



**COLORADO**  
Department of Transportation

**I-70 WEST VAIL PASS AUXILIARY LANES**



**EAST VAIL NOISE MEETING**  
**2.13.2020**



## **WHY IS THE WEST VAIL PASS AUXILIARY LANES PROJECT CONDUCTING A NOISE ANALYSIS?**

- A noise analysis is required on this proposed CDOT project because auxiliary lanes are proposed, which qualifies it as a Type I Project per the Code of Federal Regulations, which is defined as:
  - A new highway built on a new location, interchange modifications, or an existing highway that is significantly altered by substantially changing the horizontal or vertical characteristics of the road, or the number of through traffic lanes being increased or auxiliary lanes added.



## **NOISE ANALYSIS PROCESS – FEDERAL AND STATE REQUIREMENTS**

- Analysis conducted per the Code of Federal Regulations (23 CFR Part 772) – Procedures for Abatement of Highway Traffic Noise and Construction Noise
  - CDOT’s 2015 Noise Analysis and Abatement Guidance
  - FHWA’s 2011 Highway Traffic Noise: Analysis and Abatement Guidance

Steps in process:

1. Conduct field measurements of existing noise
2. Validate noise model with measurements
3. Model existing conditions for current I-70 alignment
4. Model future Proposed Action (auxiliary lanes) and future No-Action
5. Complete noise mitigation evaluation





## **NOISE ANALYSIS – CURRENTLY UNDER REVIEW**

- Noise-related information and results reported in this presentation is based on the most current draft noise technical report for the West Vail Pass Auxiliary Lanes project. Information may change prior to the Environmental Assessment public review.

