WEST DAVIS CORRIDOR

Noise Technical Report

in support of the
Four Lanes to S.R. 193 Re-evaluation of the Environmental Impact Statement

West Davis Corridor Project

Utah Department of Transportation

UDOT udot.utah.gov

Project No. S-R199(229)

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Acronyms and Abbreviations

CFR	Code of Federal Regulations
EIS	Environmental Impact Statement
FHWA	Federal Highway Administration
L_{eq}	equivalent noise level
LOS	level of service
ML	monitoring location
mph	miles per hour
N	no
NA	not applicable
NAC	noise-abatement criteria
RFP	Request for Proposal
S.R.	State Route
UDOT	Utah Department of Transportation
WDC	West Davis Corridor
Y	yes

1 Introduction

The purpose of this technical report is to evaluate the expected changes in noise impacts and mitigation, as documented in the West Davis Corridor (WDC) Final Environmental Impact Statement (EIS) and Record of Decision, compared to the Request for Proposal (RFP) design for the WDC in the area between State Route (S.R.) 193 and 3000 West in Syracuse, Utah.

The WDC Record of Decision was signed on September 29, 2017. A re-evaluation of the EIS that evaluated the change from a two-lane, 146-foot cross-section to a four-lane, 250-foot cross-section between S.R. 193 and 3000 West in Syracuse, Utah, was prepared in October 2019. This report evaluates the traffic-generated noise impacts from this change. More details about this change are described in Section 2, Project Description, of this report.

This noise analysis was prepared in accordance with the Utah Department of Transportation's (UDOT) Noise Abatement Policy, last revised June 15, 2017, which is consistent with federal regulation 23 Code of Federal Regulations (CFR) Part 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, and Utah Administrative Code Rule R930-3, *Highway Noise Abatement*.

2 Project Description

The project area for this report is the area along the WDC from 3000 West to S.R. 193 (about 400 South) in Syracuse, Utah.

In the WDC Final EIS, the design of the Preferred Alternative between 3000 West and S.R. 193 was a two-lane highway with a grade-separated crossing of 700 South (WDC over 700 South) and no intersection at S.R. 193. The design of the Refined Selected Alternative evaluated in this report includes the WDC RFP design between 3000 West and S.R. 193 in Syracuse, Utah. In this area, the WDC RFP design includes a four-lane highway with a grade-separated crossing of 700 South (WDC over 700 South) and an at-grade intersection for WDC at S.R. 193. The changes with the Refined Selected Alternative are the addition of two lanes of new highway between S.R. 193 and 3000 West.

Applicability

The Refined Selected Alternative is new highway construction. Therefore, this project is a Type 1 project that requires considering noise-abatement measures.

What is a Type 1 project?

According to UDOT's Noise Abatement Policy, a Type 1 project is a project that alters the horizontal or vertical alignment of a road or increases the number of through travel lanes.

UDOT evaluated noise impacts using noise models and methodologies approved by the Federal Highway Administration (FHWA) and UDOT (*Noise Abatement*, UDOT 08A2-01, revised June 15, 2017). Noise impacts were identified and evaluated at residential and other locations (for example, schools and recreation sites) within about 800 feet from the nearest travel lane using traffic volumes at a level of service (LOS) C to represent the worst-case noise conditions while traffic is operating at uncongested, free-flow speeds of 65 miles per hour (mph) on the WDC, 45 mph on the on and off ramps, and 45 mph on arterial roads that cross the WDC.

3 Characteristics of Noise

Sound travels through the air as waves of minute air-pressure fluctuations caused by vibration. In general, sound waves travel away from the noise source as an expanding spherical surface. As a result, the energy contained in a sound wave is spread over an increasing area as it travels away from the source. This results in a decrease in loudness at greater distances from the noise source.

Sound-level meters measure the actual pressure fluctuations caused by sound waves and record separate measurements for different sound frequency ranges. The decibel (dB) scale used to describe sound is a logarithmic scale that accounts for the large range of sound-pressure levels in the environment. Most sounds consist of a broad range of sound frequencies. Several frequency-weighting schemes have been used to develop composite decibel scales that approximate the way the human ear responds to sound levels. The A-weighted decibel (dBA) scale most closely approximates the way the human ear hears sounds and is the most widely used scale in assessing traffic-related noise impacts. Typical A-weighted noise levels for various types of sound sources are summarized in Table 1.

Varying noise levels are often described in terms of the equivalent noise level (L_{eq}). Equivalent noise levels are used to develop single-value descriptions of average noise exposure over stated periods of time (for example, 1 hour) and are generally based on A-weighted sound-level measurements.

The logarithmic nature of decibel scales is such that individual decibel ratings for different noise sources cannot be added directly to give the noise level for the combined noise source. For example, two noise sources that produce equal decibel ratings at a given location will produce a combined noise level that is 3 dBA greater than either sound alone. When two noise sources differ by 10 dBA, the combined noise level will be 0.4 dBA greater than the louder source alone.

People generally perceive a 10-dBA increase in a noise source as a doubling of loudness. For example, a 70-dBA sound will be perceived by an average person as twice as loud as a 60-dBA sound. People generally cannot detect a 1-to-2-dBA increase in noise levels. Under ideal listening conditions, differences of 2 or 3 dBA can be detected by some people. A 5-dBA change would probably be perceived by most people under normal listening conditions.

When distance is the only factor considered, sound levels from isolated point sources of noise typically decrease by about 6 dBA for every doubling of distance from the noise source. When the noise source is a continuous line (for example, vehicle traffic on a highway), noise levels decrease by about 3 dBA for every doubling of distance away from the source.

Table 1. Weighted Noise Levels and Human Response

Sound Source	dBA[a]	Response Descriptor
Carrier deck jet operation	140	Limit of amplified speech
	130	Painfully loud
Jet takeoff (200 feet) Auto horn (3 feet)	120	Threshold of feeling and pain
Riveting machine Jet takeoff (2,000 feet)	110	
Shout (0.5 foot) New York subway station	100	Very annoying
Heavy truck (50 feet) Pneumatic drill (50 feet)	90	Hearing damage (8-hour exposure)
Passenger train (100 feet) Helicopter (in-flight, 500 feet) Freight train (50 feet)	80	Annoying
Freeway traffic (50 feet)	70	Intrusive
Air conditioning unit (20 feet) Light auto traffic (50 feet)	60	
Normal speech (15 feet)	50	Quiet
Living room, bedroom, library	40	
Soft whisper (15 feet)	30	Very quiet
Broadcasting studio	20	
	10	Just audible
	0	Threshold of hearing

Source: CEQ 1970

[a] Typical A-weighted noise levels taken with a sound-level meter and expressed as decibels on the "A" scale. The "A" scale approximates the frequency response of the human ear.

Noise levels at different distances can also be affected by factors other than the distance from the noise source. Topographic features and structural barriers that absorb, reflect, or scatter sound waves can increase or decrease noise levels. Atmospheric conditions (wind speed and direction, humidity levels, and temperatures) can also affect the degree to which sound is attenuated over distance.

4 Regulatory Setting

The federal regulation that FHWA uses to assess noise impacts is 23 CFR Part 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise*. This regulation was most recently updated on July 13, 2010. Utah Administrative Code Rule R930-3, *Highway Noise Abatement*, and UDOT's Noise Abatement Policy 08A2-01, revised June 15, 2017, establish UDOT's noise impact and abatement policies and procedures, which are compliant with 23 CFR Part 772.

Noise-abatement criteria (NAC) are used to define the noise levels that are considered an impact (in hourly A-weighted sound-level decibels) for each land use activity category. UDOT's Noise Abatement Policy states that a traffic noise impact occurs when either (1) the future worst-case noise level is equal to or greater than the UDOT NAC for specified land use activity categories or (2) the future worst-case noise level is greater than or equal to an increase of 10 dBA over the existing noise level (substantial increase).

The UDOT NAC are summarized in Table 2.

Table 2. UDOT's Noise-abatement Criteria

Activity Category	L_{eq} Noise Levels (dBA)	Description of Activity Category
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	66 (exterior)	Residential.
C	66 (exterior)	Active sports areas, amphitheaters, 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, recreation 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 room, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	71 (exterior)	Hotels, motels, offices, restaurants/bars, and other undeveloped lands, properties, or activities not included in categories A–D or F.
F	—	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	—	Undeveloped lands that are not permitted.

Source: UDOT 2017

5 Affected Environment

The noise study area (see Figure 1) includes parts of Syracuse, Utah, within an 800-foot buffer from the nearest travel lane of WDC from S.R. 193 (about 400 South) to 3000 West.

The project corridor is a mix of undeveloped land, residential developments, and recreational properties (golf course and park). The predominant source of existing noise in the noise study area is automobile and truck traffic on the existing 700 South, 3000 West, and residential roads.

