27	30	40
	NB Off	192	15	5	40
	SB On	214	8	9	40
	SB Off	515	28	19	40
US 50B	NB On	527	14	36	40
	NB Off	921	37	33	40
	SB On	630	19	148	40
	SB Off	529	29	44	40
29th St	NB Off	838	35	44	40
	SB On	798	28	22	40
	SB Off	124	6	9	40

Table B-4
Existing (2002) Sideroad Loudest-Hour Traffic Volumes

Street	Side of I-25	Autos	Med	Hvy	Speed
Pueblo Blvd	East	143	10	17	40
	West	1327	95	158	40
Illinois	Both	76	2	2	40
Aqua	West	160	3	2	40
Indiana	East	147	10	12	40
	West	349	24	28	40
Minnequa	West	248	8	5	40
Central	West	250	17	14	40
SH 78	Both	1100	62	74	40
Mesa	Both	319	10	10	40
Abriendo	West	312	14	14	40
Santa Fe	just North	1145	37	37	40
	just South	1364	44	44	40
Santa Fe	just North of 1st	1068	34	34	40
	just South of 1st	1101	35	35	40
Santa Fe	just North of 13th	524	17	17	40
	just South of 13th	760	24	24	40
1st St	East	999	56	67	40
	West	943	53	64	40
4th St (SH 96)	East	1145	64	77	40
	West	1145	64	77	40
6th St	West	437	24	24	40
8th St	Both	961	31	31	40
13 St	West	1278	69	42	40
US 50B	East	2484	85	254	40
29th St	East	1260	55	55	40
	West	1526	66	66	40

Table B-5
Existing I-25 Alignment Alternative (2035) Mainline Loudest-Hour Traffic Volumes

Section	Direction	Autos	Med	Hvy	Speed
US 50 / SH 47 to North	Northbound	3478	116	162	60
	Southbound	3900	131	181	60
29th St to US 50 / SH 47	Northbound	3434	115	159	60
	Southbound	4178	140	194	60
US 50B to 29th St	Northbound	3434	115	159	60
	Southbound	4178	140	194	60
13th St to SH50B	Northbound	4528	192	212	60
	Southbound	5001	212	234	60
1st St to 13th Street	Northbound	3690	157	173	60
	Southbound	4351	185	204	60
ILEX to 1st Street	Northbound	3645	241	266	55
	Southbound	4235	280	309	55
Abriendo to ILEX	Northbound	3645	241	266	55
	Southbound	4235	280	309	55
Central to Abriendo Ave	Northbound	2486	164	181	55
	Southbound	3129	207	228	55
Indiana to Central	Northbound	3002	123	210	60
	Southbound	3791	156	265	60
Illinois to Indiana	Northbound	2408	99	169	60
	Southbound	3240	133	227	60
Illinois to Pueblo Blvd	Northbound	2408	99	169	60
	Southbound	3240	133	227	60
Pueblo Blvd to South	Northbound	659	27	46	70
	Southbound	1253	52	88	70

Table B-6
Existing I-25 Alignment Alternative (2035) Ramp Loudest-Hour Traffic Volumes

Ramp	Direction	autos	med	hvy	speed
Pueblo Blvd	NB On SLIP	133	3	20	40
	NB On LOOP	1591	37	243	30
	NB Off	73	9	14	40
	SB On	262	28	22	40
	SB Off	2452	136	136	40
Indiana	NB On	443	30	20	40
	NB Off	20	1	2	40
	SB On	60	8	4	40
	SB Off	342	15	27	40
Northern	NB Off	386	17	17	40
	SB On	506	47	35	40
Abriendo	NB On	1115	24	73	40
	SB Off	1128	36	36	40
1st St	NB Off	85	6	5	40
	SB On	568	25	31	40
6th St	NB Off	603	26	19	40
	SB Off	512	35	41	40
13th St	NB On	1380	60	60	40
	SB Off	574	31	19	40
US 50B	NB On	320	7	21	40
	NB Off	1428	61	46	40
	SB On	1014	26	244	40
	SB Off	359	20	29	40
29th St	SB Off (A)	722	23	23	40

Table B-7
Existing I-25 Alignment Alternative (2035) Sideroad Loudest-Hour Traffic Volumes

Location	Side of I-25	2035 Peak		Side of I-25	2035 Peak	
		Hr	Speed		Hr	Speed
Pueblo Blvd	East of I-25			West of I-25		
	Autos	403	40	Autos	4203	40
	Med Trucks	29	40	Med Trucks	300	40
	Hvy Trucks	48	40	Hvy Trucks	500	40
Indiana	East of I-25			West of I-25		
	Autos	188	35	Autos	1211	35
	Med Trucks	13	35	Med Trucks	84	35
	Hvy Trucks	15	35	Hvy Trucks	97	35
Mesa to Central Feeder				West of I-25		
				Autos	265	40
				Med Trucks	8	40
				Hvy Trucks	2	40
Northern Ave	East of I-25			West of I-25		
	Autos	2542	40	Autos	2723	40
	Med Trucks	143	40	Med Trucks	153	40
	Hvy Trucks	171	40	Hvy Trucks	184	40
Mesa	Both Sides					
	Autos	835	35			
	Med Trucks	27	35			
	Hvy Trucks	27	35			
Abriendo to Northern Frontage	East of I-25			West of I-25		
	Autos	470	40	Autos	546	40
	Med Trucks	15	40	Med Trucks	18	40
	Hvy Trucks	31	40	Hvy Trucks	36	40
Abriendo	East of I-25			West of I-25		
	Autos	1540	40	Autos	1518	40
	Med Trucks	51	40	Med Trucks	50	40
	Hvy Trucks	101	40	Hvy Trucks	100	40
Santa Fe Drive	SF Ave to Northern					
	Autos	1038	45			
	Med Trucks	33	45			
	Hvy Trucks	33	45			
Santa Fe S. of I-25	SF Drive to Northern					
	Autos	770	40			
	Med Trucks	23	40			
	Hvy Trucks	23	40			
Santa Fe at I-25	just North of I-25			just South of I-25		
	Autos	1213	40	Autos	1613	40
	Med Trucks	39	40	Med Trucks	51	40