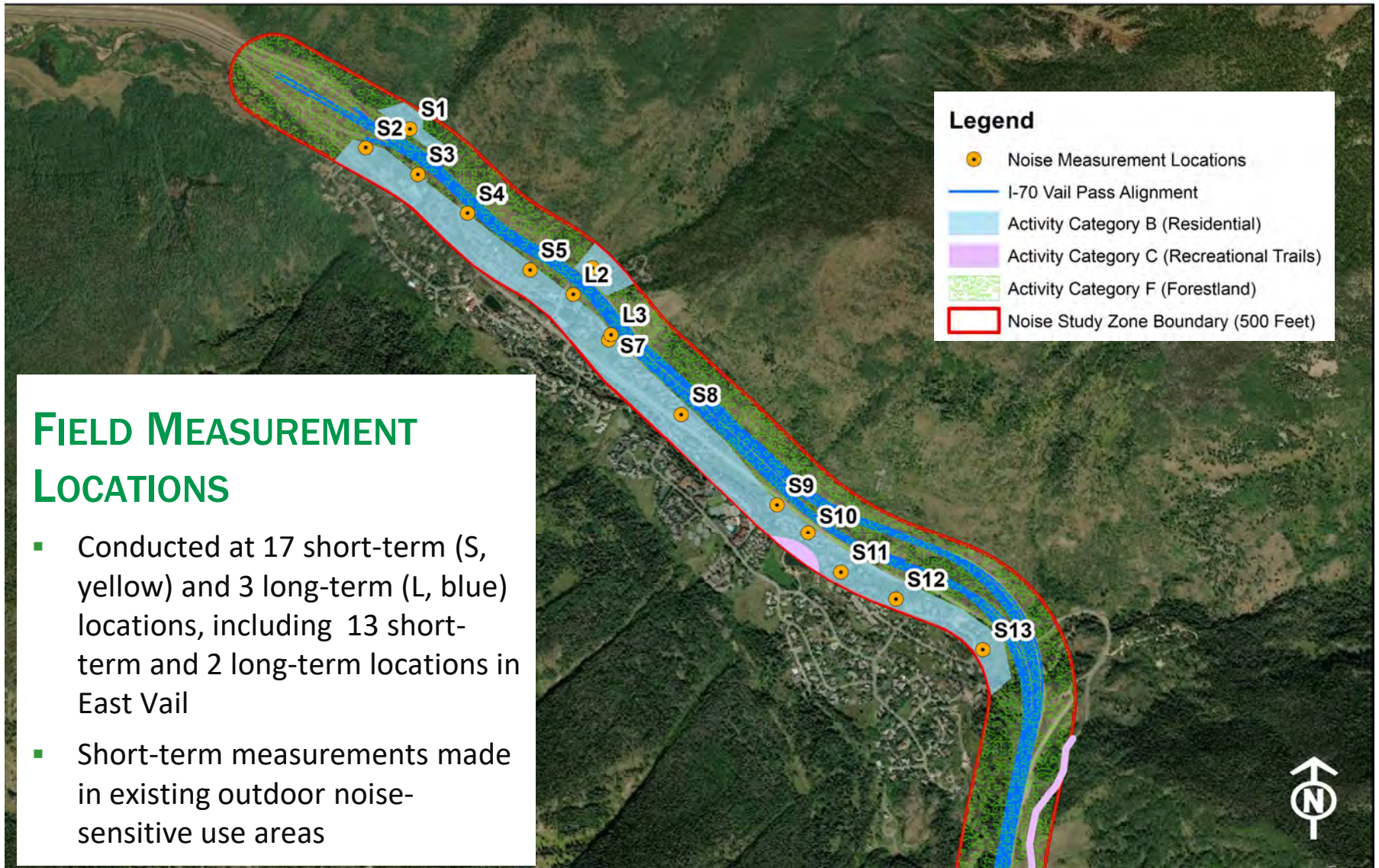


## FIELD MEASUREMENTS

- Noise measurements were collected in June 2018.
- Short-term attended measurements were conducted over 15-minute periods; Two 15-minute measurements at each location (30 minutes total). Traffic counts were conducted concurrent with short-term measurements.
- Long-term measurements were made over periods of several days, including both weekday and weekend periods, to establish the loudest traffic noise hour.



# NOISE MEASUREMENTS





## **NOISE MEASUREMENTS**

### **ABBREVIATION AND TERM DEFINITIONS**

- dBA – Stands for “A” weighted decibels, which are an expression of the relative loudness of sounds in air as perceived by the human ear.
- $L_{eq}$  – The average sound level occurring over a specified period of time.
- Receiver – A location that represents noise sensitive land uses; can represent multiple receptors.
- Receptor - A specific location (e.g. a house) represented by a modeled receiver.
  - Outdoor areas of frequent human use for residential, school, places of worship, park, hotel, and other sensitive land uses are considered for evaluation. Indoor areas of residences are not considered for evaluation.



**NOISE MEASUREMENTS**

**FIELD MEASUREMENT RESULTS**

- Measured traffic noise levels in East Vail ranged from 50 to 65 dBA  $L_{eq}$ .
- Measurements are used to validate the model and do not need to be taken at the worst noise-hour.

| Noise Measurement Location ID | Location  | Measured Leq (dBA) |
|-------------------------------|---|--------------------|
| S1                            | Lawn area north of Fall Line Drive, Vail                | 64.3               |
|                               |   | 65.1               |
| S2                            | 3891 Big Horn Road Units B & C, Vail                    | 53.1               |
|                               |   | 55.0               |
| S3                            | 3941-4 & 4011-6 Big Horn Road, Vail                     | 54.9               |
|                               |   | 57.8               |
| S4                            | 4073 Spruce Way, Vail                                   | 57.2               |
|                               |   | 57.3               |
| S5                            | 4193a Spruce Way, Vail                                  | 55.4               |
|                               |   | 49.8               |
| S6                            | 4396 Columbine Way, Vail                                | 60.8               |
|                               |   | 61.8               |
| S7                            | 4335 Spruce Way, Vail                                   | 54.8               |
|                               |   | 55.7               |
| S8                            | 4545 Big Horn Road, Vail                                | 56.9               |
|                               |   | 58.0               |
| S9                            | 4770 Vail Racquet Club Townhouse Drive, Vail            | 58.0               |
|                               |   | 59.0               |
| S10                           | L1 & L3 Condos, Vail Racquet Club Townhouse Drive, Vail | 57.1               |
|                               |   | 55.3               |
| S11                           | Pool area, Main Gore Place, Vail                        | 50.8               |
|                               |   | 51.6               |
| S12                           | 5040 Prima Court Unit 1, Vail                           | 51.3               |
|                               |   | 52.5               |
| S13                           | 5177 Gore Circle, Vail                                  | 54.8               |
|                               |   | 52.1               |

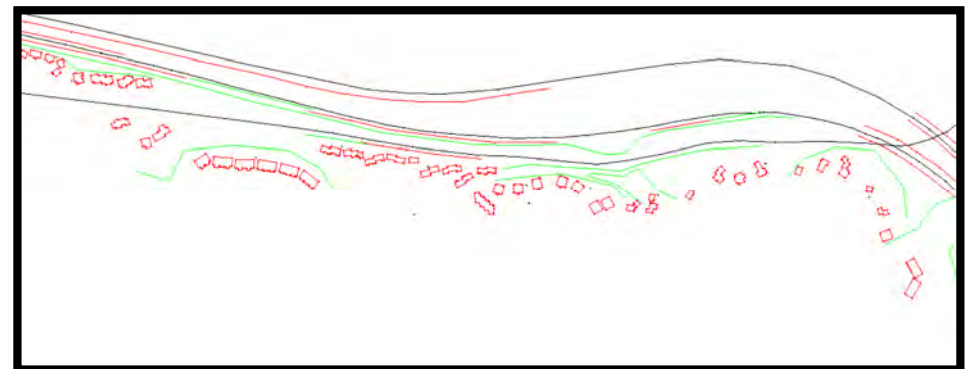
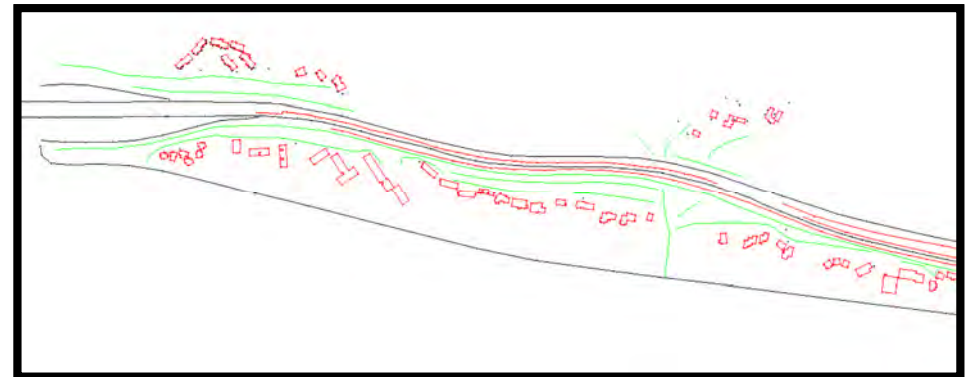