5.1 Noise Monitoring

Existing noise levels in the noise study area were determined during the FEIS process by taking short-term (15-minute) sound-level measurements at four locations in this portion of the noise study area with a Larson-Davis model 824 sound-level meter. Noise-measurement locations were selected to represent existing residential developments or other areas where people could be exposed to traffic noise for extended periods. Noise-monitoring locations (ML) are shown in Figure 1, and the associated measured noise levels are listed in Table 3.

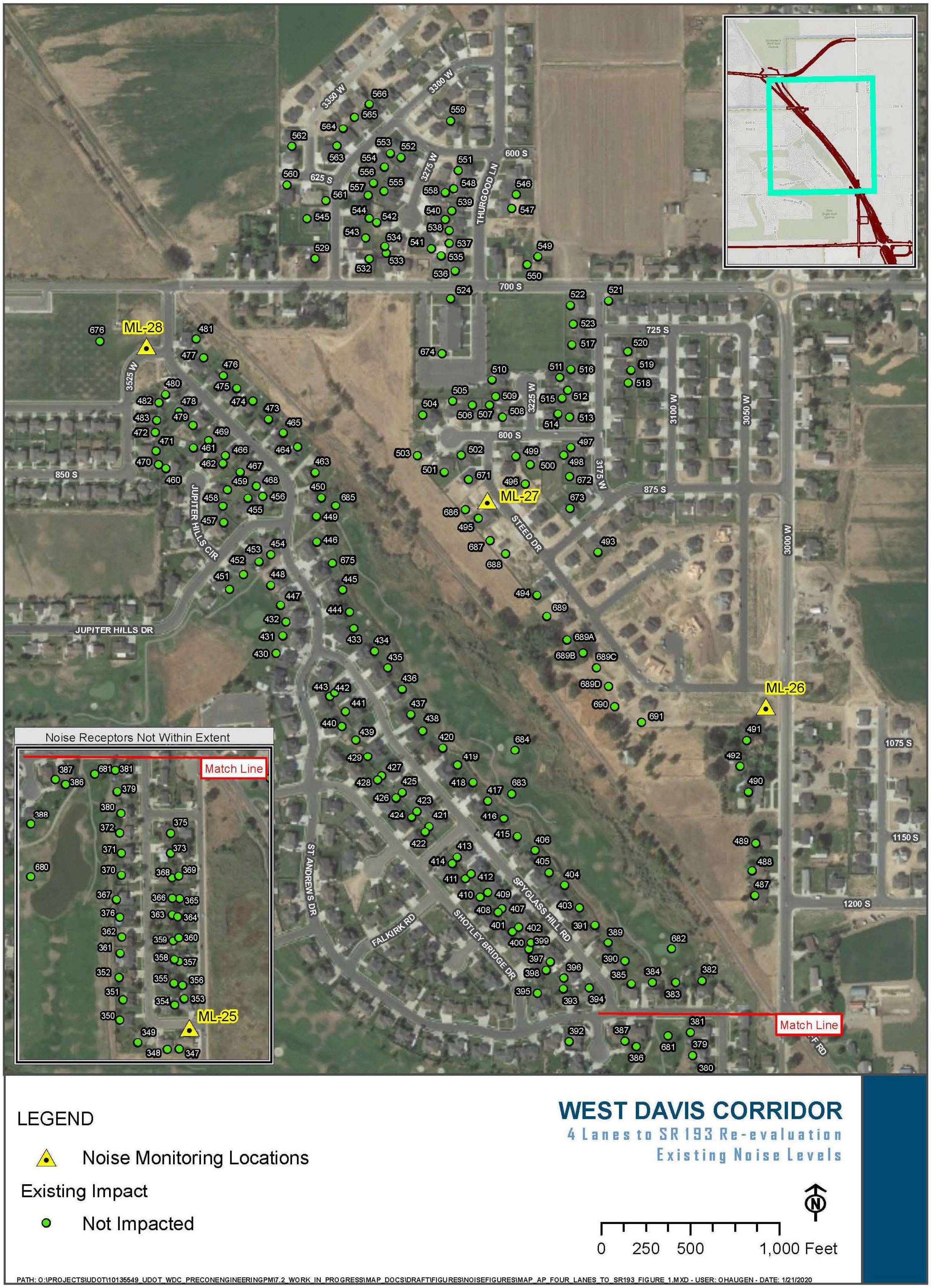
Table 3. Measured Noise Levels in the Noise Study Area

Monitoring Location	Address	Activity Category and Noise Level (dBA L_{eq})[a]	Measured Noise Level (dBA L_{eq}, rounded)
ML-25	South of 3000 West and 1525 South, Syracuse	B	65
ML-26	3000 West, north of 1200 South, Syracuse	B	62
ML-27	800 South, west of 3000 West, Syracuse	B	49
ML-28	Intersection of St. Andrew's Drive and 3525 South, Syracuse	B	53

[a] For descriptions of the activity categories, see Table 2, UDOT's Noise-abatement Criteria, above.

Measured noise levels were used to characterize the existing noise environment. Measured noise levels in the noise study area ranged from 49 to 65 dBA depending on the proximity of the monitoring location to noise sources such as local traffic on 700 South, 3000 West, and the nearby residential streets. As a comparison, typical noise levels range from 35 to 50 dBA in rural and agricultural areas, 50 to 65 dBA in suburban to urban areas, and 65 to 75 dBA in downtown urban areas.

Figure 1. Existing Noise Receptor Map



5.2 Existing Noise Levels

The primary source of existing noise in the noise study area is automobile and truck traffic on 700 South, 3000 West, and the nearby residential streets. Existing traffic noise levels for receptors in the noise study area were estimated based on measurements of existing noise levels taken at various locations in the study area. Under existing conditions, no receptors exceeded the NAC of 66 dBA. The locations of those receptors are shown above in Figure 1, Existing Noise Receptor Map.

The noise model developed for the existing conditions scenario included 233 receptors (representing 223 individual dwelling units, 1 church [with two receptors], and 8 recreation sites) throughout the noise study area. With the Refined Selected Alternative, UDOT would acquire 14 residential properties located near 3000 West or 700 South. Properties to be acquired will be demolished and were not included as receptors in the existing conditions or in the noise analysis for the Refined Selected Alternative's build scenario.

Traffic-related noise impacts with the Refined Selected Alternative were estimated with FHWA's Traffic Noise Model version 2.5 based on the proposed roadway design as shown in Figure 2, Build Scenario Noise Receptor Map, on page 14. The modeled roadway included the proposed WDC improvements between 3000 West and S.R. 193. Roadway links were modeled in 100-foot increments to provide a high degree of accuracy in the model output. Traffic volumes used in the model were based on LOS C volumes for the WDC as provided by UDOT, with traffic on the WDC operating at 65 mph.

Overall, noise levels with the Refined Selected Alternative would range from 54 to 72 dBA compared to the existing conditions of 49 to 65 dBA.

6 Expected Impacts with the Refined Selected Alternative

With the Refined Selected Alternative, 90 receptors (representing 86 dwelling units and 4 recreation sites) would have traffic noise impacts; that is, they would approach, exceed, or substantially exceed (≥ 10-dBA increase over existing noise levels) the NAC as defined in Table 2. The locations of the receptors that would approach, exceed, or substantially exceed the NAC are shown in Figure 2, Build Scenario Noise Receptor Map, on page 14.

7 Summary of Existing and Expected Noise Levels

Table 4 summarizes the modeled existing and Refined Selected Alternative build scenario noise levels at receptors in the noise study area. Shaded cells indicate impacts with the Refined Selected Alternative. For receptor locations, refer to Figure 1, Existing Noise Receptor Map, and Figure 2, Build Scenario Noise Receptor Map.