Table B-7

Existing I-25 Alignment Alternative (2035) Sideroad Loudest-Hour Traffic Volumes

	Hvy Trucks	39	40	Hvy Trucks	51	40
Santa Fe at 1st St	just North of 1st St	2035 Peak Hr	Speed	just South of 1st St	2035 Peak Hr	Speed
	Autos	1263	40	Autos	812	40
	Med Trucks	40	40	Med Trucks	26	40
	Hvy Trucks	40	40	Hvy Trucks	26	40
Santa Fe at 13th St	just North of 13th St	2035 Peak Hr	Speed	just South of 13th St	2035 Peak Hr	Speed
	Autos	1015	40	Autos	1151	40
	Med Trucks	32	40	Med Trucks	37	40
	Hvy Trucks	32	40	Hvy Trucks	37	40
1st St	East of I-25	2035 Peak Hr	Speed	West of I-25	2035 Peak Hr	Speed
	Autos	96	40	Autos	1111	40
	Med Trucks	5	40	Med Trucks	62	40
	Hvy Trucks	6	40	Hvy Trucks	75	40
4th to 1st Frontage	East of I-25	2035 Peak Hr	Speed	West of I-25	2035 Peak Hr	Speed
	Autos	235	40	Autos	1420	40
	Med Trucks	13	40	Med Trucks	80	40
	Hvy Trucks	16	40	Hvy Trucks	96	40
4th St (SH 96)	East of I-25	2035 Peak Hr	Speed	West of I-25	2035 Peak Hr	Speed
	Autos	2531	40	Autos	1719	40
	Med Trucks	142	40	Med Trucks	97	40
	Hvy Trucks	171	40	Hvy Trucks	116	40
6th to 4th Frontage	East of I-25	2035 Peak Hr	Speed	West of I-25	2035 Peak Hr	Speed
	Autos	648	40	Autos	724	40
	Med Trucks	36	40	Med Trucks	40	40
	Hvy Trucks	36	40	Hvy Trucks	40	40
8th to 6th Frontage	East of I-25	2035 Peak Hr	Speed	West of I-25	2035 Peak Hr	Speed
	Autos	648	40	Autos	194	40
	Med Trucks	36	40	Med Trucks	11	40
	Hvy Trucks	36	40	Hvy Trucks	11	40
8th St	East of I-25	2035 Peak Hr	Speed	West of I-25	2035 Peak Hr	Speed
	Autos	1218	40	Autos	1590	40
	Med Trucks	39	40	Med Trucks	51	40
	Hvy Trucks	39	40	Hvy Trucks	51	40
13th to 8th Frontage	East of I-25	2035 Peak Hr	Speed	West of I-25	2035 Peak Hr	Speed
	Autos	287	40	Autos	386	40
	Med Trucks	16	40	Med Trucks	21	40
	Hvy Trucks	9	40	Hvy Trucks	13	40
13th St				West of I-25	2035 Peak Hr	Speed
				Autos	2131	40
				Med Trucks	116	40

Table B-7

Existing I-25 Alignment Alternative (2035) Sideroad Loudest-Hour Traffic Volumes

				Hvy Trucks	69	40
Dillon - North of US 50B	Dillon N. of US50B	2035 Peak Hr	Speed			
	Autos	1270	40			
	Med Trucks	55	40			
	Hvy Trucks	55	40			
US 50B from Frontages	SB from 29th Frontage	2035 Peak Hr	Speed	NB to Ramp and 29th	2035 Peak Hr	Speed
	Autos	972	40	Autos	1049	40
	Med Trucks	42	40	Med Trucks	46	40
	Hvy Trucks	42	40	Hvy Trucks	46	40
US 50B	East of Dillon	2035 Peak Hr	Speed	West of Dillon	2035 Peak Hr	Speed
	Autos	4129	45	Autos	3738	45
	Med Trucks	141	45	Med Trucks	127	45
	Hvy Trucks	422	45	Hvy Trucks	382	45
29th St / US50B Loop and Ramp	Loop (F)	2035 Peak Hr	Speed	NB On Ramp (G)	2035 Peak Hr	Speed
	Autos	361	40	Autos	350	40
	Med Trucks	12	40	Med Trucks	11	40
	Hvy Trucks	12	40	Hvy Trucks	11	40
29th St to US50B Frontage Road	SB West of I-25 (E)	2035 Peak Hr	Speed	NB East of I-25 (D)	2035 Peak Hr	Speed
	Autos	1325	40	Autos	737	40
	Med Trucks	58	40	Med Trucks	15	40
	Hvy Trucks	58	40	Hvy Trucks	15	40
29th St	East of I-25	2035 Peak Hr	Speed	West of I-25	2035 Peak Hr	Speed
	Autos	1115	40	Autos	1733	40
	Med Trucks	48	40	Med Trucks	75	40
	Hvy Trucks	48	40	Hvy Trucks	75	40
29th St Frontage Roads	just NE of 29th (B)	2035 Peak Hr	Speed	just SW of 29th (C)	2035 Peak Hr	Speed
	Autos	632	40	Autos	1139	40
	Med Trucks	27	40	Med Trucks	36	40
	Hvy Trucks	13	40	Hvy Trucks	36	40
Feeder Rd (Mesa to Central)				West of I-25	2035 Peak Hr	Speed
				Autos	265	40
				Med Trucks	8	40
				Hvy Trucks	3	40

