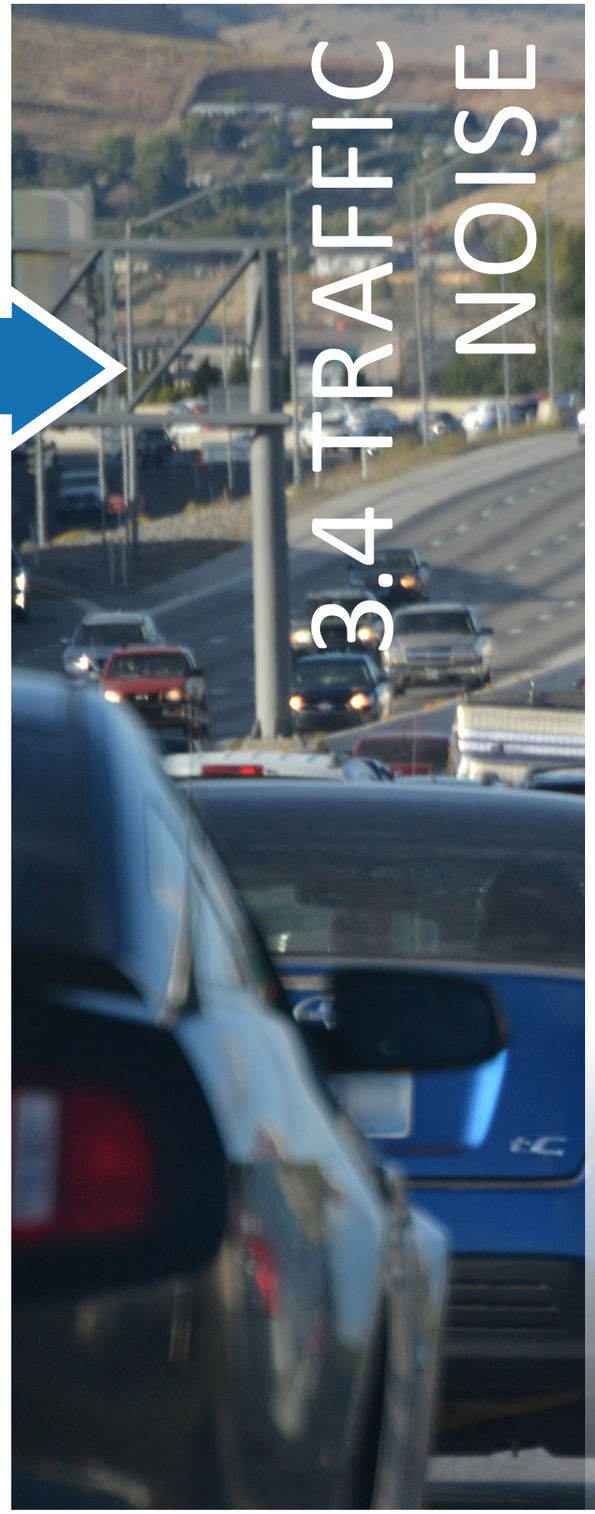


3.4 Traffic Noise

This section summarizes the traffic noise analysis NDOT completed for the project and provides the following information:

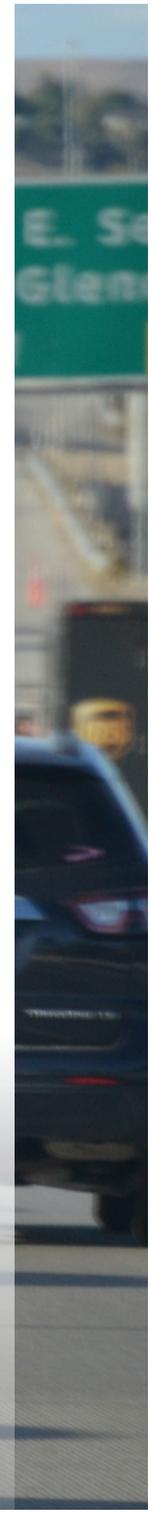
- Background information about the noise analysis completed for this project
- Assessment of existing conditions
- Anticipated impacts related to traffic noise
- Summary of the noise analysis for the Preferred Alternative
- Measures to minimize and mitigate anticipated impacts

NDOT's noise modeling for the Draft EIS compared Alternatives 1, 2, and 3 to help identify the preferred alternative. The results of this modeling are discussed in this section and described in further detail in the Spaghetti Bowl Project Highway Traffic Noise Technical Report in Appendix D.5B.

Background

The criteria for evaluating traffic noise impacts in this analysis are contained in Title 23 of the Code of Federal Regulations (CFR), Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise, in the FHWA Highway Traffic Noise Analysis and Abatement Policy Guidance (FHWA 2011), and in the NDOT Traffic and Construction Noise Abatement Policy (NDOT 2018). NDOT conducted the traffic noise analysis to evaluate the change in conditions that could result from reconstructing the study area freeway system. According to 23 CFR 772.3, all highway projects that are developed in conformance with this regulation are deemed to be in conformance with FHWA noise standards. In addition, the No Build Alternative was analyzed and compared to existing and future traffic noise levels to satisfy the National Environmental Policy Act.

Traffic noise levels were evaluated using FHWA's Traffic Noise Model (TNM) Version 2.5, which is the latest analytical method developed for highway traffic noise prediction. TNM 2.5 was used to predict design year (2040) noise levels for Alternatives 1, 2, and 3 and the No Build Alternative. NDOT also used TNM 2.5 to determine existing (2016) noise levels. Onsite noise measurements were used to validate the noise models.



3.4 TRAFFIC NOISE

NDOT identified Alternative 2 as its Preferred Alternative in the Draft EIS, and subsequently FHWA has also identified Alternative 2 as the Preferred Alternative. 23 U.S.C. 139(f)(4)(D) allows project sponsors to further develop the preferred alternative:

> At the discretion of the lead agency, the preferred alternative for a project, after being identified, may be developed to a higher level of detail than other alternatives in order to facilitate the development of mitigation measures….