## NOISE MODELING

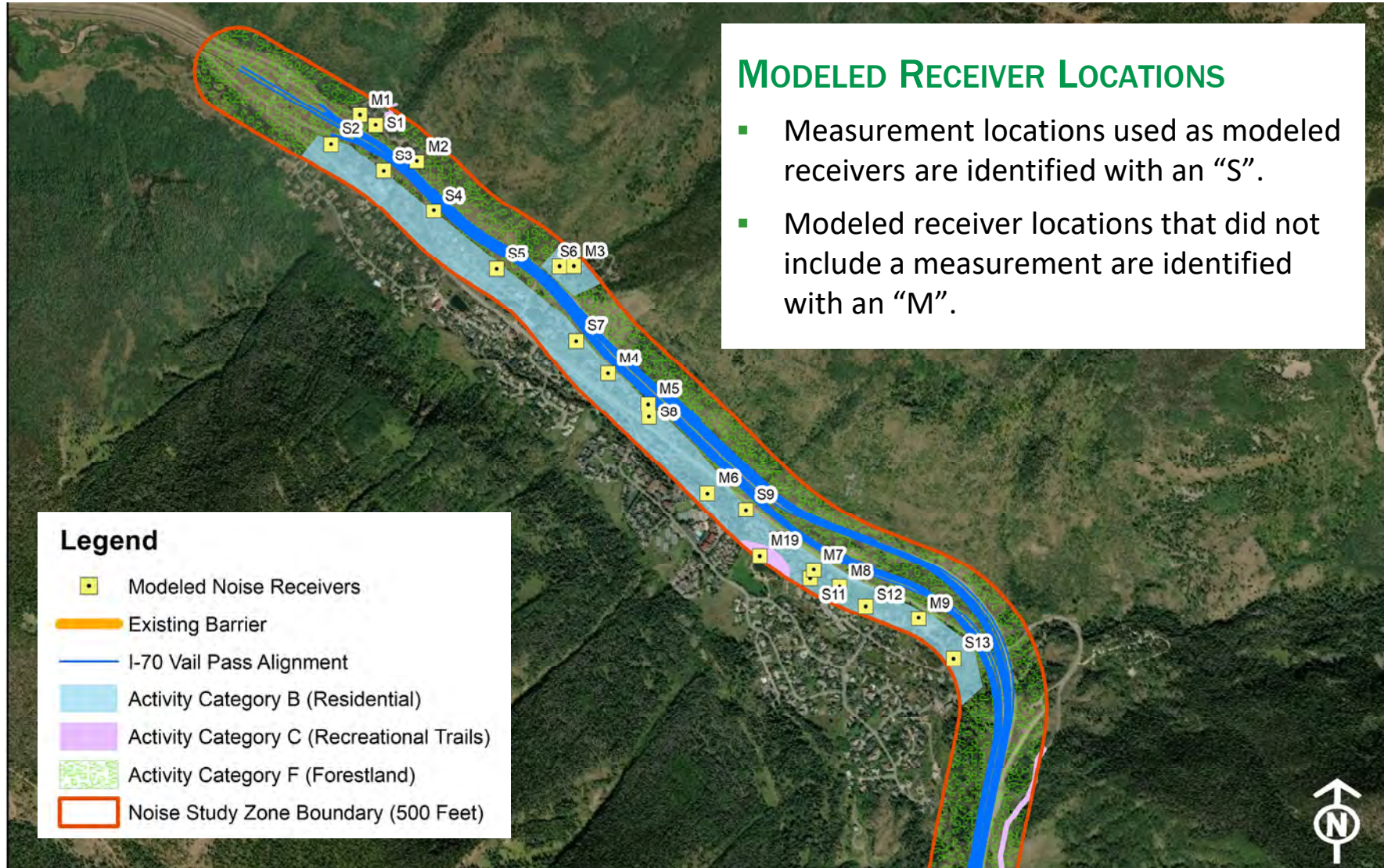
### MODEL EXISTING CONDITIONS

- Study area extends 500 feet from proposed edge of travel lanes
- Inputs include:
  - Roadway alignment
  - Number and width of travel lanes
  - Traffic volumes, including trucks
  - Traffic speeds
  - Existing barriers and structures
  - Topography
  - Ground type
  - Receiver locations
- Model validated with field measurements





# NOISE MODELING





## **TRAFFIC NOISE IMPACT CRITERIA**

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

- Proposed Action traffic noise level approaches (i.e., equals) or exceeds CDOT's Noise Abatement Criteria (NAC). For residential land, the NAC is 66 dBA.
- Proposed Action traffic noise level exceeds the existing highway traffic noise level by 10 dBA.