Table B-8
Modified I-25 Alignment Alternative (2035) Mainline Loudest-Hour Traffic Volumes

Section	Direction	Autos	Med	Hvy	Speed
US 50 / SH 47 to North	Northbound	3511	118	163	60
	Southbound	3923	131	182	60
29th St to US 50 / SH 47	Northbound	3411	114	158	60
	Southbound	4145	139	192	60
US 50B to 29th St	Northbound	3411	114	158	60
	Southbound	4145	139	192	60
13th St to SH50B	Northbound	4472	190	209	60
	Southbound	4913	209	230	60
1st St to 13th Street	Northbound	3613	154	169	60
	Southbound	4340	184	203	60
ILEX to 1st Street	Northbound	3540	234	258	55
	Southbound	4088	270	298	55
Abriendo to ILEX	Northbound	3540	234	258	55
	Southbound	4088	270	298	55
Central to Abriendo Ave	Northbound	2486	164	181	55
	Southbound	3045	201	222	55
Indiana to Central	Northbound	2916	120	204	60
	Southbound	3640	150	255	60
Illinois to Indiana	Northbound	2506	103	175	60
	Southbound	3370	139	236	60
Illinois to Pueblo Blvd	Northbound	2506	103	175	60
	Southbound	3370	139	236	60
Pueblo Blvd to South	Northbound	670	28	47	70
	Southbound	1199	49	84	70

Table B-9
 Modified I-25 Alignment Alternative (2035) Ramp Loudest-Hour Traffic Volumes

Ramp	Direction	autos	med	hvy	speed
Pueblo Blvd	NB On SLIP	122	3	19	40
	NB On LOOP	1693	40	259	30
	NB Off	73	9	14	40
	SB On	302	32	25	40
	SB Off	2311	128	128	40
Indiana	NB On	637	42	28	40
	NB Off	31	2	4	40
	SB On	60	8	4	40
	SB Off	619	28	49	40
Northern	NB Off	475	21	21	40
	SB On	557	52	39	40
Abriendo	NB On	1214	26	79	40
	SB Off	1184	38	38	40
1st St	NB Off	117	8	7	40
	SB On	612	27	34	40
6th St	NB Off	525	23	17	40
	SB Off	595	41	48	40
13th St	NB On	1424	62	62	40
	SB Off	662	36	22	40
US 50B	NB On	342	7	22	40
	NB Off	1484	64	48	40
	SB On	1043	26	251	40
	SB Off	338	19	27	40
29th St	SB Off (A)	767	24	24	40

Table B-10
Modified I-25 Alignment Alternative (2035) Sideroad Loudest-Hour Traffic Volumes

Pueblo Blvd	East of I-25	2035 Peak	Speed	West of I-25	2035 Peak	Speed		
		Hr			Hr			
	Autos	403	40	Autos	4415	40		
	Med Trucks	29	40	Med Trucks	315	40		
	Hvy Trucks	48	40	Hvy Trucks	526	40		
Indiana	East of I-25	2035 Peak	Speed	West of I-25	2035 Peak	Speed		
	Autos	177		35	Autos		773	35
	Med Trucks	12		35	Med Trucks		53	35
	Hvy Trucks	14		35	Hvy Trucks		62	35
Northern Ave	East of I-25	2035 Peak	Speed	West of I-25	2035 Peak	Speed		
	Autos	2830		40	Autos		3279	40
	Med Trucks	159		40	Med Trucks		184	40
	Hvy Trucks	191		40	Hvy Trucks		221	40
Mesa	East of I-25	2035 Peak	Speed	West of I-25	2035 Peak	Speed		
	Autos	415		40	Autos		524	40
	Med Trucks	14		40	Med Trucks		17	40
	Hvy Trucks	27		40	Hvy Trucks		34	40
Mesa to Abriendo/ SF Drive Frontage	East of I-25	2035 Peak	Speed	West of I-25	2035 Peak	Speed		
	Autos	634		40	Autos		557	40
	Med Trucks	21		40	Med Trucks		18	40
	Hvy Trucks	42		40	Hvy Trucks		37	40
Northern to Mesa Frontage	East of I-25	2035 Peak	Speed	West of I-25	2035 Peak	Speed		
	Autos	371		40	Autos		371	40
	Med Trucks	12		40	Med Trucks		12	40
	Hvy Trucks	24		40	Hvy Trucks		24	40
Abriendo				West of I-25	2035 Peak	Speed		
				Autos	1518		40	
				Med Trucks	50		40	
				Hvy Trucks	100		40	
Runyon Ext at at SantaFe Drive	SantaFeDr to Mesa	2035 Peak	Speed	Mesa to Northern	2035 Peak	Speed		
	Autos	564		40	Autos		564	40
	Med Trucks	18		40	Med Trucks		18	40
	Hvy Trucks	18		40	Hvy Trucks		18	40
Runyon Ext at Locust	Locust to SantaFeAve	2035 Peak	Speed	Locust to SantaFeDr	2035 Peak	Speed		
	Autos	23		40	Autos		23	40
	Med Trucks	1		40	Med Trucks		1	40
	Hvy Trucks	1		40	Hvy Trucks		1	40
Santa Fe Drive	SF Ave to Northern	2035 Peak	Speed		2035 Peak	Speed		
	Autos	1365		45			0	
	Med Trucks	44		45			0	