Following the Draft EIS publication, NDOT updated the noise analysis and barrier analysis for the Preferred Alternative, Alternative 2, to refine impacts and mitigation measures. The updated analysis for Alternative 2 is summarized at the end of this section and includes the southbound I-580 direct-connect ramp to the Reno-Tahoe International Airport and updated crossroad traffic volumes. Spaghetti Bowl Project Preferred Alternative (Alternative 2) Highway Traffic Noise Technical Report, in Appendix D.5A, provides more information about the updated noise analysis for Alternative 2.

Appendix D.5

Spaghetti Bowl Project Preferred Alternative (Alternative 2) Highway Traffic Noise Technical Report (Appendix D.5A) documents the methodology and results of the updated analysis completed only for the Preferred Alternative (Alternative 2).

Spaghetti Bowl Project Highway Traffic Noise Technical Report (Appendix D.5B) documents the methodology and results for the noise analysis of Alternatives 1, 2, and 3. This is the same report that was an appendix to the Draft EIS.

EXISTING CONDITIONS | TRAFFIC NOISE IMPACTS | MEASURES TO MINIMIZE AND MITIGATE ADVERSE TRAFFIC NOISE IMPACTS

EXISTING CONDITIONS

"Receivers" are the properties or land uses where lower noise levels are beneficial to that location and land use, and where frequent exterior use occurs (residences, schools, parks, hospitals, cemeteries, radio/recording studios, etc.). Receivers within approximately 500 feet of the project were evaluated for traffic noise impacts under existing conditions. As noted in FHWA's *Highway Traffic Noise Analysis and Abatement Policy and Guidance*, "Highway traffic noise is not usually a serious problem for people who live more than 500 feet from heavily traveled freeways" (2017). There are 342 receivers in the study area under the existing conditions. Based on the TNM, 150 of the 342 receivers are impacted under existing conditions (includes existing noise barriers). Impacted receivers under existing conditions are defined as having noise levels that exceed the noise abatement criteria as defined in accordance with NDOT's (FHWA approved) *Traffic and Construction Noise Analysis and Abatement Policy* (2018). The preliminary receivers and modeling points are shown in the Spaghetti Bowl Project Highway Traffic Noise Technical Report in Appendix D.5B.

Traffic noise barriers currently exist within the study area. Figure 3.4-1 and 3.4-2 show where there are existing traffic noise barriers on different portions of the Spaghetti Bowl.

The view north along US 395 and Butler Street, just north of the Spaghetti Bowl. The taller wall on the right is a traffic noise barrier, and the shorter wall on the left is a retaining wall.

Figure 3.4-1A. Locations of Existing Traffic Noise Barriers (East-West)

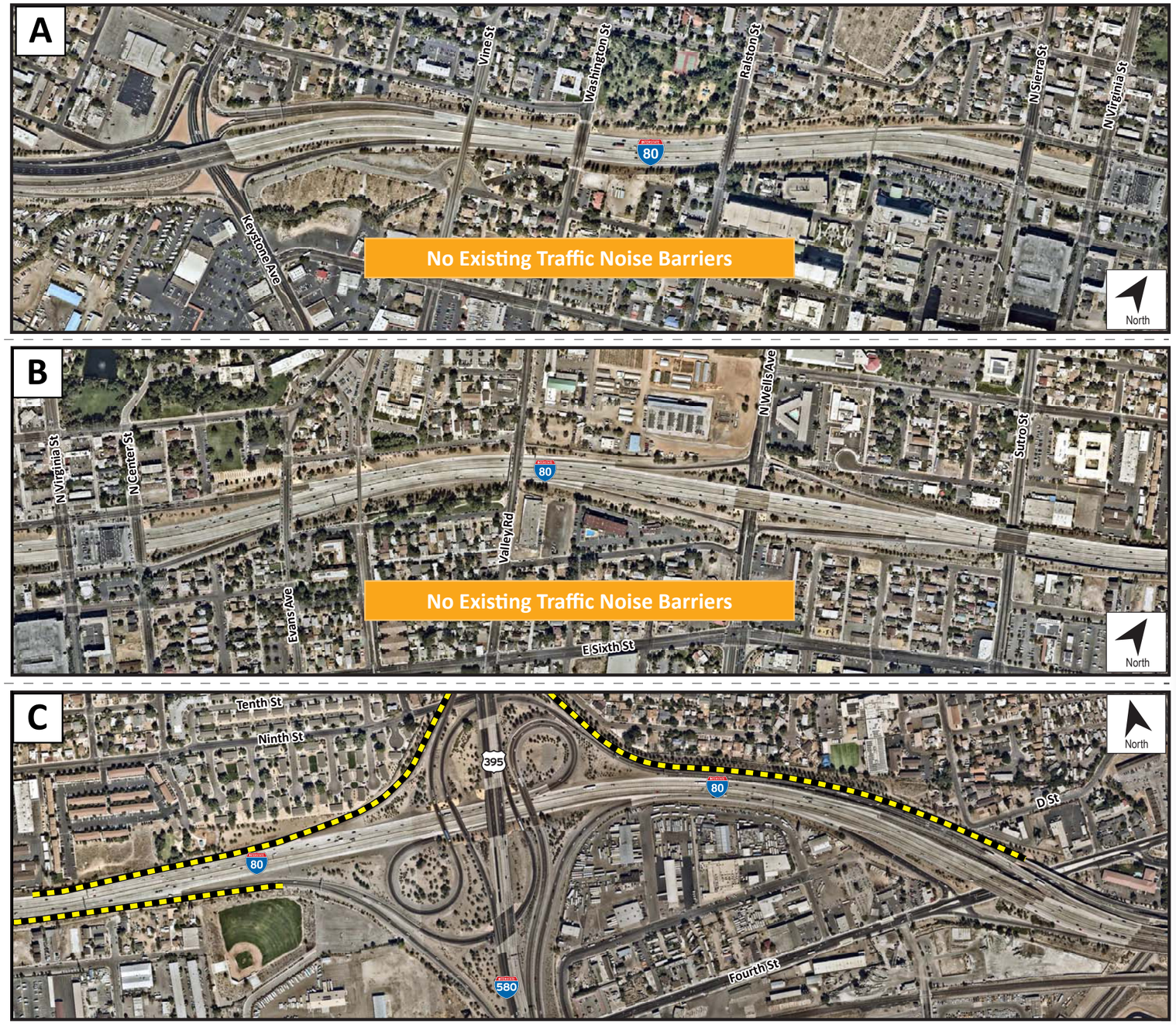


Figure 3.4-1B. Locations of Existing Traffic Noise Barriers (East-West)