Table 4. Modeled Existing and Refined Selected Alternative Noise Levels in the Noise Study Area

Receptor[a]	Activity Category	UDOT NAC L_{eq}(h)	Existing		With Refined Selected Alternative		
			Existing Noise Levels (dBA)	Existing Impact?	Refined Selected Alternative Noise Levels (dBA)	≥ UDOT NAC?	≥ 10 dBA Increase over Existing Noise Level?
347	B	66	62	N	61	N	N
348	B	66	62	N	60	N	N
349	B	66	58	N	59	N	N
350	B	66	58	N	58	N	N
351	B	66	62	N	56	N	N
352	B	66	58	N	56	N	N
353	B	66	62	N	60	N	N
354	B	66	62	N	61	N	N
355	B	66	62	N	62	N	N
356	B	66	62	N	60	N	N
357	B	66	62	N	61	N	N
358	B	66	62	N	61	N	N
359	B	66	62	N	62	N	N
360	B	66	62	N	61	N	N
361	B	66	58	N	57	N	N
362	B	66	58	N	57	N	N
363	B	66	62	N	63	N	N
364	B	66	62	N	62	N	N
365	B	66	62	N	62	N	N
366	B	66	62	N	63	N	N
367	B	66	58	N	58	N	N
368	B	66	62	N	64	N	N
369	B	66	62	N	64	N	N
370	B	66	58	N	58	N	N
371	B	66	58	N	59	N	N
372	B	66	58	N	60	N	N
373	B	66	62	N	65	N	N
375	B	66	62	N	65	N	N
376	B	66	58	N	57	N	N
379	B	66	58	N	61	N	N
380	B	66	58	N	61	N	N
381	B	66	58	N	63	N	N
382	B	66	58	N	64	N	N
383	B	66	57	N	64	N	N
384	B	66	56	N	63	N	N
385	B	66	55	N	62	N	N
386	B	66	55	N	61	N	N

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Table 4. Modeled Existing and Refined Selected Alternative Noise Levels in the Noise Study Area

Receptor[a]	Activity Category	UDOT NAC L_{eq}(h)	Existing		With Refined Selected Alternative		
			Existing Noise Levels (dBA)	Existing Impact?	Refined Selected Alternative Noise Levels (dBA)	≥ UDOT NAC?	≥ 10 dBA Increase over Existing Noise Level?
387	B	66	55	N	60	N	N
388	B	66	55	N	58	N	N
389	B	66	55	N	63	N	N
390	B	66	55	N	63	N	N
391	B	66	54	N	63	N	N
392	B	66	57	N	58	N	N
393	B	66	57	N	58	N	N
394	B	66	55	N	60	N	N
395	B	66	53	N	57	N	N
396	B	66	57	N	58	N	N
397	B	66	53	N	57	N	N
398	B	66	53	N	58	N	N
399	B	66	53	N	58	N	N
400	B	66	53	N	58	N	N
401	B	66	53	N	58	N	N
402	B	66	50	N	57	N	N
403	B	66	53	N	62	N	N
404	B	66	52	N	**62**	N	**Y**
405	B	66	51	N	**62**	N	**Y**
406	B	66	50	N	**61**	N	**Y**
407	B	66	49	N	57	N	N
408	B	66	49	N	57	N	N
409	B	66	49	N	56	N	N
410	B	66	49	N	57	N	N
411	B	66	49	N	56	N	N
412	B	66	50	N	55	N	N
413	B	66	50	N	55	N	N
414	B	66	49	N	57	N	N
415	B	66	50	N	**60**	N	**Y**
416	B	66	50	N	**60**	N	**Y**
417	B	66	49	N	**60**	N	**Y**
418	B	66	49	N	**60**	N	**Y**
419	B	66	49	N	**60**	N	**Y**
420	B	66	49	N	**60**	N	**Y**
421	B	66	49	N	55	N	N
422	B	66	49	N	55	N	N
423	B	66	49	N	55	N	N
424	B	66	49	N	55	N	N
425	B	66	49	N	54	N	N
426	B	66	49	N	55	N	N
427	B	66	49	N	55	N	N
428	B	66	49	N	56	N	N
429	B	66	49	N	55	N	N
430	B	66	49	N	56	N	N
431	B	66	49	N	57	N	N

(*continued on next page*)

Table 4. Modeled Existing and Refined Selected Alternative Noise Levels in the Noise Study Area

Receptor[a]	Activity Category	UDOT NAC L_{eq}(h)	Existing		With Refined Selected Alternative		
			Existing Noise Levels (dBA)	Existing Impact?	Refined Selected Alternative Noise Levels (dBA)	≥ UDOT NAC?	≥ 10 dBA Increase over Existing Noise Level?
432	B	66	49	N	56	N	N
433	B	66	49	N	**61**	N	**Y**
434	B	66	49	N	**60**	N	**Y**
435	B	66	49	N	**60**	N	**Y**
436	B	66	49	N	**60**	N	**Y**
437	B	66	49	N	**60**	N	**Y**
438	B	66	49	N	**60**	N	**Y**
439	B	66	49	N	55	N	N
440	B	66	49	N	57	N	N
441	B	66	49	N	55	N	N
442	B	66	49	N	56	N	N
443	B	66	49	N	56	N	N
444	B	66	49	N	**61**	N	**Y**
445	B	66	49	N	**62**	N	**Y**
446	B	66	49	N	**63**	N	**Y**
447	B	66	49	N	57	N	N
448	B	66	49	N	58	N	N
449	B	66	49	N	**65**	N	**Y**
450	B	66	49	N	**65**	N	**Y**
451	B	66	49	N	**59**	N	**Y**
452	B	66	49	N	**60**	N	**Y**
453	B	66	49	N	**61**	N	**Y**
454	B	66	49	N	**60**	N	**Y**
455	B	66	49	N	**62**	N	**Y**
456	B	66	49	N	**62**	N	**Y**
457	B	66	49	N	**61**	N	**Y**
458	B	66	49	N	**62**	N	**Y**
459	B	66	49	N	**62**	N	**Y**
460	B	66	50	N	**61**	N	**Y**
461	B	66	50	N	**63**	N	**Y**
462	B	66	49	N	**63**	N	**Y**
463	B	66	49	N	**66**	N	**Y**
464	B	66	50	N	**65**	N	**Y**
465	B	66	50	N	**64**	N	**Y**
466	B	66	50	N	**61**	N	**Y**
467	B	66	49	N	**61**	N	**Y**
468	B	66	49	N	**61**	N	**Y**
469	B	66	50	N	**61**	N	**Y**
470	B	66	50	N	**61**	N	**Y**
471	B	66	50	N	**62**	N	**Y**
472	B	66	51	N	**62**	N	**Y**
473	B	66	51	N	**64**	N	**Y**
474	B	66	52	N	**64**	N	**Y**
475	B	66	52	N	**64**	N	**Y**

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Table 4. Modeled Existing and Refined Selected Alternative Noise Levels in the Noise Study Area

Receptor[a]	Activity Category	UDOT NAC L_{eq}(h)	Existing		With Refined Selected Alternative		
			Existing Noise Levels (dBA)	Existing Impact?	Refined Selected Alternative Noise Levels (dBA)	≥ UDOT NAC?	≥ 10 dBA Increase over Existing Noise Level?
476	B	66	52	N	**64**	N	**Y**
477	B	66	53	N	**64**	N	**Y**
478	B	66	52	N	**62**	N	**Y**
479	B	66	51	N	**61**	N	**Y**
480	B	66	52	N	61	N	N
481	B	66	53	N	**64**	N	**Y**
482	B	66	52	N	**63**	N	**Y**
483	B	66	52	N	**62**	N	**Y**
487	B	66	65	N	**69**	**Y**	N
488	B	66	65	N	**67**	**Y**	N
489	B	66	65	N	65	N	N
490	B	66	61	N	63	N	N
491	B	66	61	N	60	N	N
492	B	66	61	N	62	N	N
493	B	66	49	N	**61**	N	**Y**
494	B	66	49	N	**72**	**Y**	**Y**
495	B	66	49	N	**69**	**Y**	**Y**
496	B	66	49	N	**62**	N	**Y**
497	B	66	49	N	58	N	N
498	B	66	49	N	**59**	N	**Y**
499	B	66	49	N	**61**	N	**Y**
500	B	66	49	N	**61**	N	**Y**
501	B	66	49	N	**70**	**Y**	**Y**
502	B	66	49	N	**66**	**Y**	**Y**
503	B	66	49	N	**72**	**Y**	**Y**
504	B	66	49	N	**66**	**Y**	**Y**
505	B	66	49	N	**63**	N	**Y**
506	B	66	51	N	**62**	N	**Y**
507	B	66	49	N	**60**	N	**Y**
508	B	66	49	N	**60**	N	**Y**
509	B	66	49	N	**60**	N	**Y**
510	B	66	51	N	59	N	N
511	B	66	51	N	56	N	N
512	B	66	50	N	57	N	N
513	B	66	49	N	58	N	N
514	B	66	49	N	57	N	N
515	B	66	50	N	56	N	N
516	B	66	51	N	56	N	N
517	B	66	53	N	55	N	N
518	B	66	51	N	54	N	N
519	B	66	51	N	54	N	N
520	B	66	53	N	54	N	N
521	B	66	60	N	53	N	N
522	B	66	60	N	54	N	N

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Table 4. Modeled Existing and Refined Selected Alternative Noise Levels in the Noise Study Area