Table B-10

Modified I-25 Alignment Alternative (2035) Sideroad Loudest-Hour Traffic Volumes

	Hvy Trucks	44	45		0	
Santa Fe Ave at Central	Central to Minneauqa	2035 Peak Hr	Speed	West Central	2035 Peak Hr	Speed
	Autos	1331	40	Autos	609	40
	Med Trucks	42	40	Med Trucks	19	40
	Hvy Trucks	42	40	Hvy Trucks	19	40
Santa Fe Ave at Abriendo	Abriendo to D St	2035 Peak Hr	Speed	Abriendo to Central	2035 Peak Hr	Speed
	Autos	2109	40	Autos	1805	40
	Med Trucks	67	40	Med Trucks	58	40
	Hvy Trucks	67	40	Hvy Trucks	58	40
Santa Fe Ave at 1st St	just North of 1st St	2035 Peak Hr	Speed	just South of 1st St	2035 Peak Hr	Speed
	Autos	1410	40	Autos	1331	40
	Med Trucks	45	40	Med Trucks	42	40
	Hvy Trucks	45	40	Hvy Trucks	42	40
Santa Fe Ave at 13th St	just North of 13th St	2035 Peak Hr	Speed	just South of 13th St	2035 Peak Hr	Speed
	Autos	1094	40	Autos	462	40
	Med Trucks	35	40	Med Trucks	15	40
	Hvy Trucks	35	40	Hvy Trucks	15	40
1st St	East of I-25	2035 Peak Hr	Speed	West of I-25	2035 Peak Hr	Speed
	Autos	96	40	Autos	1431	40
	Med Trucks	5	40	Med Trucks	80	40
	Hvy Trucks	6	40	Hvy Trucks	96	40
4th to 1st Frontage	East of I-25	2035 Peak Hr	Speed	West of I-25	2035 Peak Hr	Speed
	Autos	64	40	Autos	1549	40
	Med Trucks	4	40	Med Trucks	87	40
	Hvy Trucks	4	40	Hvy Trucks	104	40
4th St (SH 96)	East of I-25	2035 Peak Hr	Speed	West of I-25	2035 Peak Hr	Speed
	Autos	2638	40	Autos	1784	40
	Med Trucks	148	40	Med Trucks	100	40
	Hvy Trucks	178	40	Hvy Trucks	120	40
6th to 4th Frontage	East of I-25	2035 Peak Hr	Speed	West of I-25	2035 Peak Hr	Speed
	Autos	76	40	Autos	918	40
	Med Trucks	4	40	Med Trucks	51	40
	Hvy Trucks	4	40	Hvy Trucks	51	40
8th to 6th Frontage	East of I-25	2035 Peak Hr	Speed	West of I-25	2035 Peak Hr	Speed
	Autos	572	40	Autos	302	40
	Med Trucks	32	40	Med Trucks	17	40
	Hvy Trucks	32	40	Hvy Trucks	17	40
8th St	East of I-25	2035 Peak Hr	Speed	West of I-25	2035 Peak Hr	Speed
	Autos	1816	40	Autos	1918	40
	Med Trucks	58	40	Med Trucks	61	40

Table B-10

Modified I-25 Alignment Alternative (2035) Sideroad Loudest-Hour Traffic Volumes

	Hvy Trucks	58	40	Hvy Trucks	61	40
13th to 8th Frontage	East of I-25	2035 Peak Hr	Speed	West of I-25	2035 Peak Hr	Speed
	Autos	1049	40	Autos	475	40
	Med Trucks	57	40	Med Trucks	26	40
	Hvy Trucks	34	40	Hvy Trucks	15	40
13th St				West of I-25	2035 Peak Hr	Speed
				Autos	1601	40
				Med Trucks	87	40
				Hvy Trucks	52	40
Dillon - North of US 50B	Dillon N. of US50B	2035 Peak Hr	Speed			
	Autos	1259	40			
	Med Trucks	55	40			
	Hvy Trucks	55	40			
US 50B from Frontages	SB from 29th Frontage	2035 Peak Hr	Speed	NB to Ramp and 29th	2035 Peak Hr	Speed
	Autos	1060	40	Autos	1104	40
	Med Trucks	46	40	Med Trucks	48	40
	Hvy Trucks	46	40	Hvy Trucks	48	40
US 50B	East of Dillon	2035 Peak Hr	Speed	West of Dillon	2035 Peak Hr	Speed
	Autos	3939	45	Autos	3622	45
	Med Trucks	134	45	Med Trucks	123	45
	Hvy Trucks	403	45	Hvy Trucks	370	45
29th St / US50B Loop and Ramp	Loop (F)	2035 Peak Hr	Speed	NB On Ramp (G)	2035 Peak Hr	Speed
	Autos	384	40	Autos	327	40
	Med Trucks	12	40	Med Trucks	10	40
	Hvy Trucks	12	40	Hvy Trucks	10	40
29th St to US50B Frontage	SB West of I-25 (E)	2035 Peak Hr	Speed	NB East of I-25 (D)	2035 Peak Hr	Speed
	Autos	1435	40	Autos	818	40
	Med Trucks	62	40	Med Trucks	17	40
	Hvy Trucks	62	40	Hvy Trucks	17	40
29th St	East of I-25	2035 Peak Hr	Speed	West of I-25	2035 Peak Hr	Speed
	Autos	1159	40	Autos	1844	40
	Med Trucks	50	40	Med Trucks	80	40
	Hvy Trucks	50	40	Hvy Trucks	80	40
29th St Frontage Roads	just NE of 29th (B)	2035 Peak Hr	Speed	just SW of 29th (C)	2035 Peak Hr	Speed
	Autos	384	40	Autos	699	40
	Med Trucks	16	40	Med Trucks	22	40
	Hvy Trucks	8	40	Hvy Trucks	22	40