*For residential land uses, only exterior areas of frequent human use are considered.*



**NOISE RESULTS**

**PRELIMINARY RESULTS OF MODELING FOR PROPOSED ACTION AND NO ACTION IN EAST VAIL**

- Proposed Action levels ranged from 56 to 72 dBA  $L_{eq}(1-hr)$
- No Action levels ranged from 55 to 71 dBA  $L_{eq}(1-hr)$
- Proposed Action noise increases above Existing ranged from 1 to 5 dBA (increase due to combination of future traffic increases and Project)
- Proposed Action noise changes from No Action ranged from 2 dBA decrease to 2 dBA increase (increase due to Project only)

| Receiver ID | Activity Category / CDOT NAC (dBA) | No Action (2045) $L_{eq}$ (dBA) | Proposed Action (2045) $L_{eq}$ (dBA) | Proposed Action Causes Impact? (Yes or No) |
|-------------|------------------------------------|---------------------------------|---------------------------------------|--|
| S1          | B (66 dBA)                         | 67.9                            | 68.9                                  | Yes  |
| S2          | B (66 dBA)                         | 60.7                            | 61.2                                  | No   |
| S3          | B (66 dBA)                         | 60.6                            | 60.7                                  | No   |
| S4          | B (66 dBA)                         | 62.6                            | 62.9                                  | No   |
| S5          | B (66 dBA)                         | 55.1                            | 56.6                                  | No   |
| S6          | B (66 dBA)                         | 67.4                            | 69.5                                  | Yes  |
| S7          | B (66 dBA)                         | 62.6                            | 61.9                                  | No   |
| S8          | B (66 dBA)                         | 62.2                            | 60.4                                  | No   |
| S9          | B (66 dBA)                         | 64.3                            | 63.4                                  | No   |
| S10         | B (66 dBA)                         | 59.2                            | 57.8                                  | No   |
| S11         | B (66 dBA)                         | 56.3                            | 56.0                                  | No   |
| S12         | B (66 dBA)                         | 58.7                            | 58.7                                  | No   |
| S13         | B (66 dBA)                         | 60.5                            | 59.4                                  | No   |
| M1          | B (66 dBA)                         | 67.1                            | 67.9                                  | Yes  |
| M2          | B (66 dBA)                         | 70.8                            | 71.7                                  | Yes  |
| M3          | B (66 dBA)                         | 60.1                            | 61.7                                  | No   |
| M4          | B (66 dBA)                         | 59.4                            | 58.5                                  | No   |
| M5          | B (66 dBA)                         | 62.2                            | 62.1                                  | No   |
| M6          | B (66 dBA)                         | 64.5                            | 63.1                                  | No   |
| M7          | B (66 dBA)                         | 61.2                            | 60.5                                  | No   |
| M8          | B (66 dBA)                         | 58.1                            | 57.6                                  | No   |
| M9          | B (66 dBA)                         | 62.3                            | 63.1                                  | No   |
| M19         | C (66 dBA)                         | 60.3                            | 59.6                                  | No   |