Receptor[a]	Activity Category	UDOT NAC $L_{eq}(h)$	Existing		With Refined Selected Alternative		
			Existing Noise Levels (dBA)	**Existing Impact?**	**Refined Selected Alternative Noise Levels (dBA)**	**≥ UDOT NAC?**	**≥ 10 dBA Increase over Existing Noise Level?**
523	B	66	54	N	55	N	N
524 – Church (north side of building)	C	66 exterior	60 exterior	N	58 exterior	N	N
	D	51	35[b] interior	N	33[b] interior	N	N
529	B	66	57	N	62	N	N
532	B	66	57	N	59	N	N
533	B	66	55	N	58	N	N
534	B	66	55	N	57	N	N
535	B	66	60	N	57	N	N
536	B	66	55	N	56	N	N
537	B	66	57	N	62	N	N
538	B	66	52	N	56	N	N
539	B	66	52	N	55	N	N
540	B	66	52	N	55	N	N
541	B	66	55	N	57	N	N
542	B	66	52	N	57	N	N
543	B	66	54	N	58	N	N
544	B	66	52	N	57	N	N
545	B	66	52	N	60	N	N
546	B	66	52	N	54	N	N
547	B	66	52	N	54	N	N
548	B	66	51	N	55	N	N
549	B	66	60	N	55	N	N
550	B	66	60	N	55	N	N
551	B	66	49	N	54	N	N
552	B	66	49	N	55	N	N
553	B	66	49	N	55	N	N
554	B	66	49	N	56	N	N
555	B	66	51	N	56	N	N
556	B	66	51	N	56	N	N
557	B	66	51	N	57	N	N
558	B	66	51	N	55	N	N
559	B	66	48	N	54	N	N
560	B	66	51	N	60	N	N
561	B	66	51	N	59	N	N
562	B	66	49	N	58	N	N
563	B	66	49	N	57	N	N
564	B	66	48	N	56	N	N
565	B	66	48	N	56	N	N
566	B	66	48	N	55	N	N
671	B	66	49	N	**67**	**Y**	**Y**
672	B	66	49	N	**61**	N	**Y**
673	B	66	49	N	**61**	N	**Y**

(*continued on next page*)

Table 4. Modeled Existing and Refined Selected Alternative Noise Levels in the Noise Study Area

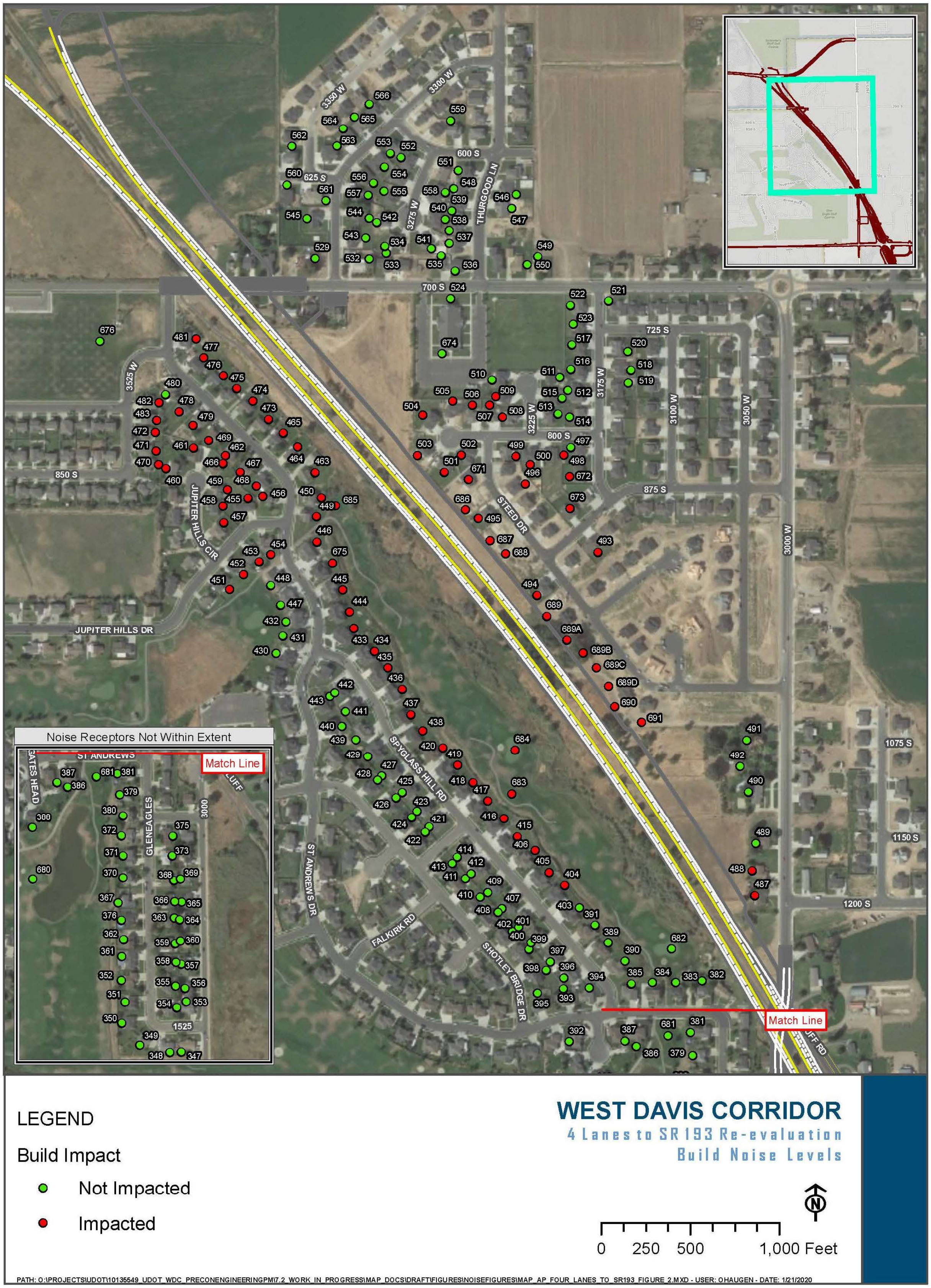
Receptor[a]	Activity Category	UDOT NAC $L_{eq}(h)$	Existing		With Refined Selected Alternative		
			Existing Noise Levels (dBA)	Existing Impact?	Refined Selected Alternative Noise Levels (dBA)	≥ UDOT NAC?	≥ 10 dBA Increase over Existing Noise Level?
674 – Church (south side of building)	C	66 exterior	53 exterior	N	61 exterior	N	N
	D	51 interior	28[b] interior	N	36[b] interior	N	N
675	B	66	49	N	**63**	N	**Y**
676 – Park	C	66	53	N	61	N	N
680 – Golf Course	C	66	55	N	58	N	N
681 – Golf Course	C	66	55	N	63	N	N
682 – Golf Course	C	66	57	N	65	N	N
683 – Golf Course	C	66	50	N	**62**	N	**Y**
684 – Golf Course	C	66	50	N	**65**	N	**Y**
685 – Golf Course	C	66	49	N	**67**	**Y**	**Y**
686	B	66	49	N	**69**	**Y**	**Y**
687	B	66	49	N	**69**	**Y**	**Y**
688 – Two Home Sites + Pool Site	B, C	66	49	N	**68**	**Y**	**Y**
689 – Two Homes	B	66	49	N	**71**	**Y**	**Y**
689 A	B	66	49	N	**71**	**Y**	**Y**
689 B	B	66	49	N	**71**	**Y**	**Y**
689 C	B	66	49	N	**71**	**Y**	**Y**
689 D	B	66	49	N	**71**	**Y**	**Y**
690	B	66	49	N	**70**	**Y**	**Y**
691	B	66	49	N	**68**	**Y**	**Y**

Shaded cells indicate impacts with the Refined Selected Alternative.

[a] All receptors are single residential sites unless noted otherwise.

[b] The interior noise level for this masonry church building was estimated by subtracting 25 dBA from the exterior noise level (FHWA 2018, Table 6-1).

Figure 2. Build Scenario Noise Receptor Map



8 Noise Abatement Methodology

This section discusses UDOT's methodology for evaluating noise-abatement mitigation measures for the traffic noise impacts identified in Section 6, Expected Impacts with the Refined Selected Alternative.

For a noise wall to be effective, it must be high enough and long enough to block the view of the noise source (that is, traffic on the roadway) from the receptor's line of sight. FHWA's *Highway Traffic Noise: Analysis and Abatement Guidance* (FHWA 2011) states that, as a general rule of thumb, the noise barrier should extend 4 times as far in each direction as the distance from the receptor to the barrier. For example, if the receptor is 50 feet from the proposed noise barrier, the barrier needs to extend at least 200 feet on either side of the receptor in order to shield the receptor from noise traveling past the ends of the barrier.

Noise walls for individual homes do not meet the cost-effectiveness criterion of UDOT's Noise Abatement Policy. Gaps in a noise wall cause "noise leaks," which reduce the effectiveness of the wall at homes near the gap. In addition, the effectiveness of noise walls decreases with increasing distance from the wall. For example, a residence that is 300 feet from a noise wall might experience noise levels that exceed the residential NAC. However, the noise wall might be ineffective in reducing noise levels by 7 dBA or more at that distance, and, therefore, a noise barrier might not be warranted according to UDOT's Noise Abatement Policy. The goal of noise abatement is to substantially reduce noise, which might or might not result in noise levels below the residential NAC.

The two primary criteria to consider when evaluating noise-abatement measures are feasibility and reasonableness. Noise abatement would be provided by UDOT only if UDOT determines that noise-abatement measures are *both* feasible and reasonable.