Table B-11
No Build Alternative (2035) Mainline Loudest-Hour Traffic Volumes

Section	Direction	Autos	Med	Hvy	Speed
US 50 / SH 47 to North	Northbound	3519	118	163	60
	Southbound	2956	99	137	60
29th St to US 50 / SH 47	Northbound	3519	118	163	60
	Southbound	3519	118	163	60
US 50B to 29th St	Northbound	3519	118	163	60
	Southbound	3519	118	163	60
13th St to SH50B	Northbound	3519	118	163	60
	Southbound	3519	118	163	60
1st St to 13th Street	Northbound	3704	124	172	55
	Southbound	3704	124	172	55
ILEX to 1st Street	Northbound	2782	93	129	55
	Southbound	2782	93	129	55
Abriendo to ILEX	Northbound	2794	94	130	55
	Southbound	3704	124	172	55
Central to Abriendo Ave	Northbound	2934	98	136	55
	Southbound	2790	93	130	55
Indiana to Central	Northbound	2478	83	115	60
	Southbound	3519	118	163	60
Illinois to Indiana	Northbound	1967	66	91	65
	Southbound	3122	105	145	65
Illinois to Pueblo Blvd	Northbound	1967	66	91	70
	Southbound	2922	98	136	70
Pueblo Blvd to South	Northbound	800	27	37	70
	Southbound	1700	57	79	70

Table B-12
No Build Alternative (2035) Ramp Loudest-Hour Traffic Volumes

Ramp	Direction	autos	med	hvy	speed
Pueblo Blvd	NB On	1276	30	194	40
	NB Off	181	22	37	40
	SB On	324	33	27	40
	SB Off	1522	89	93	40
Indiana	NB On	519	33	24	40
	NB Off	20	1	2	40
	SB On	0	0	0	40
	SB Off	0	0	0	40
Central	NB On	680	26	26	40
	NB Off	194	28	17	40
	SB On	363	33	24	40
	SB Off	700	25	19	40
Abriendo	NB On	777	21	54	40
	NB Off	66	3	4	40
	SB On	119	7	6	40
	SB Off	732	26	23	40
ILEX	NB On	359	30	55	40
	NB Off	69	6	9	40
	SB On	344	24	16	40
	SB Off	614	67	87	40
1st St	NB On	492	34	26	40
	NB Off	554	23	36	40
	SB On	624	29	31	40
	SB Off	504	29	55	40
6th St	NB On	610	29	21	40
	SB Off	198	14	16	40
13th St	NB On	554	22	24	40
	NB Off	467	37	12	40
	SB On	634	24	27	40
	SB Off	374	20	14	40
US 50B	NB On	658	17	45	40
	NB Off	948	38	34	40
	SB On	939	28	221	40
	SB Off	728	40	61	40
29th St	NB Off	669	28	35	40
	SB On	847	30	23	40
	SB Off	717	35	52	40

Table B-12

No-Action Alternative (2035) Ramp Loudest-Hour Traffic Volumes

Ramp	Direction	autos	med	hvy	speed
Pueblo Blvd	NB On	1064	25	161	40
	NB Off	151	19	31	40
	SB On	270	27	23	40
	SB Off	1269	74	77	40
Indiana	NB On	433	28	20	40
	NB Off	17	1	2	40
	SB On	0	0	0	40
	SB Off	0	0	0	40
Central	NB On	567	22	22	40
	NB Off	162	24	14	40
	SB On	302	28	20	40
	SB Off	583	21	16	40
Abriendo	NB On	648	18	45	40
	NB Off	55	2	3	40
	SB On	99	6	5	40
	SB Off	610	22	19	40
ILEX	NB On	299	25	46	40
	NB Off	57	5	7	40
	SB On	287	20	14	40
	SB Off	511	56	73	40
1st St	NB On	410	28	22	40
	NB Off	462	19	30	40
	SB On	520	24	26	40
	SB Off	420	24	46	40
6th St	NB On	508	24	18	40
	SB Off	165	12	13	40
13th St	NB On	462	18	20	40
	NB Off	389	30	10	40
	SB On	528	20	22	40
	SB Off	312	17	11	40
US 50B	NB On	548	15	37	40
	NB Off	790	32	28	40
	SB On	783	24	184	40
	SB Off	606	33	50	40
29th St	NB Off	557	23	29	40
	SB On	706	25	19	40
	SB Off	598	29	43	40

Location of Roadways

The locations of all roadways were determined using CAD topographical maps. This information was provided in electronic format by CH2M HILL.