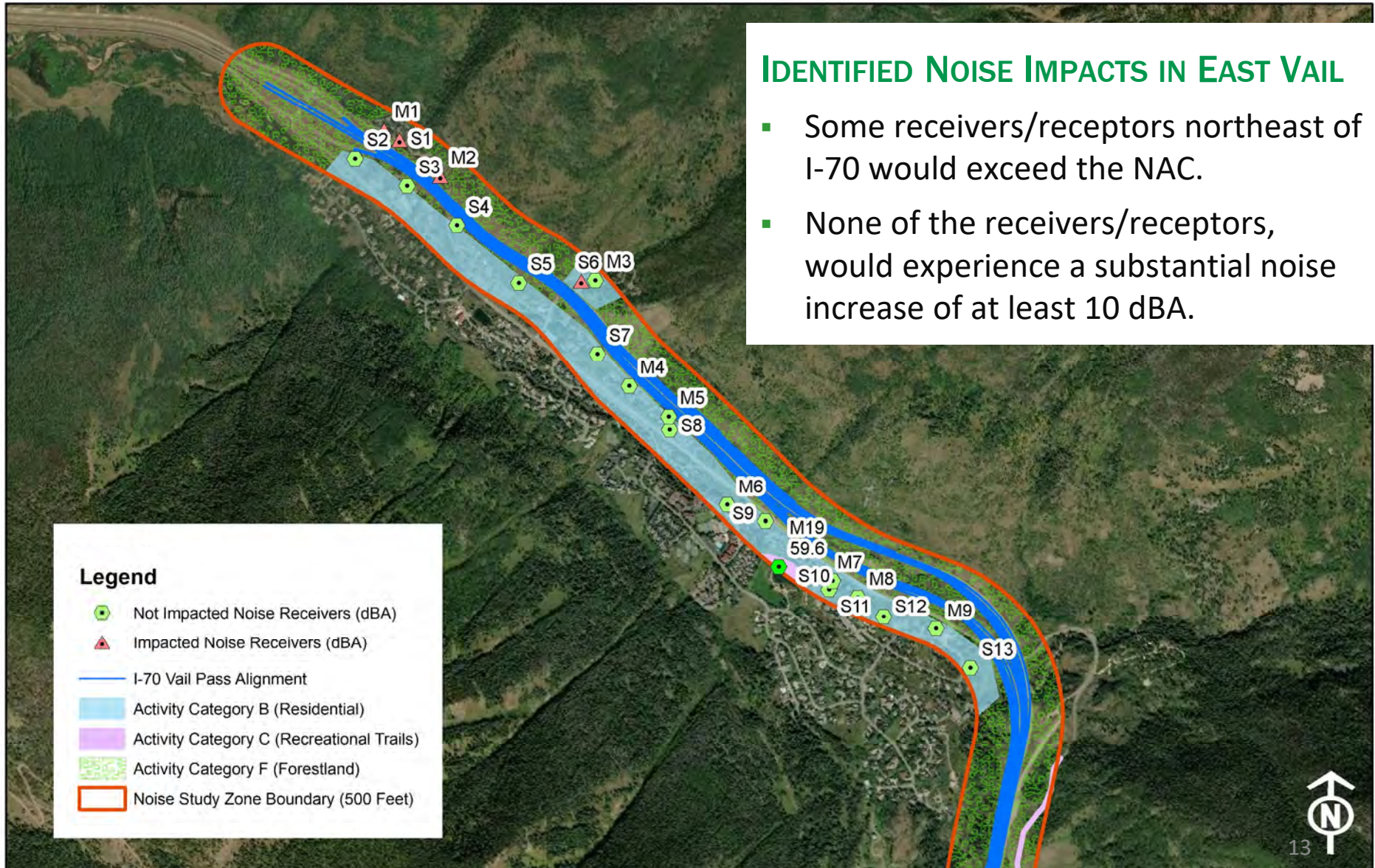




# NOISE RESULTS

## IDENTIFIED NOISE IMPACTS IN EAST VAIL

- Some receivers/receptors northeast of I-70 would exceed the NAC.
- None of the receivers/receptors, would experience a substantial noise increase of at least 10 dBA.





## **NOISE ABATEMENT EVALUATION CRITERIA – SET BY FHWA & CDOT**

Noise abatement is evaluated for all impacted receptors. However, based on CDOT, abatement is only recommended to be included in the project if it:

- Provides at least 5 dBA of noise reduction for at least one impacted receptor
- Does not have any “fatal flaw” issues (e.g., safety, maintenance, access, drainage)
- Does not exceed 20 feet in height
- Meets the minimum noise reduction design goal of at least 7 dBA for at least one receptor
- The Cost Benefit (\$/dBA/receptor) equals or is less than the Cost Benefit Index (\$6,800/dBA/receptor)
- Has support from more than 50 percent of the potentially benefited receptors (Support determined through Benefited Receptor Preference Survey, which may be conducted after the NEPA process if abatement is otherwise feasible and reasonable)