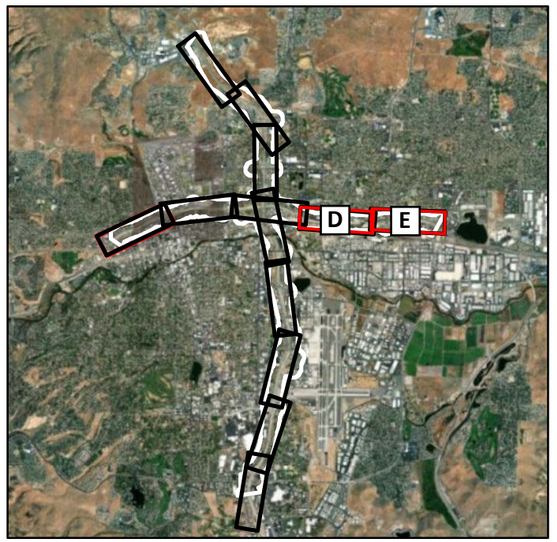


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Figure 3.4-2A. Locations of Existing Traffic Noise Barriers (North-South)

Figure 3.4-2B. Locations of Existing Traffic Noise Barriers (North-South)

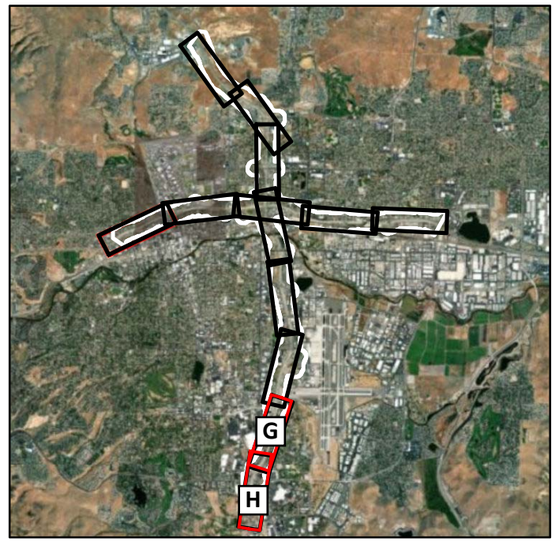
Figure 3.4-2C. Locations of Existing Traffic Noise Barriers (North-South)

Legend

Existing Traffic Noise Barrier

0 200 400 800

Scale in Feet



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TRAFFIC NOISE IMPACTS

New traffic noise impacts are due to increased traffic, and the result of alignment changes and the relocation of freeway-to-freeway ramps and freeway on- or off-ramps moving closer to receivers in some locations. The freeway widening and new ramp locations result in freeway use being located closer to receivers. This can result in increased noise levels. Alternatives 1, 2, and 3 widen existing roads or move existing roads and freeway ramps in order to improve safety and the movement of traffic. Alternatives 1, 2, and 3 were designed to avoid or minimize, to the extent practicable, impacts to the adjacent environment. As a result, the alternatives analyzed minimize impacts while maintaining the goals of the project.

Table 3.4-1 compares the traffic noise impacts of the No Build Alternative (2040) and Alternatives 1, 2, and 3. Receivers within 500 feet of the project were evaluated per FHWA guidance. Traffic noise impacts are defined as modeled noise levels for the No Build Alternative and Alternatives 1, 2, and 3 that either exceed noise abatement criteria, in this case 66 dBA by the design year of 2040 or increase by 12 dBA from existing conditions. The number of total receivers evaluated can vary from one alternative to the next, because the footprint of the alternatives is different and can include or exclude receivers based on the 500-foot study area.

Existing traffic noise barriers at the I-80/Rock Boulevard interchange

Existing traffic noise barriers at the I-80/Wells Avenue interchange

The traffic noise impacts of Alternatives 1, 2, and 3 are found in Table B-1 of the Spaghetti Bowl Project Highway Traffic Noise Technical Report in Appendix D.5B.

Table 3.4-1. Traffic Noise Impacts (2040)

Impact Category	No Build Alternative	Alternative 1	Alternative 2	Alternative 3
Number of Impacted Receivers	177	187	186	210
Construction-related Noise and Vibration	No impacts	• Dump trucks, graders, cranes, bulldozers, pile-driving equipment, and pavement construction equipment would generate noise and vibration during construction. • Replacing existing traffic noise barriers would also temporarily increase noise at nearby receivers. • Adverse effects related to construction noise and vibration are anticipated to be localized and transient. • Construction vibrations can often be perceived at levels far less than would be considered damaging to residential buildings. Only the largest equipment anticipated has the capability to produce damaging vibrations. However, vibrations rapidly decrease as they pass through soils, and vibrations are anticipated to be well below expected damage threshold limits near structures. Although vibration should not cause damage to homes and other structures, residents are encouraged to secure valuable items as normal construction activities can cause shifting of loose or precariously perched objects.		

After publishing the Draft EIS, NDOT conducted additional noise modeling on Alternative 2, the Preferred Alternative, to further assess the impacts and refine the mitigation measures. This refined analysis of Alternative 2 included the southbound I-580 airport direct-connect ramp and updated crossroad traffic volumes.

The updated Alternative 2 analysis evaluated existing (2016) noise levels to serve as a baseline condition for the noise impact assessment and design year 2040 noise levels for the Preferred Alternative. The updated noise modeling evaluated 236 receivers and modeled both 2040 AM and PM peak traffic volumes. There would be 133 impacted receivers in 2040 under the No Build Alternative, and 154 impacted receivers under Alternative 2. In some cases noise levels will go down because ramps or freeways will move farther from some receivers than they are today. The change in impacts from the Draft EIS (186) to the Final EIS (154) is the result of several factors, including change in alignment, profile elevations, and traffic distribution, each of which can increase or decrease changes in predicted noise results. In some cases a change of one decibel can change a receiver from an impact to no impact. Table 3.4-2 summarizes the updated modeled traffic noise results. Further details on individual receiver locations and impacts are provided in Attachments A and B of the Spaghetti Bowl Project Preferred Alternative (Alternative 2) Highway Traffic Noise Technical Report in Appendix D.5A.