Location of Receptors

Noise levels were predicted at several locations. These included 10 locations to validate the noise model, 40 locations to determine the increase in the noise levels, and at more than 550 locations to analyze noise mitigation. Most of these locations are either Noise Activity Category B (residences) or Noise Activity Category C (parks, etc.) The coordinates of these locations were determined from topographical plans. Elevation and topography were taken into account.

Location of Terrain Features and Structures

Existing terrain features such as embankments, existing noise walls, the edge of the roadway itself, and structures can act as barriers that reduce noise propagation. The effects of these features were modeled when it was determined that they break the line-of-sight between the adjacent roadway and receptors and were of substantial mass.

ATTACHMENT C
Statement of Likelihood



Noise Analysis and Abatement Guidelines

COLORADO DEPARTMENT OF TRANSPORTATION NOISE ABATEMENT DETERMINATION WORKSHEET

Instructions: To complete this form refer to CDOT Noise Analysis Guidelines

STIP # _____ Date of Analysis: January 30, 2012

Project Name & Location: New Pueblo Freeway: Residences between 24th and 29th Streets

A. FEASIBILITY:

- 1. Can a 5dBA noise reduction be achieved by constructing a noise barrier or berm?
 YES NO
- 2. Are there any fatal flaw drainage, terrain, safety, or maintenance issues involving the proposed noise barrier or berm?
 YES NO
- 3. Can a noise barrier or berm less than 20 feet tall be constructed?
 YES NO

B. REASONABLENESS:

- 1. Has the Design goal of 7 dBA noise reduction for abatement measure been met for at least one impacted receptor?
 YES NO
- 2. Is the Cost Benefit Index below \$6800 per receptor per dBA?
 YES NO
- 3. Are more than 50% of benefited resident/owners in favor of the recommended noise abatement measure?
 YES NO **ASSUMED - NEEDS TO BE VERIFIED**

C. INSULATION CONSIDERATION: N/A

- 1. Are normal noise abatement measures physically infeasible or economically unreasonable?
 YES NO
If the answer to 1 is YES, then:
- 2. a. Does this project have noise impacts to NAC Activity Category D?
 YES NO
- b. If yes, is it reasonable and feasible to provide insulation for these buildings?
 YES NO

D. ADDITIONAL CONSIDERATIONS:

This neighborhood was not considered for mitigation as part of the I-25/US50/SH47 project, despite the front row being removed.

E. STATEMENT OF LIKELIHOOD:

- 1. Are noise mitigation measures feasible?
 YES NO
- 2. Are noise mitigation measures reasonable?
 YES NO
- 3. Is insulation of buildings both feasible and reasonable?
 YES NO N/A
- 4. Shall noise abatement measures be provided?
 YES NO

F. ABATEMENT DECISION DESCRIPTION AND JUSTIFICATION:

Proposed walls meet all CDOT requirements based on this analysis and are recommended for inclusion in project.

Completed by: Mike Hankard, Hankard Env., Inc. Date: January 30, 2012



Noise Analysis and Abatement Guidelines

COLORADO DEPARTMENT OF TRANSPORTATION NOISE ABATEMENT DETERMINATION WORKSHEET

Instructions: To complete this form refer to CDOT Noise Analysis Guidelines

STIP # _____ Date of Analysis: January 30, 2012

Project Name & Location: New Pueblo Freeway: Mineral Palace Park, Towers, and Albany Residences

A. FEASIBILITY:

- 1. Can a 5dBA noise reduction be achieved by constructing a noise barrier or berm?
 YES NO
- 2. Are there any fatal flaw drainage, terrain, safety, or maintenance issues involving the proposed noise barrier or berm?
 YES NO
- 3. Can a noise barrier or berm less than 20 feet tall be constructed?
 YES NO

B. REASONABLENESS:

- 1. Has the Design goal of 7 dBA noise reduction for abatement measure been met for at least one impacted receptor?
 YES NO
- 2. Is the Cost Benefit Index below \$6800 per receptor per dBA?
 YES NO
- 3. Are more than 50% of benefited resident/owners in favor of the recommended noise abatement measure?
 YES NO **ASSUMED - NEEDS TO BE VERIFIED**

C. INSULATION CONSIDERATION: N/A

- 1. Are normal noise abatement measures physically infeasible or economically unreasonable?
 YES NO
If the answer to 1 is YES, then:
- 2. a. Does this project have noise impacts to NAC Activity Category D?
 YES NO
- b. If yes, is it reasonable and feasible to provide insulation for these buildings?
 YES NO

D. ADDITIONAL CONSIDERATIONS:

The City of Colorado Springs has expressed a strong desire for noise mitigation in the park.

E. STATEMENT OF LIKELIHOOD:

- 1. Are noise mitigation measures feasible?
 YES NO
- 2. Are noise mitigation measures reasonable?
 YES NO
- 3. Is insulation of buildings both feasible and reasonable?
 YES NO **N/A**
- 4. Shall noise abatement measures be provided?
 YES NO

F. ABATEMENT DECISION DESCRIPTION AND JUSTIFICATION:

Proposed barrier meets all CDOT requirements based on this analysis and is recommended for inclusion in project.