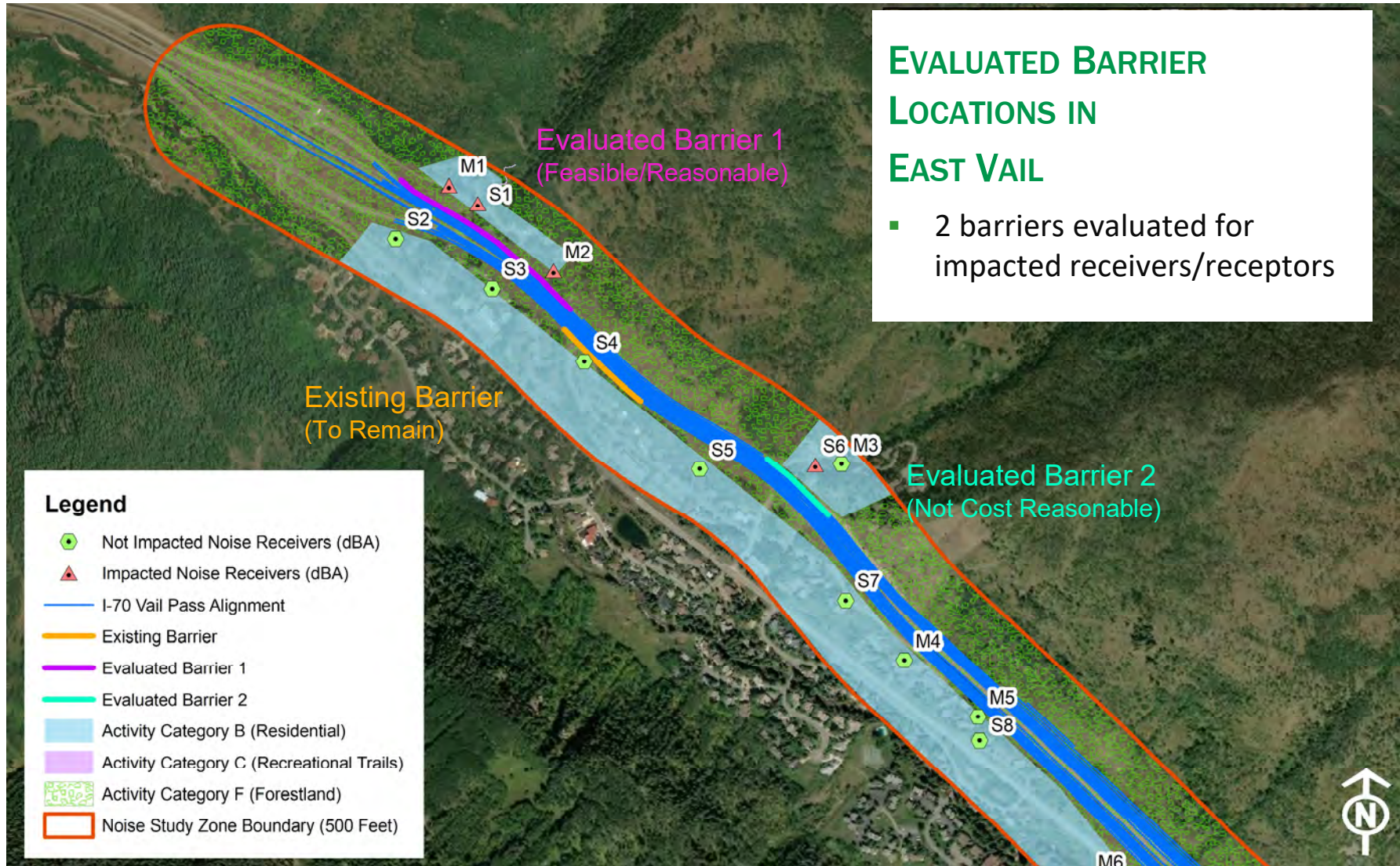
## **NOISE ABATEMENT EVALUATION METHODOLOGY**

- 5 potential barriers were evaluated, including 2 barriers in East Vail.
  - Noise walls were the only abatement evaluated.
- Barrier placement for each impacted area was considered in multiple locations.
- The location determined to be the most acoustically effective for each set of impacted receivers was then optimized for cost reasonableness criteria.