8.1 Feasibility and Reasonableness Factors

8.1.1 Feasibility Factors

The feasibility of noise-abatement measures deals primarily with construction and engineering considerations such as safety, location of cross streets, sight distance, and access to adjacent properties, among other considerations. Under UDOT's Noise Abatement Policy, a noise barrier must be considered "acoustically feasible"—that is, the barrier must reduce noise by at least 5 dBA for at least 50% of front-row receptors.

What are feasibility factors?

The feasibility of noise-abatement measures deals primarily construction and engineering considerations.

If a noise-abatement measure is determined by UDOT to be acoustically feasible, then the abatement measure will be evaluated to determine whether its construction is reasonable. If a noise-abatement measure is determined by UDOT to be not feasible, it will not be considered any further.

8.1.2 Reasonableness Factors

What are reasonableness factors?

Reasonableness factors are the noise-abatement design goal, cost-effectiveness, and the viewpoints of property owners and residents.

Under UDOT's Noise Abatement Policy, reasonableness factors must be collectively achieved in order for a noise-abatement measure to be considered "reasonable." All three reasonableness factors described below must be met in order for a noise barrier to be considered reasonable.

- ***Noise-abatement Design Goal.*** Every reasonable effort should be made to achieve substantial reductions in noise. UDOT defines the minimum noise reduction (design goal) from proposed abatement measures to be 7 dBA or greater for at least 35% of front-row receptors. No abatement measure will be considered reasonable if the noise-abatement design goal cannot be achieved.
- ***Cost-effectiveness.*** The cost of a noise-abatement measure must be considered reasonable in order for it to be included in a project. Noise-abatement costs are determined by multiplying a fixed unit cost per square foot by the height and length of the barrier.

  For residential receptors, cost-effectiveness is based on the cost of the abatement measure (for example, a noise wall) divided by the number of benefited receptors (the total number of dwelling units at which noise is reduced by a minimum of 5 dBA as a result of the abatement measure).

  Currently, the maximum cost used to determine the reasonableness of a noise-abatement measure is $30,000 per benefiting residence (Activity Category B) based on a unit cost of $20 per square foot of barrier, and $360 per lineal foot for Activity Categories A, C, D, or E.
- ***Viewpoints of Property Owners and Residents.*** If a noise-abatement measure is both feasible and cost-effective, UDOT will also consider the viewpoints of property owners and residents to determine whether the noise-abatement measures are desired. Balloting will be conducted for those noise-abatement measures that both meet the noise-abatement design goal and are cost-effective consistent with the procedures described in UDOT's Noise Abatement Policy.

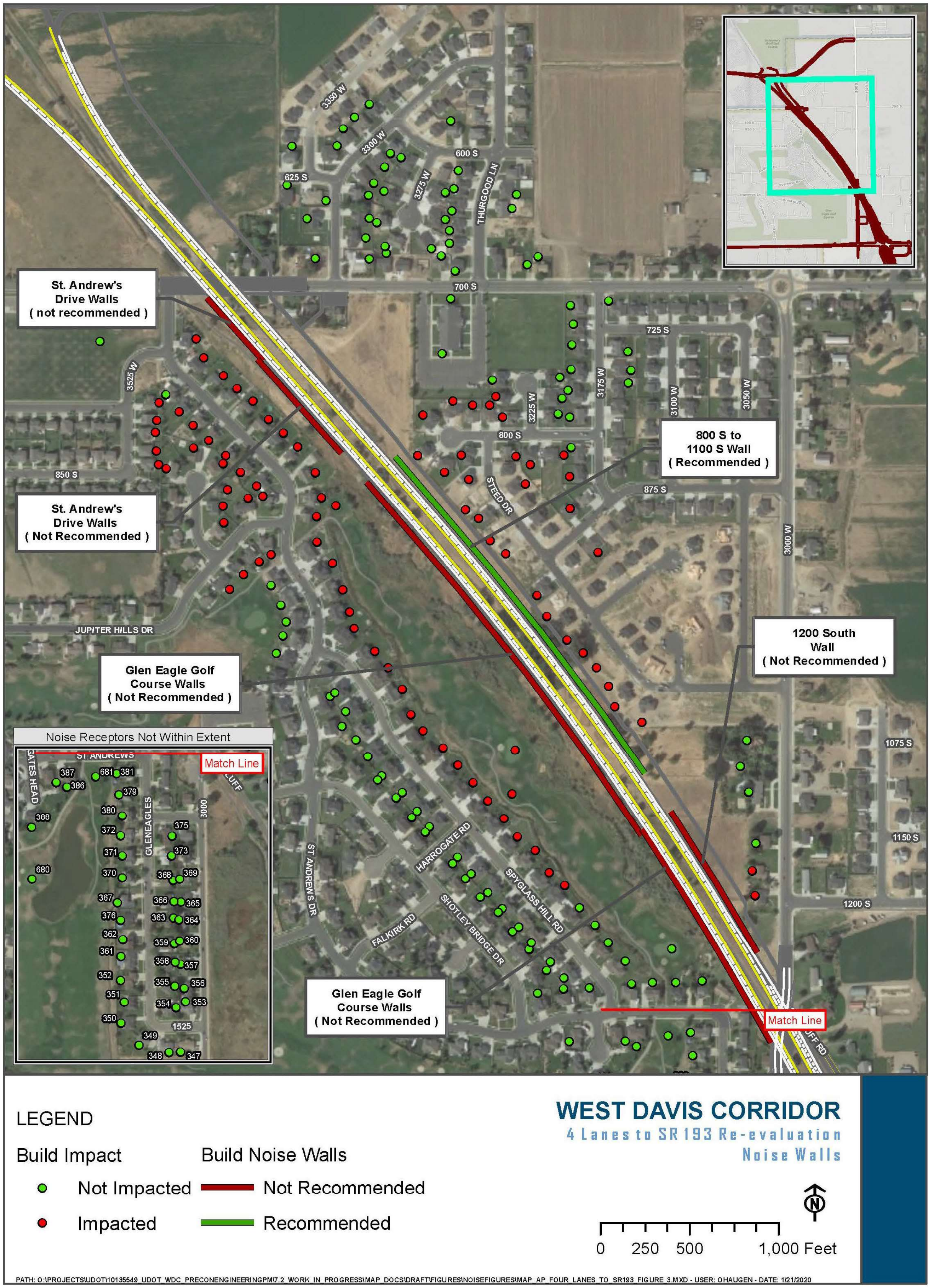
The noise walls considered for the Refined Selected Alternative are discussed below. UDOT evaluated noise walls for four locations along the WDC where noise impacts would occur with the Refined Selected Alternative. One wall in this section of the WDC was found to be both feasible and reasonable.

8.1.3 Noise Wall Evaluations

In this section, noise walls evaluations are summarized for locations where there would be impacts to noise receptors as defined in Sections 6 and 7. The noise walls that were evaluated are described from north to south on the west side of the WDC, then from north to south on the east side of the WDC.

The locations of the evaluated noise walls are shown in Figure 3, Build Scenario Noise Walls.

Figure 3. Build Scenario Noise Walls



St. Andrew's Drive Walls – West of WDC

The St. Andrew's Drive walls consist of two noise walls that were evaluated near St. Andrew's Drive where noise impacts are expected to a total of 28 residential receptors, including 9 front-row receptors. One wall would be located adjacent to a jersey barrier required for southbound WDC traffic, and the other wall would be located near the clear zone in a section where jersey barrier is not required. The two walls evaluated have a combined length of about 900 feet (see Figure 3, Build Scenario Noise Walls).

As summarized in Table 5, UDOT evaluated walls ranging from 18 to 20 feet high (for detailed information, see Appendix A, Noise Wall Analysis).

Table 5. Noise-abatement Analysis for Noise Walls near St. Andrew's Drive

	Feasibility		Reasonable					
Barrier Height (feet)	**% Front-row with 5-dBA Reduction**	**Acoustically Feasible?[a]**	**% Front-row with 7-dBA Reduction**	**Noise Abatement Design Goal?[b]**	**Anticipated Cost**	**Allowable Cost**	**Cost-effective?[c]**	**Is Barrier Feasible and Reasonable?**
18	56	Y	0	N	NA	NA	NA	**N**
20	67	Y	0	N	NA	NA	NA	**N**

[a] 5-dBA reduction for at least 50% of front-row receptors.

[b] 7-dBA reduction for at least 35% of front-row receptors.

[c] Anticipated cost is less than allowable cost.

The two noise walls analyzed do not achieve UDOT's noise-abatement design goal of 7 dBA for 35% of front-row receptors; therefore, these walls are not recommended.