Completed by: Mike Hankard, Hankard Env., Inc. Date: January 30, 2012

CDOT Form #1209 Revised 02/11



Noise Analysis and Abatement Guidelines

COLORADO DEPARTMENT OF TRANSPORTATION NOISE ABATEMENT DETERMINATION WORKSHEET

Instructions: To complete this form refer to CDOT Noise Analysis Guidelines

STIP # _____ Date of Analysis: January 30, 2012

Project Name & Location: New Pueblo Freeway: Residences along Kelly and Bradford Streets

A. FEASIBILITY:

- 1. Can a 5dBA noise reduction be achieved by constructing a noise barrier or berm?
 YES NO
- 2. Are there any fatal flaw drainage, terrain, safety, or maintenance issues involving the proposed noise barrier or berm?
 YES NO
- 3. Can a noise barrier or berm less than 20 feet tall be constructed?
 YES NO

B. REASONABLENESS:

- 1. Has the Design goal of 7 dBA noise reduction for abatement measure been met for at least one impacted receptor?
 YES NO
- 2. Is the Cost Benefit Index below \$6800 per receptor per dBA?
 YES NO
- 3. Are more than 50% of benefited resident/owners in favor of the recommended noise abatement measure?
 YES NO **ASSUMED - NEEDS TO BE VERIFIED**

C. INSULATION CONSIDERATION: N/A

- 1. Are normal noise abatement measures physically infeasible or economically unreasonable?
 YES NO
If the answer to 1 is YES, then:
- 2. a. Does this project have noise impacts to NAC Activity Category D?
 YES NO
- b. If yes, is it reasonable and feasible to provide insulation for these buildings?
 YES NO

D. ADDITIONAL CONSIDERATIONS:

E. STATEMENT OF LIKELIHOOD:

- 1. Are noise mitigation measures feasible?
 YES NO
- 2. Are noise mitigation measures reasonable?
 YES NO
- 3. Is insulation of buildings both feasible and reasonable?
 YES NO **N/A**
- 4. Shall noise abatement measures be provided?
 YES NO

F. ABATEMENT DECISION DESCRIPTION AND JUSTIFICATION:

Proposed barrier meets all CDOT requirements based on this analysis and is recommended for inclusion in project.

Completed by: Mike Hankard, Hankard Env., Inc. Date: January 30, 2012

CDOT Form #1209 Revised 02/11



Noise Analysis and Abatement Guidelines

COLORADO DEPARTMENT OF TRANSPORTATION NOISE ABATEMENT DETERMINATION WORKSHEET

Instructions: To complete this form refer to CDOT Noise Analysis Guidelines

STIP # _____ Date of Analysis: January 30, 2012

Project Name & Location: New Pueblo Freeway: JJ Raigoza Park and Residences along Evans from Maryland to Indiana (Modified Alignment Alternative)

A. FEASIBILITY:

1. Can a 5dBA noise reduction be achieved by constructing a noise barrier or berm?
 YES NO
2. Are there any fatal flaw drainage, terrain, safety, or maintenance issues involving the proposed noise barrier or berm?
 YES NO
3. Can a noise barrier or berm less than 20 feet tall be constructed?
 YES NO

B. REASONABLENESS:

1. Has the Design goal of 7 dBA noise reduction for abatement measure been met for at least one impacted receptor?
 YES NO
2. Is the Cost Benefit Index below \$6800 per receptor per dBA?
 YES NO
3. Are more than 50% of benefited resident/owners in favor of the recommended noise abatement measure?
 YES NO **ASSUMED - NEEDS TO BE VERIFIED**

C. INSULATION CONSIDERATION: N/A

1. Are normal noise abatement measures physically infeasible or economically unreasonable?
 YES NO
If the answer to 1 is YES, then:
 - a. Does this project have noise impacts to NAC Activity Category D?
 YES NO
 - b. If yes, is it reasonable and feasible to provide insulation for these buildings?
 YES NO

D. ADDITIONAL CONSIDERATIONS:

E. STATEMENT OF LIKELIHOOD:

- | | |
|--|---|
| 1. Are noise mitigation measures feasible?
<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO | 2. Are noise mitigation measures reasonable?
<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO |
| 3. Is insulation of buildings both feasible and reasonable?
<input type="checkbox"/> YES <input type="checkbox"/> NO <u>N/A</u> | 4. Shall noise abatement measures be provided?
<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO |

F. ABATEMENT DECISION DESCRIPTION AND JUSTIFICATION:

Proposed barrier meets all CDOT requirements based on this analysis and is recommended for inclusion in project.

Completed by: Mike Hankard, Hankard Env., Inc. Date: January 30, 2012

CDOT Form #1209 Revised 02/11



Noise Analysis and Abatement Guidelines

COLORADO DEPARTMENT OF TRANSPORTATION NOISE ABATEMENT DETERMINATION WORKSHEET

Instructions: To complete this form refer to CDOT Noise Analysis Guidelines

STIP # _____ Date of Analysis: January 30, 2012

Project Name & Location: New Pueblo Freeway: Residences along Palm Street (Existing Alignment Alternative)

A. FEASIBILITY:

1. Can a 5dBA noise reduction be achieved by constructing a noise barrier or berm?
 YES NO
2. Are there any fatal flaw drainage, terrain, safety, or maintenance issues involving the proposed noise barrier or berm?
 YES NO
3. Can a noise barrier or berm less than 20 feet tall be constructed?
 YES NO

B. REASONABLENESS:

1. Has the Design goal of 7 dBA noise reduction for abatement measure been met for at least one impacted receptor?
 YES NO
2. Is the Cost Benefit Index below \$6800 per receptor per dBA?
 YES NO
3. Are more than 50% of benefited resident/owners in favor of the recommended noise abatement measure?
 YES NO **ASSUMED - NEEDS TO BE VERIFIED**