**NOISE ABATEMENT**



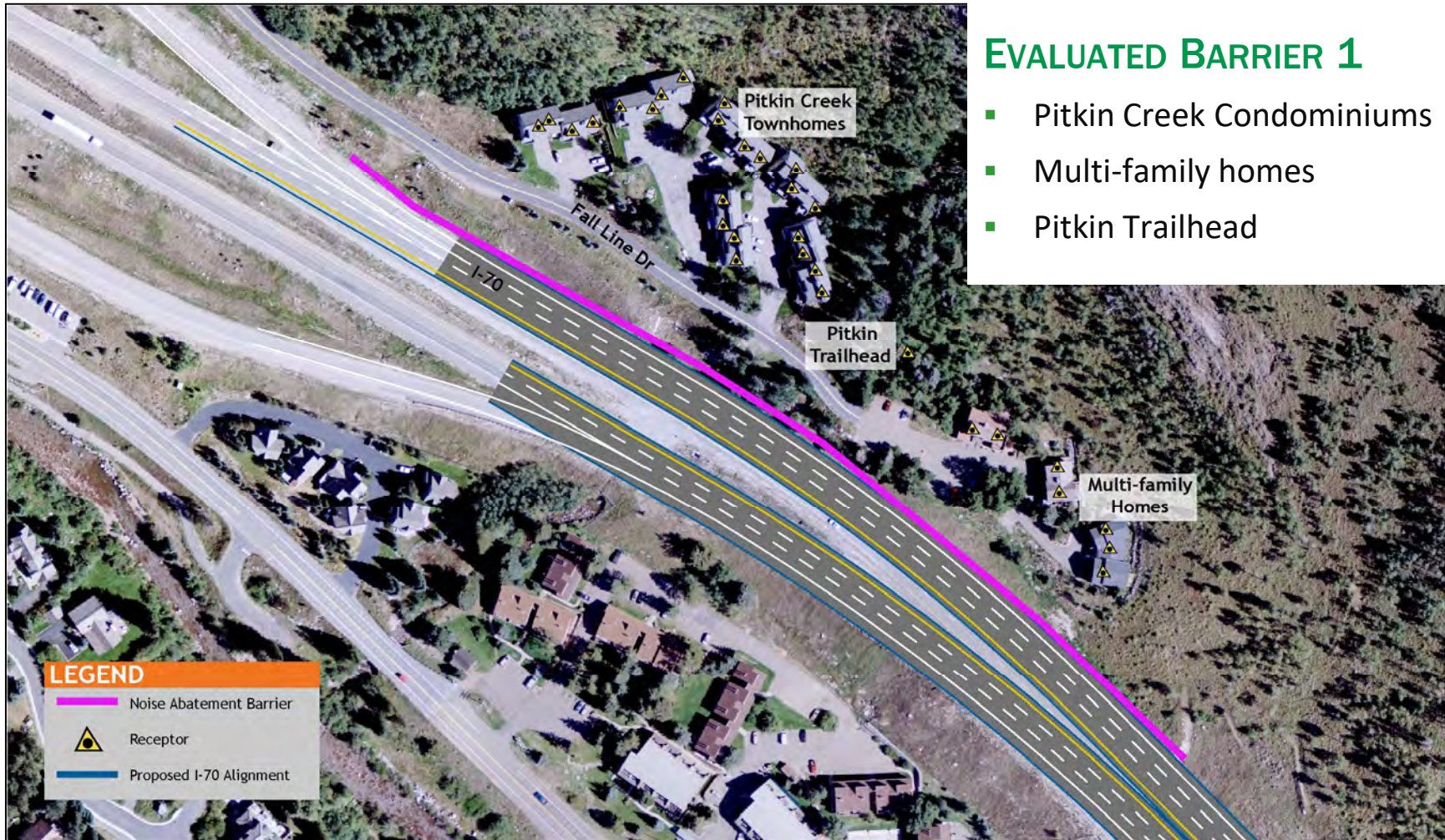




## NOISE ABATEMENT

### EVALUATED BARRIER 1

- Pitkin Creek Condominiums
- Multi-family homes
- Pitkin Trailhead

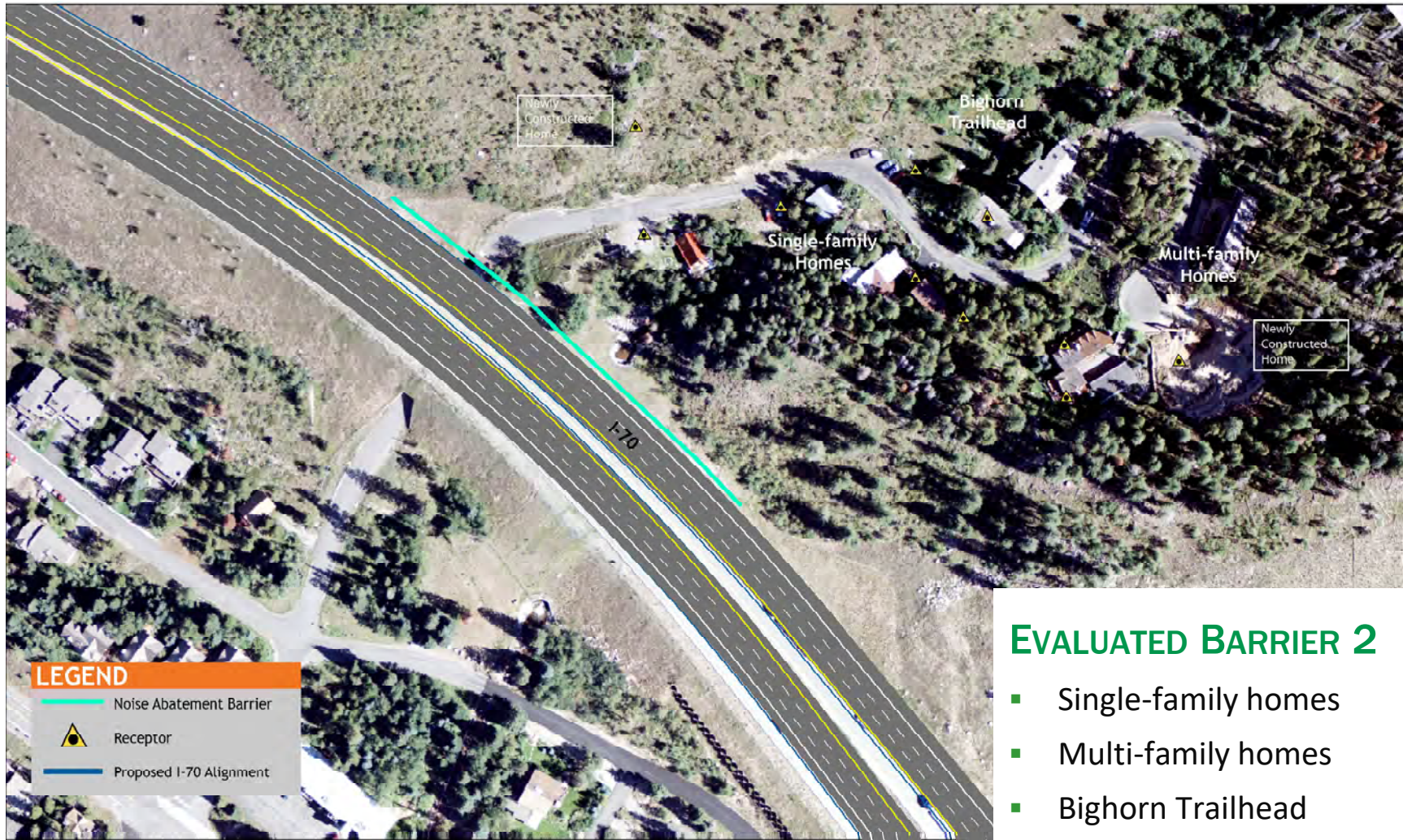


**BARRIER 1 WAS FOUND TO BE FEASIBLE AND REASONABLE**





**NOISE ABATEMENT**



**BARRIER 2 WAS FOUND TO BE FEASIBLE BUT NOT REASONABLE DUE TO COST**



**PRELIMINARY COST REASONABLENESS CALCULATIONS FOR BARRIERS  
IN EAST VAIL**

| Barrier ID                                    | Evaluated Barrier 1   | Evaluated Barrier 2      |
|---|---|--------------------------|
| Barrier Location (approximate)                | Barrier is still being optimized but has been found to be feasible and reasonable | WB EOS, MP 180.5         |
| Recommended Barrier Height & Length (feet)    |   | 20 ft high x 520 ft long |
| Barrier Area (square feet)                    |   | 10,400 ft <sup>2</sup>   |
| Unit Cost                                     |   | \$45/ft <sup>2</sup>     |
| Total Cost                                    |   | \$468,000                |
| No. Benefited Receptors                       |   | 5                        |
| Total Decibels of Benefit Provided            |   | 39.8                     |
| Average Benefit (dBA/receptor)                |   | 8.0                      |
| Cost Benefit(\$/dBA/receptor)                 |   | \$11,759                 |
| Design year Leq Range Without Abatement (dBA) |   | 61.7 to 69.5             |
| Design year Leq Range With Abatement (dBA)    |   | 52.3 to 59.9             |



**PRELIMINARY RESULTS OF NOISE ABATEMENT EVALUATION  
IN EAST VAIL**

| <b>Abatement Criteria</b>   | <b>Evaluated Barrier 1</b> | <b>Evaluated Barrier 2</b> |
|---|----------------------------|----------------------------|
| <b>Provides at least 5 dBA of noise reduction for at least one receptor?</b>                      | Yes                        | Yes                        |
| <b>Free of “fatal flaw” issues (e.g., safety, maintenance, access, drainage)?</b>                 | Yes                        | Yes                        |
| <b>Wall is 20 feet in height or less?</b>   | Yes                        | Yes                        |
| <b>Meets the minimum noise reduction design goal of at least 7 dBA for at least one receptor?</b> | Yes                        | Yes                        |