Table 3.4-2. Preferred Alternative Updated Traffic Noise Impacts (2040)

Impact Category	No Build Alternative	Preferred Alternative PM
Number of Receivers Modeled	236	236
Number of Impacted Receivers	133	**154**
Noise Levels	41 to 77 dBA	37 to 76 dBA
Change in Noise Levels from Existing	0 to 3 dBA	-6 to 12 dBA

Note: Proposed barrier mitigation analyzes the higher impacted receivers between the proposed AM/PM design years. Mitigation first identifies whether the AM or PM is higher, then uses the appropriate AM/PM model to determine if a proposed noise barrier is reasonable or feasible. In this case, PM had the higher impacted receivers and was the model used for determining proposed noise barriers.

MEASURES TO MINIMIZE AND MITIGATE ADVERSE TRAFFIC NOISE IMPACTS

From early on in the alternatives development phase, NDOT has refined the design of Alternatives 1, 2, and 3 to avoid or minimize noise impacts while also meeting the need for the project. As illustrated in Figures 3.4-1 and 3.4.2, there are currently traffic noise barriers throughout much of the study area. Table 3.4-3 describes mitigation measures to reduce traffic noise and construction-related noise impacts, and compares the traffic noise impacts of the No Build Alternative and Alternatives 1, 2, and 3, after the implementation of mitigation.

Traffic Noise Mitigation Criteria

A traffic noise impact occurs when the modeled noise level either meets or exceeds the Noise Abatement Criteria, in this case 66 dBA by the design year of 2040, or increases by 12 dBA[1] from existing conditions.

NDOT evaluated traffic noise barriers wherever there were traffic noise impacts. To be recommended for further consideration, a traffic noise barrier must be both feasible and reasonable:

- NDOT defines **feasibility** as at least a 5-dBA reduction for 50 percent of the first (or front) row of affected receptors. (This is the minimum requirement and does not preclude achieving the noise reduction design goal under the definition of reasonableness.)
- NDOT defines **reasonableness** with three criteria:
  - **The cost-effectiveness of the traffic noise barrier:** A maximum construction cost of $50,000 (2018 U.S. dollars) is allotted per benefited receptor (i.e., dwelling) that satisfies NDOT Policy criteria (NDOT 2018). A cost of $35 per square foot (2018 U.S. dollars) of precast concrete (current NDOT standard for noise barrier material) traffic noise barrier was used in the cost calculation.
  - **The achievement of the noise reduction design goal:** NDOT has defined the traffic noise reduction design goal as 8 dBA: "Each project shall be evaluated for achieving this goal, or as close to this goal that can be attained."
  - **The points of view of the benefited property owners and residents:** Traffic noise barriers will be constructed as modeled and designed for construction unless enough benefitted receptors oppose their construction. The viewpoints of the benefited receptors will be accepted during the National Environmental Policy Act public involvement process through writing or documented in the public record during a public meeting or hearing, and before the Record of Decision.

1 Sound from highway traffic is generated primarily from a vehicle's tires, engine, and exhaust. It is commonly measured in decibels (dB). "The decibel (dB) is a logarithmic unit which expresses the ratio of the sound pressure level being measured to a standard reference level" (FHWA 2017). However, not all frequencies are detectable by the human ear; therefore, an adjustment is made to the high and low frequencies to approximate the way an average person hears traffic sounds. This adjustment is called A weighting and is expressed as "dBA."

Table 3.4-3. Mitigation Measures for Traffic Noise Impacts

Impact Category	No Build Alternative	Alternative 1	Alternative 2 (Preferred Alternative)	Alternative 3
Traffic Noise	No Mitigation	NDOT will reconstruct traffic noise barriers in all locations that meet criteria for traffic noise mitigation to equal or better acoustical benefit. NDOT will adjust the height and length of barriers to provide maximum benefit to impacted receivers. NDOT will also build new traffic noise barriers where there currently are none at locations that meet regulatory, guidance, and policy criteria (NDOT 2018). To mitigate disproportionately high and adverse environmental justice impacts, NDOT will construct screening walls in locations that currently have a traffic noise barrier but no longer meet regulatory, guidance, and policy criteria for traffic noise mitigation. These screening walls will reduce noise levels. Screening walls will be made of concrete panels or concrete masonry blocks (aka cinder block). Typically they will be 8 to 14 feet tall and have vertical steel posts to hold them in place. Screening walls will look the same as traffic noise barriers. Figures 3.4-3 and 3.4-4 illustrate the areas where traffic noise barriers are proposed for the Preferred Alternative, Alternative 2. See Attachment A of Appendix D.5B, Spaghetti Bowl Project Highway Traffic Noise Technical Report, for locations of proposed noise barriers presented in the Draft EIS. The locations, lengths, and heights for the walls may have changed since the Draft EIS because the updated analysis contained a more detailed and refined design of the Preferred Alternative, such as including the I-580 direct-connect ramp to the Reno-Tahoe International Airport and updated cross road traffic volumes. The lengths and heights for each of the traffic noise barriers and screening walls are provided in Section 5.3 of the Spaghetti Bowl Project Preferred Alternative (Alternative 2) Highway Traffic Noise Technical Report in Appendix D.5A.		
Construction-related Noise and Vibration	No Mitigation	• To reduce construction noise impacts and vibration, NDOT will require that its contractor maintain and operate motorized equipment in compliance with all local, state, and federal laws and regulations relating to noise levels. All motorized construction equipment will have mufflers installed in accordance with the equipment manufacturer's specifications or a system of equivalent noise-reducing capacity. Mufflers and exhaust systems will be maintained in good operating condition and free of leaks and holes. If feasible, new and replacement traffic noise barriers and screening walls will be constructed early in each phase to mitigate construction noise. • NDOT will minimize the use of vibratory equipment and conduct high-vibration construction during the day, where feasible and appropriate.		