Glen Eagle Golf Course Walls – West of WDC

The Glen Eagle Golf Course walls consist of two noise walls that were evaluated near Glen Eagle Golf Course where noise impacts are expected to a total of 23 receptors (3 golf course receptors and 20 residential receptors). The 3 golf course receptors are the front-row receptors for these walls. One wall would be located near the clear zone where jersey barrier is not required, and the other wall would be located adjacent to a jersey barrier required for southbound WDC traffic. The two walls evaluated have a combined length of about 3,000 feet (see Figure 3, Build Scenario Noise Walls).

As summarized in Table 6, UDOT evaluated these noise walls at 18 feet high. This is the maximum height that would meet UDOT's cost-effectiveness criteria for recreational land uses (for detailed information, see Appendix A, Noise Wall Analysis).

Table 6. Noise-abatement Analysis for Glen Eagle Golf Course Noise Walls

	Feasibility		Reasonable					
Barrier Height (feet)	**% Front-row with 5-dBA Reduction**	**Acoustically Feasible?[a]**	**% Front-row with 7-dBA Reduction**	**Noise Abatement Design Goal?[b]**	**Anticipated Cost**	**Allowable Cost**	**Cost-effective?[c]**	**Is Barrier Feasible and Reasonable?**
18	67	Y	33	N	NA	NA	NA	**N**

[a] 5-dBA reduction for at least 50% of front-row receptors.

[b] 7-dBA reduction for at least 35% of front-row receptors.

[c] Anticipated cost is less than allowable cost.

The noise walls analyzed do not achieve UDOT's noise-abatement design goal of a 7-dBA reduction for 35% of front-row receptors; therefore, these walls are not recommended.

800 South to 1100 South Wall – East of WDC

A noise wall from 800 South to 1100 South was evaluated where noise impacts are expected to a total of 32 receptors (31 residential receptors and 1 recreational receptor). There are 18 front-row receptors in this area (17 residential receptors and 1 recreational receptor). The noise wall would be located near the clear zone for northbound WDC traffic and would be about 1,700 feet long (see Figure 3, Build Scenario Noise Walls).

As summarized in Table 7, UDOT evaluated a noise wall ranging from 12 to 16 feet high (for detailed information, see Appendix A, Noise Wall Analysis).

Table 7. Noise-abatement Analysis for 800 South to 1100 South Noise Wall

	Feasibility		Reasonable					
Barrier Height (feet)	**% Front-row with 5-dBA Reduction**	**Acoustically Feasible?[a]**	**% Front-row with 7-dBA Reduction**	**Noise Abatement Design Goal?[b]**	**Anticipated Cost**	**Allowable Cost**	**Cost-effective?[c]**	**Is Barrier Feasible and Reasonable?**
12	33	N	0	N	NA	NA	NA	**N**
14	94	Y	28	N	NA	NA	NA	**N**
15	94	Y	50	Y	$510,000	$535,000	Y	**Y**
16	94	Y	61	Y	$544,000	$535,000	N	**N**

[a] 5-dBA reduction for at least 50% of front-row receptors.

[b] 7-dBA reduction for at least 35% of front-row receptors.

[c] Anticipated cost is less than allowable cost.

A 15-foot-high, 1,700–foot-long noise wall meets the feasibility and reasonableness criteria in UDOT's Noise Abatement Policy; therefore, a wall at this location is recommended.

1200 South Wall – East of WDC

A noise wall at about 1200 South was evaluated for two residential receptors where noise impacts are expected. The noise wall would be located near the clear zone for northbound WDC traffic and would be about 650 feet long (see Figure 3, Build Scenario Noise Walls).

As summarized in Table 8, UDOT evaluated a noise wall ranging from 18 to 20 feet high (for detailed information, see Appendix A, Noise Wall Analysis).

Table 8. Noise-abatement Analysis for 1200 South Noise Wall

	Feasibility		Reasonable					
Barrier Height (feet)	**% Front-row with 5-dBA Reduction**	**Acoustically Feasible?[a]**	**% Front-row with 7-dBA Reduction**	**Noise Abatement Design Goal?[b]**	**Anticipated Cost**	**Allowable Cost**	**Cost-effective?[c]**	**Is Barrier Feasible and Reasonable?**
18	0	N	0	N	NA	NA	NA	**N**
20	0	N	0	N	NA	NA	NA	**N**

[a] 5-dBA reduction for at least 50% of front-row receptors.

[b] 7-dBA reduction for at least 35% of front-row receptors.

[c] Anticipated cost is less than allowable cost.

The noise wall evaluated does not meet UDOT's feasibility criteria; therefore, a wall at this location is not recommended.

9 Construction Noise

9.1 Construction Noise Activities

Table 9 shows the noise levels produced by various types of construction equipment. Properly maintained equipment will produce noise levels near the middle of the indicated ranges. The types of construction equipment used for this project will typically generate noise levels of 80 dBA to 90 dBA at a distance of 50 feet while the equipment is operating (EPA 1971; Gharabegian and others 1985; Toth 1979).

Construction equipment operations can vary from intermittent to fairly continuous with multiple pieces of equipment operating concurrently. Assuming that a bulldozer (85 dBA), backhoe (90 dBA), grader (90 dBA), and front-end loader (82 dBA) are operating concurrently in the same area, peak construction-period noise would generally be about 94 dBA at 50 feet from the construction site. Table 9 summarizes noise levels expected near an active construction site with the above equipment operating.

Table 9. Typical Noise Levels for Construction Equipment

Type of Equipment	Noise Level (dBA) at 50 feet
Bulldozer	85
Front loader	72 – 84
Jack hammer or rock drill	81 – 98
Crane with headache ball	75 – 87
Backhoe	72 – 93
Scraper and grader	80 – 93
Electrical generator	71 – 82
Concrete pump	81 – 83
Concrete vibrator	76
Concrete and dump trucks	83 – 90
Air compressor	74 – 87
Pile drivers (peaks)	95 – 106
Pneumatic tools	81 – 98
Roller (compactor)	73 – 75
Saws	73 – 82

Source: EPA 1971

Locations within about 1,900 feet of a construction site will experience occasional episodes of noise levels greater than 60 dBA. Areas within about 750 feet of a construction site will experience episodes of noise levels greater than 70 dBA. Such episodes of high noise levels associated with the proposed construction would not be continuous throughout the day and would generally be restricted to daytime hours.

Most construction activities associated with the Refined Selected Alternative would occur during daylight hours, which would minimize the number of noise impacts. Noise impacts could occur when construction directly adjacent to residential, park, or recreational areas is necessary.

9.2 Construction Noise Mitigation

To reduce temporary noise impacts associated with construction, contractors will comply with all state and local regulations relating to construction noise.

The contractor will be required to follow UDOT Special Provision Section 00555M, *Prosecution and Progress*. The contractor will be required to conform to this specification to reduce the impact of construction noise on the surrounding community.

10 Information for Local Officials

Activity Categories F and G include lands that are not sensitive to traffic noise. There are no impact criteria for these land use types, so noise abatement is not required. However, for Activity Category G, an estimate of the distance to the approach criteria must be provided to local governments. This estimate will help local government officials promote compatibility between land development and the Refined Selected Alternative. Syracuse City is the local government that has land use jurisdiction in the noise study area.

Table 10 lists the distances from the edge of the roadway pavement to the locations where the worst-hour $L_{eq}(h)$ levels of 66 dBA and 71 dBA would occur.

Table 10. Contour Distance to Future Noise Levels

	Approximate Distance from Edge of Highway Pavement to Noise-level Contour (feet)	
Roadway	**66-dBA Noise-level Contour**	**71-dBA Noise-level Contour**
West Davis Corridor	205	105

11 Conclusions

The Refined Selected Alternative would generally increase noise levels by 7 dBA throughout the noise study area. Of the 233 receptors that were modeled, 90 would have traffic noise impacts from the Refined Selected Alternative. Section 11.1 below discusses the recommended noise walls in the noise study area that met the requirements of UDOT’s Noise Abatement Policy.

As part of the final design phase, UDOT will conduct balloting consistent with the procedures in UDOT’s 2017 Noise Abatement Policy.

11.1 Summary of Recommended Noise Walls

11.1.1 800 South to 1100 South, East Side Wall

The recommended noise wall would be 15 feet high and 1,700 feet long. It would extend from about 800 South to about 1100 South on the east side of the WDC (see Figure 3, Build Scenario Noise Walls).

12 References

[CEQ] Council on Environmental Quality

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[EPA] U.S. Environmental Protection Agency

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[FHWA] Federal Highway Administration

2011 Highway Traffic Noise: Analysis and Abatement Guidance. FHWA-HEP-10-025. https://www.fhwa.dot.gov/environment/noise/regulations_and_guidance/analysis_and_abatement_guidance/revguidance.pdf. December.

2018 Noise Measurement Handbook: Final Report. FHWA-HEP-18-065. June 1.

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1985 Forest Fire Fighters' Noise Exposure. *Noise Control Engineering Journal* 25(3): 96–111.