| <b>Below or equal to Cost Benefit Index (\$6,800/dBA/receptor)?</b>                               | Yes                        | No                         |
| <b>Recommended?</b>   | <b>Yes</b>                 | <b>No</b>                  |





## **PRELIMINARY NOISE ABATEMENT RECOMMENDATIONS**

- **Evaluated Barrier 1 was found to meet noise abatement criteria.** The barrier is still being optimized and will be determined by the time the Environmental Assessment undergoes public review.

A Benefited Receptor Preference Survey will be conducted to determine public support and final recommendations would be determined in the final design.

- **Evaluated Barrier 2 was not found to be cost reasonable;** therefore, will not be constructed as part of the Project, based on CDOT/FHWA Policy.
- Feasibility and reasonableness determinations may change due to changes in final project design after approval of the environmental document.



# NOISE ABATEMENT

## PRELIMINARY NOISE ABATEMENT RECOMMENDATIONS



- Construct a noise abatement wall along the north side of I-70, between I-70 and Fall Line Drive.
- The wall would provide noise reduction to 27 residences and the Pitkin trailhead
- The final noise abatement decision will be made via a receptor survey during completion of project final design.



## **NEXT STEPS**

- Gather input at this East Vail noise public meeting regarding the preliminary recommendations.
- Complete Barrier 1 optimization to determine the recommended barrier dimensions.
- Obtain FHWA and CDOT approval of Environmental Assessment recommendations.
- Details of the final recommendation (including exact length and height, exact location, and aesthetics) would be determined during final design.
- Conduct a formal benefited receptor preference survey during final design to determine public support. The majority of property owners and tenants adjacent to the noise wall need to be in favor of the wall or it will not be constructed.





## WAYS TO COMMENT

- Participate in open house portion of this meeting – talk with project team members about your questions or concerns
- Fill out a comment form – leave it tonight or mail it in later
- Project webpage: [www.codot.gov/projects/I-70-West-Vail-Auxiliary-Lanes](http://www.codot.gov/projects/I-70-West-Vail-Auxiliary-Lanes)
- Email: [cdot\\_wvailpassauxlanes@state.co.us](mailto:cdot_wvailpassauxlanes@state.co.us)