Figure 3.4-3A. Preferred Alternative (Alternative 2) Traffic Noise Barriers and Screening Walls (East-West)

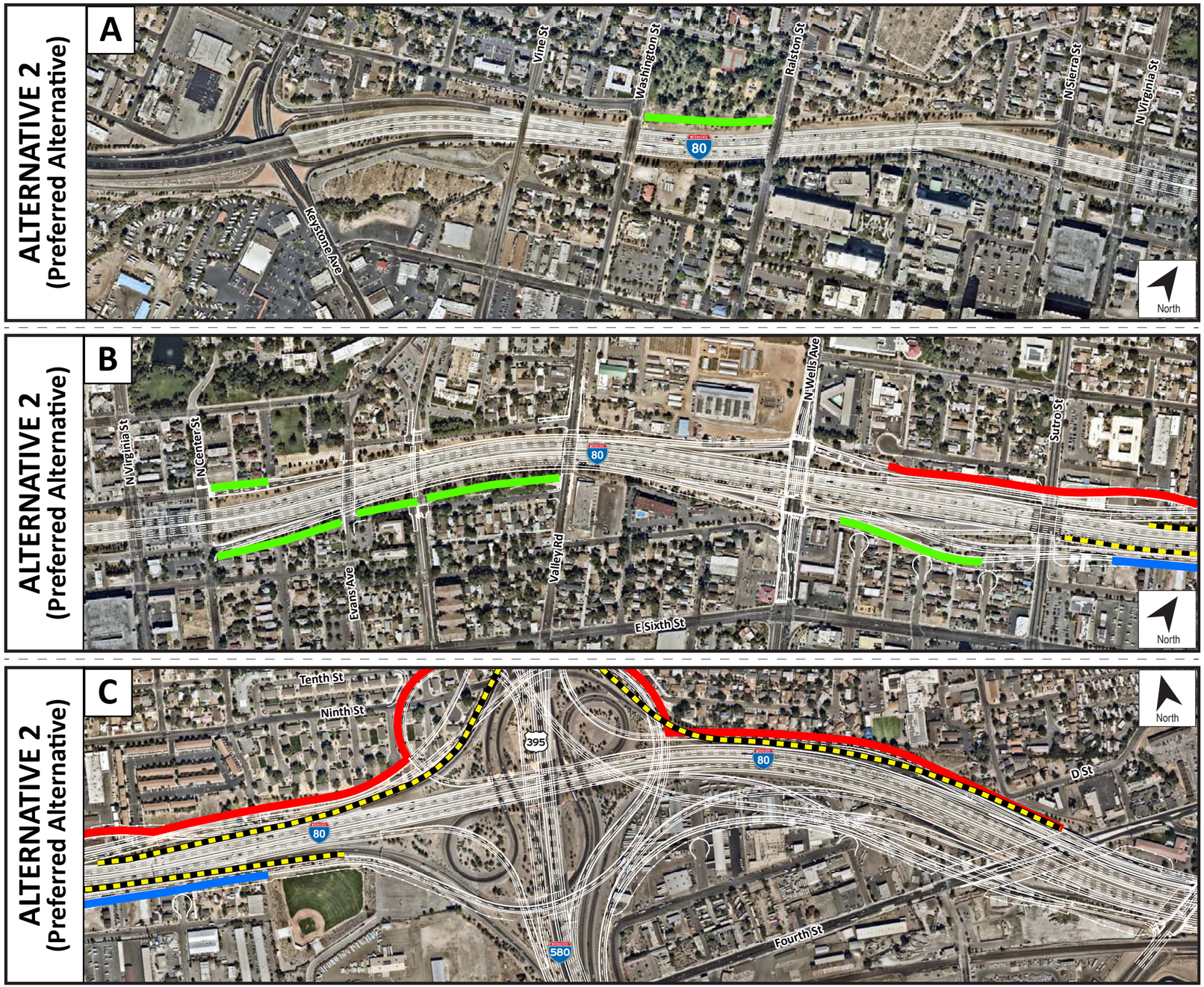
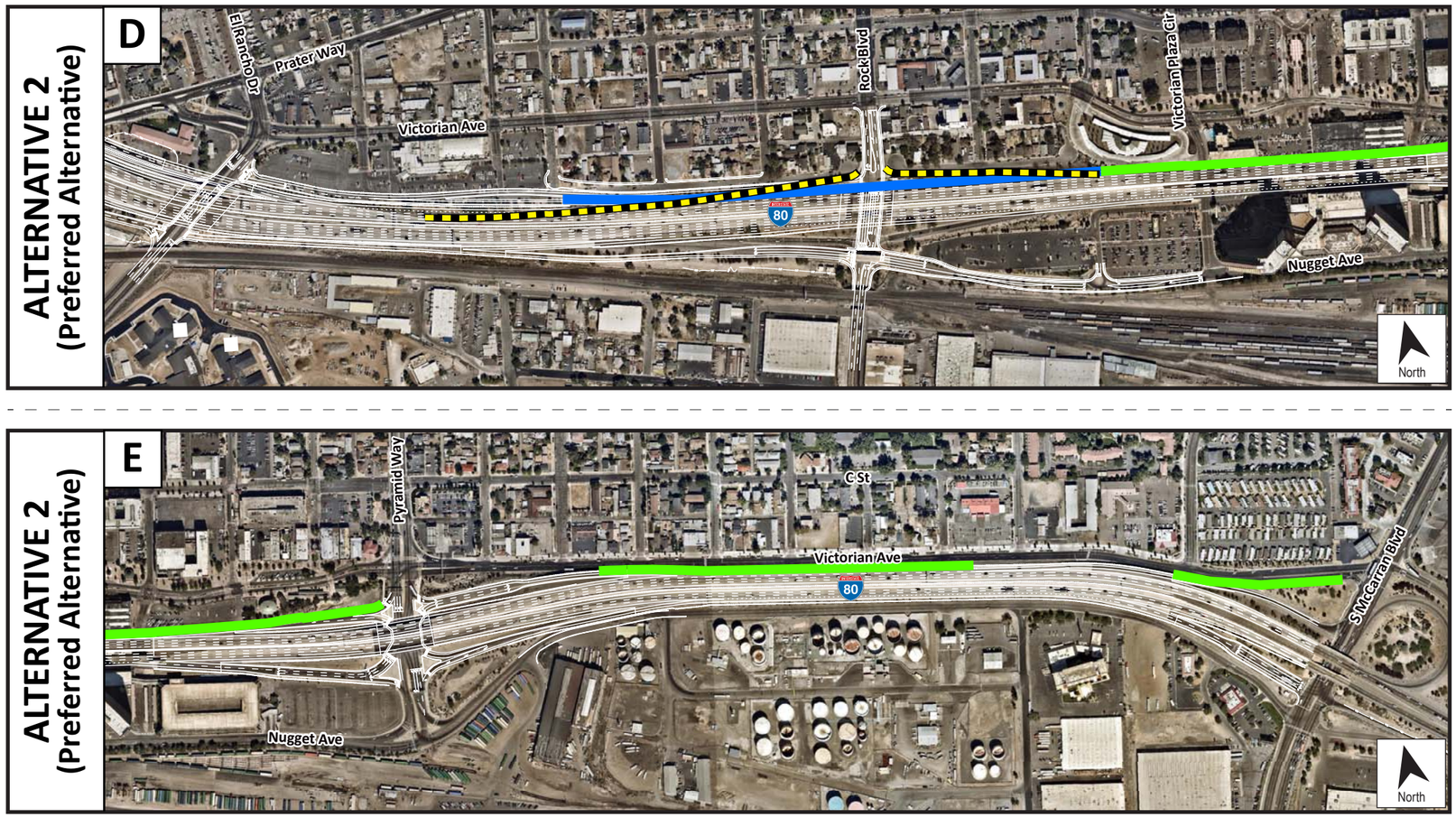