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1979 Noise-Abatement Techniques for Construction Equipment. HS-803 293; DOT-TSC-NHTSA-79-45: PB-300 948. U.S. Department of Transportation, National Highway Traffic Safety Administration, Washington, DC.

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2017 Noise Abatement. UDOT 08A2-1. Effective November 6, 1987. Revised June 15, 2017. https://www.udot.utah.gov/main/uconowner.gf?n=10496602977480171.

Appendix A. Noise Wall Analysis

Walls at St Andrew's Drive - West Side of WDC Approx. 800 South

Wall Length (ft): 900 **Reeval #1**

Wall Cost per sq ft: $20 **TNM File:** **Sept 15 1700 S to 700 S** **Barrier Analysis: Sept 18 Walls Near St Andrew's Dr**

# of Front Row Receptors (R): 9 Height = 18 Height = 20

Receptor Name	# of Receptors	1st Row Y=Yes N=No	Existing Noise Level	Build Noise Level - No Wall	Increase Over Existing	Receptors Impacted	Noise Level With 18-ft Wall	Noise Reduction	Front Row Receptors With 5 dBA Reduction	Front Row Receptors With 7 dba Reduction	Receptors With 5 dba Benefit	Noise Level With 20-ft Wall	Noise Reduction	Front Row Receptors With 5 dBA Reduction	Front Row Receptors With 7 dba Reduction	Receptors With 5 dba Benefit
463	1	Y	50	66	16	1	63	3	0	0	0	63	3	0	0	0
464	1	Y	50	65	15	1	61	4	0	0	0	60	5	1	0	1
465	1	Y	50	64	14	1	59	5	1	0	1	59	5	1	0	1
473	1	Y	51	64	13	1	58	6	1	0	1	58	6	1	0	1
474	1	Y	52	64	12	1	58	6	1	0	1	58	6	1	0	1
475	1	Y	52	64	12	1	58	6	1	0	1	58	6	1	0	1
476	1	Y	52	64	12	1	58	6	1	0	1	58	6	1	0	1
477	1	Y	53	64	11	1	60	4	0	0	0	60	4	0	0	0
481	1	Y	53	64	11	1	61	3	0	0	0	61	3	0	0	0
455	1	N	49	62	13	1	58	4			0	58	4			0
456	1	N	49	62	13	1	59	3			0	59	3			0
457	1	N	49	61	12	1	57	4			0	57	4			0
458	1	N	49	62	13	1	58	4			0	58	4			0
459	1	N	49	62	13	1	58	4			0	57	5			1
482	1	N	49	63	14	1	58	5			1	58	5			1
470	1	N	50	61	11	1	56	5			1	56	5			1
471	1	N	50	62	12	1	57	5			1	56	6			1
472	1	N	51	62	11	1	57	5			1	57	5			1
					0	0		0			0		0			0
					Total	17			5	0	9			6	0	11

Feasibility:		
# of First-Row 5 dBA Reduction:	5	6
% of First-Row 5 dBA Reduction:	56%	67%
Acoustic Feasibility (5 dBA reduction for 50% of front-row):	Yes	Yes
Reasonableness:		
# of First-Row 7 dBA Design Goal:	0	0
% of First-Row 7 dBA Design Goal:	0.0%	0.0%
Noise Abatement Design Goal (7 dBA reduction for 35% of front-row):	No	No
Cost:		
# of Benefited:	9	11
Cost of Noise Wall (Length x Height x $20/sq ft):	N/A	N/A
Cost of any other items critical to safety:	N/A	N/A
Anticipated Cost of Noise Abatement:	N/A	N/A
Allowable Cost ($30,000 per benefited receptor):	N/A	N/A
Cost Effective (Anticipated Cost < Allowable Cost):	N/A	N/A
5 dba Reduction Goal Met?	Yes	Yes
7 dba Recduction Goal Met?	No	No
Cost Criteria Met?	N/A	N/A
Feasible and Reasonable?:	No	No
Conclusion:	**Wall at St. Andrew's Drive is not recommended**	

Walls Near Glen Eagle Golf Course - West Side of WDC

Wall Length (ft): N/A **Reeval # 1**

Max Wall Cost per linear ft as per UDOT Policy: $360 360 per ft/20 per sf = 18 ft max height allowed **TNM File:** **Sept 15 1700 S to 700 S**

# of Front Row Receptors (R): 3 Golf Course Front Row Receptors include the Golf Course Tees and Greens

Receptor Name	# of Receptors	1st Row Y=Yes N=No	Existing Noise Level	Build Noise Level - No Wall	Increase Over Existing	Receptors Impacted	Noise Level With 18-ft Wall	Noise Reduction	Front Row Receptors With 5 dBA Reduction	Front Row Receptors With 7 dba Reduction	Receptors With 5 dba Benefit
683	1	Y	50	62	12	1	57	5	1	0	1
684	1	Y	50	65	15	1	58	7	1	1	1
685	1	Y	49	67	18	1	64	3	0	0	0
					Total	3			2	1	2

Feasibility:

# of First-Row 5 dBA Reduction: 2

% of First-Row 5 dBA Reduction: 67%

Acoustic Feasibility (5 dBA reduction for 50% of front-row): Yes

Reasonableness:

# of First-Row 7 dBA Design Goal: 1

% of First-Row 7 dBA Design Goal: 33.3%

Noise Abatement Design Goal (7 dBA reduction for 35% of front-row): No

Cost:

# of Benefited: 2

Cost of Noise Wall (Length x Height x $20/sq ft): N/A

Cost of any other items critical to safety: N/A

Anticipated Cost of Noise Abatement: N/A

Allowable Cost ($30,000 per benefited receptor): N/A

Cost Effective (Anticipated Cost < Allowable Cost): N/A

5 dba Reduction Goal Met? Yes

7 dba Recduction Goal Met? No

Cost Criteria Met? N/A

Feasible and Reasonable?: No

Conclusion: **Walls Near Glen Eagle Golf Course are not recommended**

Wall 800 S - 1100 S, East Side

TNM File: Nov 9 800 S to 1100 S - E Side

Wall Cost per sq ft: $20

# of Front Row Receptors (R): 18

Barrier Analysis: Nov 9 12' Wall 800 S to 1100 S

Height = 12 Length = 1700

Receptor Name	# of Residential Receptors	1st Row Y=Yes	Existing Noise Level	Build Noise Level - No Wall	Increase Over Existing	Receptors Impacted	Noise Level With 12-ft Wall	Noise Reduction	Front Row Receptors With 5 dBA Reduction	Front Row Receptors With 7 dba Reduction	Receptors With 5 dba Benefit
494	1	Y	49	72	23	1	67	5	1	0	1
495	1	Y	49	69	20	1	65	4	0	0	0
501	1	Y	49	70	21	1	66	4	0	0	0
502	1	N	49	66	17	1	64	2	0	0	0
503	1	Y	49	72	23	1	67	5	1	0	1
504	1	N	49	66	17	1	66	0	0	0	0
686	1	Y	49	69	20	1	66	3	0	0	0
687	1	Y	49	69	20	1	65	4	0	0	0
688	2	Y	49	68	19	2	65	3	0	0	0
689	2	Y	49	71	22	2	66	5	2	0	2
690	1	Y	49	70	21	1	66	4	0	0	0
691	1	Y	49	68	19	1	65	3	0	0	0
671	1	Y	49	70	21	1	66	4	0	0	0
689 A	1	Y	49	71	22	1	67	4	0	0	0
689 B	1	Y	49	71	22	1	67	4	0	0	0
689 C	1	Y	49	71	22	1	66	5	1	0	1
689 D	1	Y	49	71	22	1	66	5	1	0	1
					Total	19			6	0	6

Note: 688 is at the location of 2 future homes and a community pool

Pool is not counted as a residential receptor

Feasibility:

# of First-Row 5 dBA Reduction: 6

% of First-Row 5 dBA Reduction: 33%

Acoustic Feasibility (5 dBA reduction for 50% of front-row): No

Reasonableness:

# of First-Row 7 dBA Design Goal: 0

% of First-Row 7 dBA Design Goal: 0.0%

Noise Abatement Design Goal (7 dBA reduction for 35% of front-row): No

Cost:

# of Benefited: NA

Cost of Noise Wall (Length x Height x $20/sq ft): N/A

Cost of any other items critical to safety: N/A

Anticipated Cost of Noise Abatement: N/A

Allowable Cost ($30,000 per benefited receptor): N/A

Cost Effective (Anticipated Cost < Allowable Cost): N/A

5 dba Reduction Goal Met? No

7 dba Recduction Goal Met? No

Cost Criteria Met? N/A

Feasible and Reasonable?: No

Conclusion: **Noise walls ranging from 15' high x 1700' long wall from 800 S to 1100 S East Side is rec**