C. INSULATION CONSIDERATION:

1. Are normal noise abatement measures physically infeasible or economically unreasonable?
 YES NO
If the answer to 1 is YES, then:
 - a. Does this project have noise impacts to NAC Activity Category D?
 YES NO
 - b. If yes, is it reasonable and feasible to provide insulation for these buildings?
 YES NO

D. ADDITIONAL CONSIDERATIONS:

E. STATEMENT OF LIKELIHOOD:

- | | |
|--|---|
| 1. Are noise mitigation measures feasible?
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO | 2. Are noise mitigation measures reasonable?
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO |
| 3. Is insulation of buildings both feasible and reasonable?
<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A | 4. Shall noise abatement measures be provided?
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO |

F. ABATEMENT DECISION DESCRIPTION AND JUSTIFICATION:

Proposed barrier cannot achieve minimum noise reduction due to noise from Santa Fe Avenue not being mitigated by wall.

Completed by: Mike Hankard, Hankard Env., Inc. Date: January 30, 2012

CDOT Form #1209 Revised 02/11



Noise Analysis and Abatement Guidelines

COLORADO DEPARTMENT OF TRANSPORTATION NOISE ABATEMENT DETERMINATION WORKSHEET

Instructions: To complete this form refer to CDOT Noise Analysis Guidelines

STIP # _____ Date of Analysis: January 30, 2012

Project Name & Location: New Pueblo Freeway: Residences along Moffat Street (Existing Alignment Alternative)

A. FEASIBILITY:

1. Can a 5dBA noise reduction be achieved by constructing a noise barrier or berm?
 YES NO
2. Are there any fatal flaw drainage, terrain, safety, or maintenance issues involving the proposed noise barrier or berm?
 YES NO
3. Can a noise barrier or berm less than 20 feet tall be constructed?
 YES NO

B. REASONABLENESS:

1. Has the Design goal of 7 dBA noise reduction for abatement measure been met for at least one impacted receptor?
 YES NO
2. Is the Cost Benefit Index below \$6800 per receptor per dBA?
 YES NO
3. Are more than 50% of benefited resident/owners in favor of the recommended noise abatement measure?
 YES NO **ASSUMED - NEEDS TO BE VERIFIED**

C. INSULATION CONSIDERATION:

1. Are normal noise abatement measures physically infeasible or economically unreasonable?
 YES NO
If the answer to 1 is YES, then:
 - a. Does this project have noise impacts to NAC Activity Category D?
 YES NO
 - b. If yes, is it reasonable and feasible to provide insulation for these buildings?
 YES NO

D. ADDITIONAL CONSIDERATIONS:

E. STATEMENT OF LIKELIHOOD:

1. Are noise mitigation measures feasible?
 YES NO
2. Are noise mitigation measures reasonable?
 YES NO
3. Is insulation of buildings both feasible and reasonable?
 YES NO N/A
4. Shall noise abatement measures be provided?
 YES NO

F. ABATEMENT DECISION DESCRIPTION AND JUSTIFICATION:

Proposed barrier cannot achieve maximum cost-benefit ratio.

Completed by: Mike Hankard, Hankard Env., Inc. Date: January 30, 2012

CDOT Form #1209 Revised 02/11



Noise Analysis and Abatement Guidelines

COLORADO DEPARTMENT OF TRANSPORTATION NOISE ABATEMENT DETERMINATION WORKSHEET

Instructions: To complete this form refer to CDOT Noise Analysis Guidelines

STIP # _____ Date of Analysis: January 30, 2012

Project Name & Location: New Pueblo Freeway: JJ Raigoza Park and Residences along Evans from Maryland to Jones (Existing Alignment Alternative)

A. FEASIBILITY:

- 1. Can a 5dBA noise reduction be achieved by constructing a noise barrier or berm?
 YES NO
- 2. Are there any fatal flaw drainage, terrain, safety, or maintenance issues involving the proposed noise barrier or berm?
 YES NO
- 3. Can a noise barrier or berm less than 20 feet tall be constructed?
 YES NO

B. REASONABLENESS:

- 1. Has the Design goal of 7 dBA noise reduction for abatement measure been met for at least one impacted receptor?
 YES NO
- 2. Is the Cost Benefit Index below \$6800 per receptor per dBA?
 YES NO
- 3. Are more than 50% of benefited resident/owners in favor of the recommended noise abatement measure?
 YES NO **ASSUMED - NEEDS TO BE VERIFIED**

C. INSULATION CONSIDERATION: N/A

- 1. Are normal noise abatement measures physically infeasible or economically unreasonable?
 YES NO
If the answer to 1 is YES, then:
- 2. a. Does this project have noise impacts to NAC Activity Category D?
 YES NO
- b. If yes, is it reasonable and feasible to provide insulation for these buildings?
 YES NO

D. ADDITIONAL CONSIDERATIONS:

E. STATEMENT OF LIKELIHOOD:

- 1. Are noise mitigation measures feasible?
 YES NO
- 2. Are noise mitigation measures reasonable?
 YES NO
- 3. Is insulation of buildings both feasible and reasonable?
 YES NO **N/A**
- 4. Shall noise abatement measures be provided?
 YES NO

F. ABATEMENT DECISION DESCRIPTION AND JUSTIFICATION:

Proposed barrier meets all CDOT requirements based on this analysis and is recommended for inclusion in project.

Completed by: Mike Hankard, Hankard Env., Inc. Date: January 30, 2012

CDOT Form #1209 Revised 02/11