Figure 3.4-3B. Preferred Alternative (Alternative 2) Traffic Noise Barriers and Screening Walls (East-West)



Legend

- Existing Traffic Noise Barrier (To Be Removed)
- New Traffic Noise Barrier
- Replacement Traffic Noise Barrier
- Screening Wall

0 200 400 800

Scale in Feet

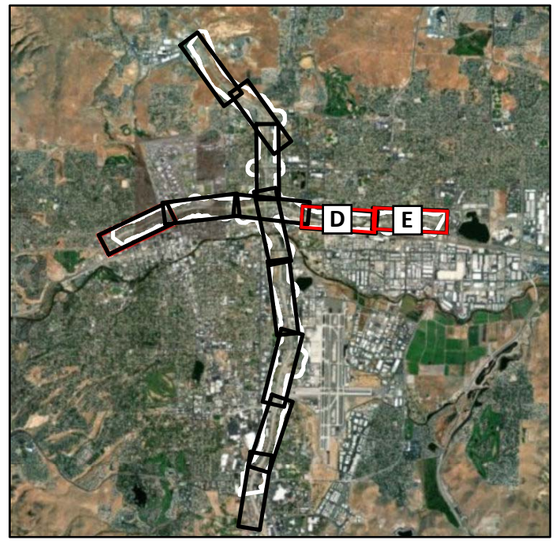


Exhibit 2 of 2

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Figure 3.4-4A. Preferred Alternative (Alternative 2) Traffic Noise Barriers and Screening Walls (North-South)

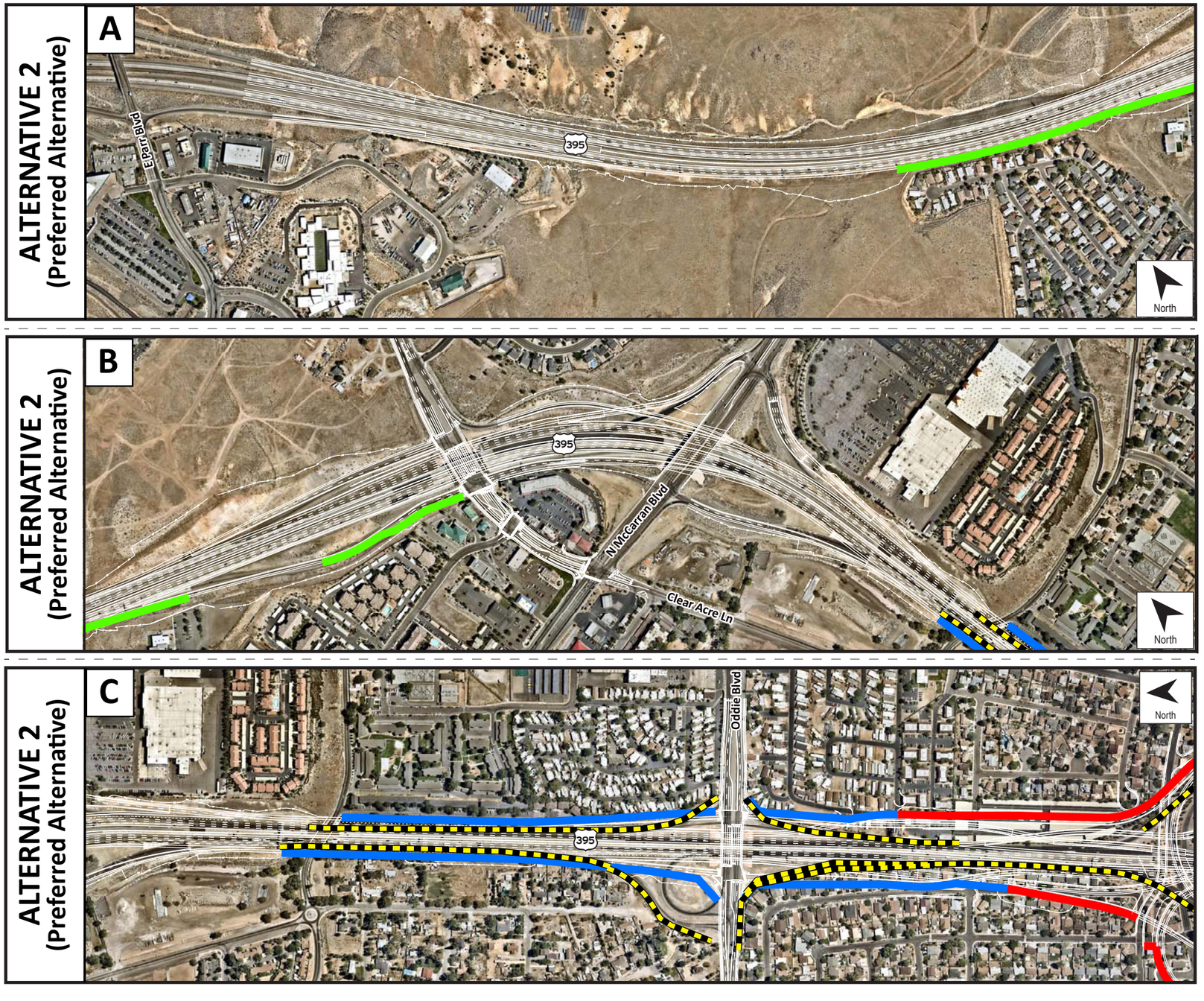
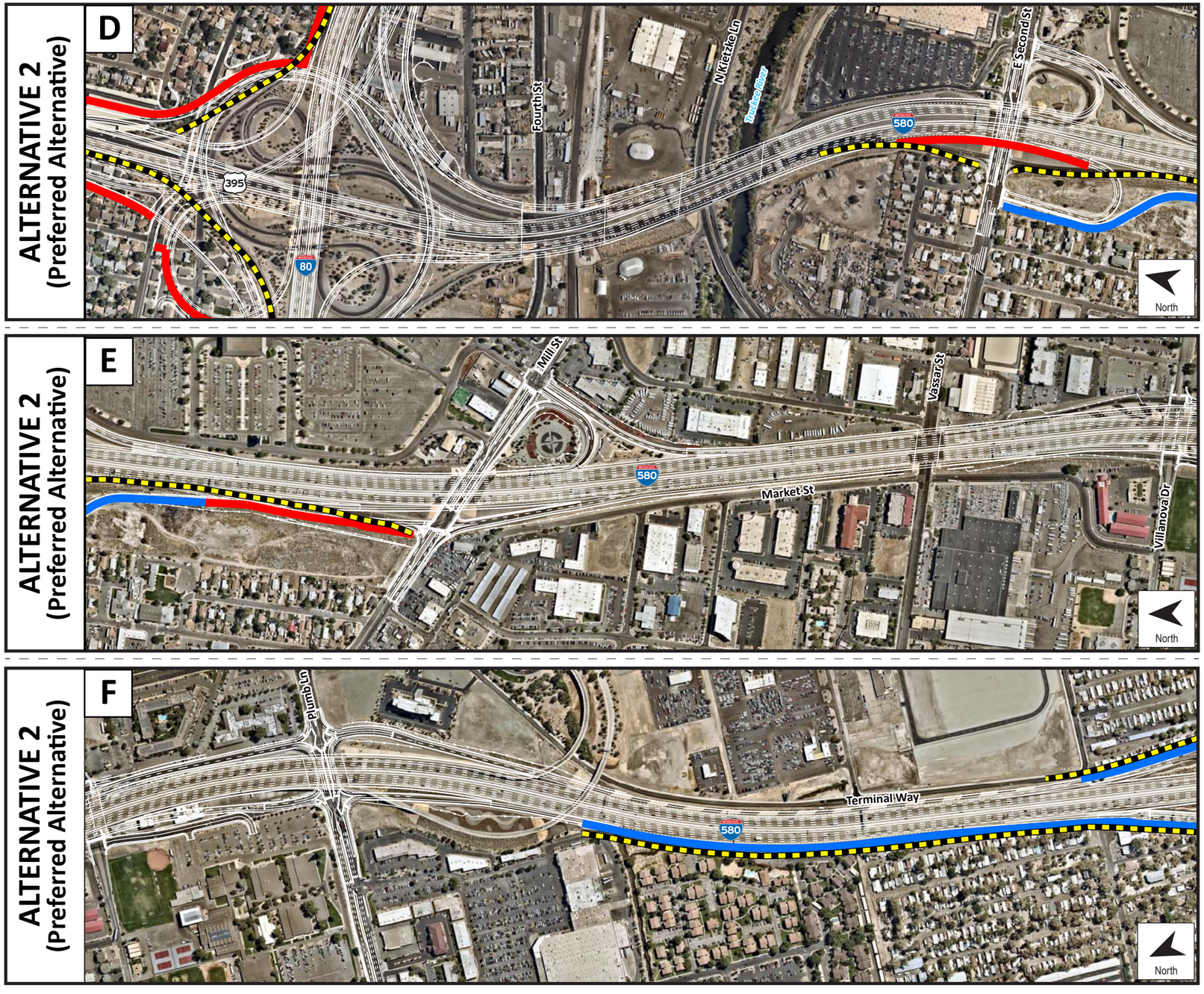


Figure 3.4-4B. Preferred Alternative (Alternative 2) Traffic Noise Barriers and Screening Walls (North-South)



Legend

- Existing Traffic Noise Barrier (To Be Removed)
- New Traffic Noise Barrier
- Replacement Traffic Noise Barrier
- Screening Wall

0 200 400 800

Scale in Feet

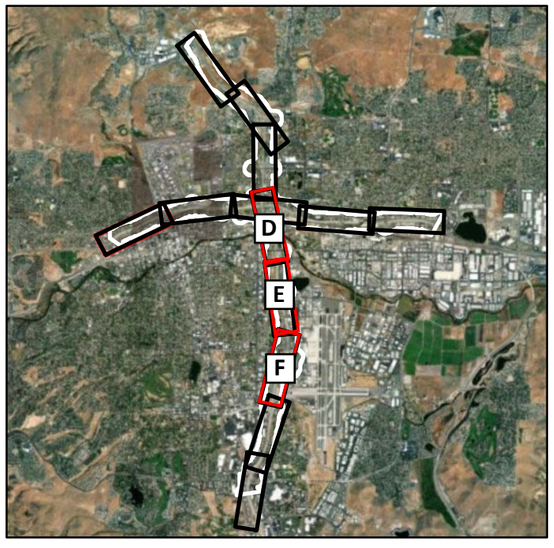


Exhibit 2 of 3

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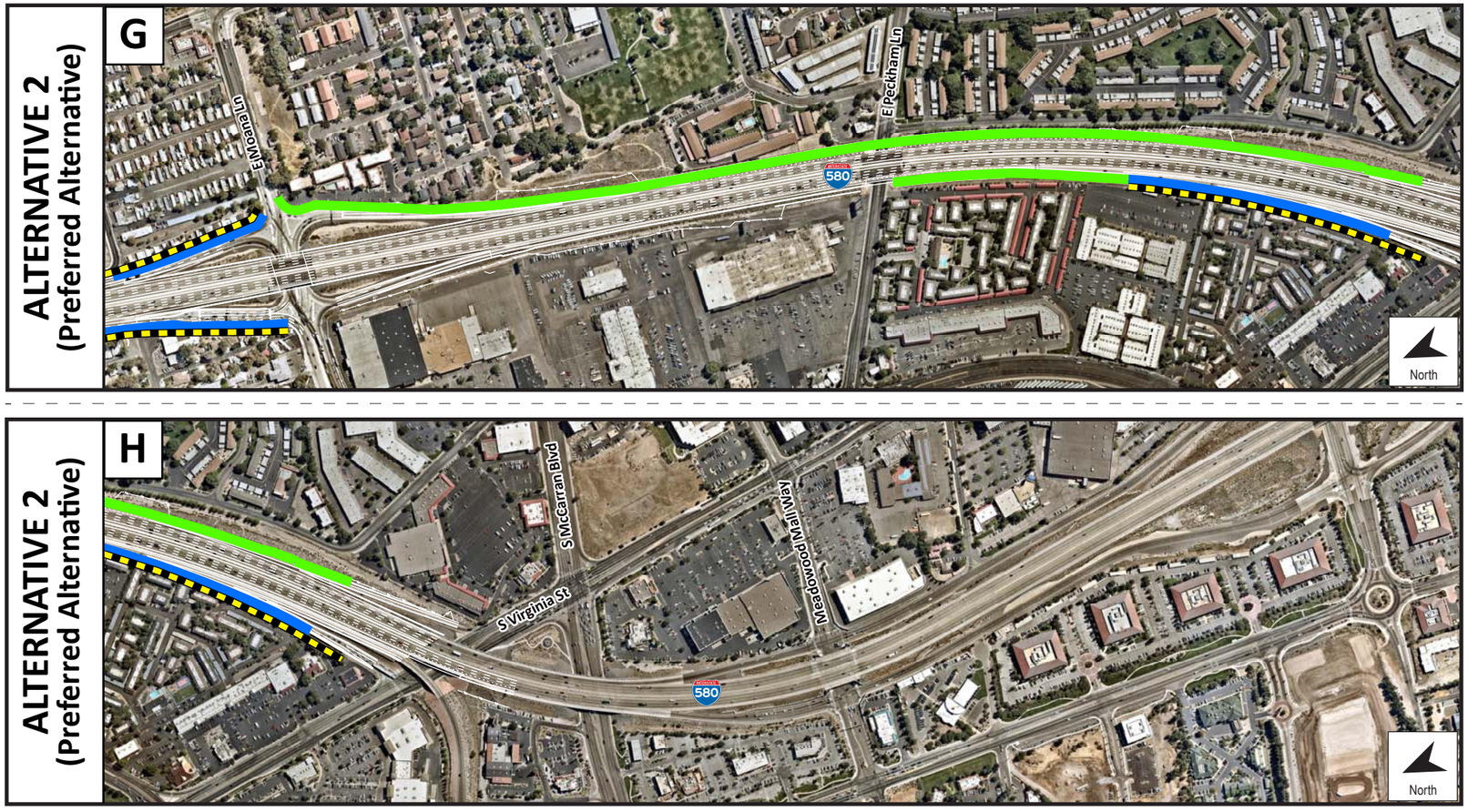
Figure 3.4-4C. Preferred Alternative (Alternative 2) Traffic Noise Barriers and Screening Walls (North-South)



Legend

- Existing Traffic Noise Barrier (To Be Removed)
- New Traffic Noise Barrier
- Replacement Traffic Noise Barrier
- Screening Wall

0 200 400 800

Scale in Feet

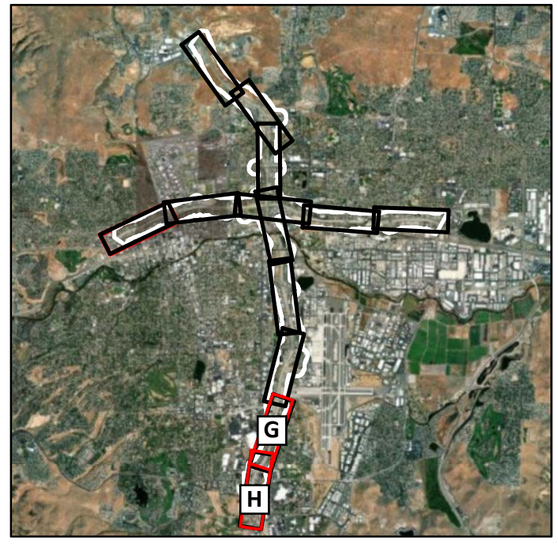


Exhibit 3 of 3

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TRAFFIC NOISE REFERENCES

Federal Highway Administration (FHWA). 2017. *Highway Traffic Noise Analysis and Abatement Policy and Guidance*. https://www.fhwa.dot.gov/environment/noise/regulations_and_guidance/polguide/polguide02.cfm. Updated August 24. Accessed June 20, 2018.

Nevada Department of Transportation (NDOT). 2018. *Traffic and Construction Noise Analysis and Abatement Policy*. https://www.nevadadot.com/Home/ShowDocument?id=14255. Effective May 15, 2018. Accessed October 23, 2018.