Wall 800 S - 1100 S, East Side

TNM File: Nov 9 800 S to 1100 S - E Side

Reeval #1

Wall Cost per sq ft: $20

Barrier Analysis: Nov 9 14' Wall 800 S to 1100 S

# of Front Row Receptors (R): 18

Height = 14 Length = 1700

Receptor Name	# of Residential Receptors	1st Row Y=Yes	Existing Noise Level	Build Noise Level - No Wall	Increase Over Existing	Receptors Impacted	Noise Level With 14-ft Wall	Noise Reduction	Front Row Receptors With 5 dBA Reduction	Front Row Receptors With 7 dba Reduction	Receptors With 5 dba Benefit
494	1	Y	49	72	23	1	65	7	1	1	1
495	1	Y	49	69	20	1	64	5	1	0	1
501	1	Y	49	70	21	1	64	6	1	0	1
502	1	N	49	66	17	1	63	3	0	0	0
503	1	Y	49	72	23	1	67	5	1	0	1
504	1	N	49	66	17	1	65	1	0	0	0
686	1	Y	49	69	20	1	64	5	1	0	1
687	1	Y	49	69	20	1	63	6	1	0	1
688	2	Y	49	68	19	2	63	5	2	0	2
689	2	Y	49	71	22	2	64	7	2	2	2
690	1	Y	49	70	21	1	64	6	1	0	1
691	1	Y	49	68	19	1	63	5	1	0	1
671	1	Y	49	70	21	1	64	6	1	0	1
689 A	1	Y	49	71	22	1	65	6	1	0	1
689 B	1	Y	49	71	22	1	65	6	1	0	1
689 C	1	Y	49	71	22	1	64	7	1	1	1
689 D	1	Y	49	71	22	1	64	7	1	1	1
					Total	19			17	5	17

Note: 688 is at the location of 2 future homes and a community pool

Pool is not counted as a residential receptor

Feasibility:

# of First-Row 5 dBA Reduction: 17

% of First-Row 5 dBA Reduction: 94%

Acoustic Feasibility (5 dBA reduction for 50% of front-row): Yes

Reasonableness:

# of First-Row 7 dBA Design Goal: 5

% of First-Row 7 dBA Design Goal: 27.8%

Noise Abatement Design Goal (7 dBA reduction for 35% of front-row): No

Cost:

# of Benefited: 17

Cost of Noise Wall (Length x Height x $20/sq ft): $476,000

Cost of any other items critical to safety: 0

Anticipated Cost of Noise Abatement: $476,000

Allowable Cost ($30,000 per benefited receptor): $535,200.00 Allowable Cost = (30000 x 17) + (70 x 360)

Cost Effective (Anticipated Cost < Allowable Cost): Yes (17 homes + 1 Pool area)

5 dba Reduction Goal Met? Yes

7 dba Recduction Goal Met? Yes

Cost Criteria Met? Yes

Feasible and Reasonable?: Yes

Conclusion: **ommended**

R#1 Wall 800 S to 1100 S E Side

Wall 800 S - 1100 S, East Side

TNM File: Nov 9 800 S to 1100 S - E Side

Wall Cost per sq ft: $20

# of Front Row Receptors (R): 18

Barrier Analysis: Nov 9 15' Wall 800 S to 1100 S

Height = 15 Length = 1700

Receptor Name	# of Residential Receptors	1st Row Y=Yes	Existing Noise Level	Build Noise Level - No Wall	Increase Over Existing	Receptors Impacted	Noise Level With 15-ft Wall	Noise Reduction	Front Row Receptors With 5 dBA Reduction	Front Row Receptors With 7 dba Reduction	Receptors With 5 dba Benefit
494	1	Y	49	72	23	1	64	8	1	1	1
495	1	Y	49	69	20	1	63	6	1	0	1
501	1	Y	49	70	21	1	64	6	1	0	1
502	1	N	49	66	17	1	62	4	0	0	0
503	1	Y	49	72	23	1	67	5	1	0	1
504	1	N	49	66	17	1	65	1	0	0	0
686	1	Y	49	69	20	1	63	6	1	0	1
687	1	Y	49	69	20	1	62	7	1	1	1
688	2	Y	49	68	19	2	62	6	2	0	2
689	2	Y	49	71	22	2	63	8	2	2	2
690	1	Y	49	70	21	1	63	7	1	1	1
691	1	Y	49	68	19	1	62	6	1	0	1
671	1	Y	49	70	21	1	64	6	1	0	1
689 A	1	Y	49	71	22	1	64	7	1	1	1
689 B	1	Y	49	71	22	1	64	7	1	1	1
689 C	1	Y	49	71	22	1	63	8	1	1	1
689 D	1	Y	49	71	22	1	63	8	1	1	1
					Total	19			17	9	17
Note: 688 is at the location of 2 future homes and a community pool						**Feasibility:**		old	17	14	17

Pool is not counted as a residential receptor

# of First-Row 5 dBA Reduction: 17

% of First-Row 5 dBA Reduction: 94%

Acoustic Feasibility (5 dBA reduction for 50% of front-row): Yes

Reasonableness:

# of First-Row 7 dBA Design Goal: 9

% of First-Row 7 dBA Design Goal: 50.0%

Noise Abatement Design Goal (7 dBA reduction for 35% of front-row): Yes

Cost:

# of Benefited: 17

Cost of Noise Wall (Length x Height x $20/sq ft): $510,000

Cost of any other items critical to safety: 0

Anticipated Cost of Noise Abatement: $510,000

Allowable Cost ($30,000 per benefited receptor): $535,200.00 Allowable Cost = (30000 x 17) + (70 x 360)

Cost Effective (Anticipated Cost < Allowable Cost): Yes (17 homes + 1 Pool area)

5 dba Reduction Goal Met? Yes

7 dba Recduction Goal Met? Yes

Cost Criteria Met? Yes

Feasible and Reasonable?: Yes

Conclusion:

Wall 800 S - 1100 S, East Side

TNM File: Nov 9 800 S to 1100 S - E Side

Wall Cost per sq ft: $20

# of Front Row Receptors (R): 18

Barrier Analysis: Nov 9 16' Wall 800 S to 1100 S

Height = 16 Length = 1700

Receptor Name	# of Residential Receptors	1st Row Y=Yes	Existing Noise Level	Build Noise Level - No Wall	Increase Over Existing	Receptors Impacted	Noise Level With 14-ft Wall	Noise Reduction	Front Row Receptors With 5 dBA Reduction	Front Row Receptors With 7 dba Reduction	Receptors With 5 dba Benefit
494	1	Y	49	72	23	1	64	8	1	1	1
495	1	Y	49	69	20	1	62	7	1	1	1
501	1	Y	49	70	21	1	64	6	1	0	1
502	1	N	49	66	17	1	62	4	0	0	0
503	1	Y	49	72	23	1	67	5	1	0	1
504	1	N	49	66	17	1	65	1	0	0	0
686	1	Y	49	69	20	1	63	6	1	0	1
687	1	Y	49	69	20	1	62	7	1	1	1
688	2	Y	49	68	19	2	62	6	2	0	2
689	2	Y	49	71	22	2	62	9	2	2	2
690	1	Y	49	70	21	1	63	7	1	1	1
691	1	Y	49	68	19	1	62	6	1	0	1
671	1	Y	49	70	21	1	63	7	1	1	1
689 A	1	Y	49	71	22	1	63	8	1	1	1
689 B	1	Y	49	71	22	1	64	7	1	1	1
689 C	1	Y	49	71	22	1	63	8	1	1	1
689 D	1	Y	49	71	22	1	63	8	1	1	1
					Total	19			17	11	17

Note: 688 is at the location of 2 future homes and a community pool

Pool is not counted as a residential receptor

Feasibility:

of First-Row 5 dBA Reduction: 17

% of First-Row 5 dBA Reduction: 94%

Acoustic Feasibility (5 dBA reduction for 50% of front-row): Yes

Reasonableness:

of First-Row 7 dBA Design Goal: 11

% of First-Row 7 dBA Design Goal: 61.1%

Noise Abatement Design Goal (7 dBA reduction for 35% of front-row): Yes

Cost:

of Benefited: 17

Cost of Noise Wall (Length x Height x $20/sq ft): $544,000

Cost of any other items critical to safety: 0

Anticipated Cost of Noise Abatement: $544,000

Allowable Cost ($30,000 per benefited receptor): $535,200.00 Allowable Cost = (30000 x 17) + (70 x 360)

Cost Effective (Anticipated Cost < Allowable Cost): No (17 homes + 1 Pool area)

5 dba Reduction Goal Met? Yes

7 dba Recduction Goal Met? Yes

Cost Criteria Met? No

Feasible and Reasonable?: No

Conclusion:

Wall at 1200 S - East Side

Wall Length (ft): 700

Wall Cost per sq ft: $20

# of Front Row Receptors (R): 2

Reeval #1

TNM File: **Sept 15 1700 S to 700 S**

Height = 18

Height = 20

Receptor Name	# of Receptors	1st Row Y=Yes	Existing Noise Level	Build Noise Level - No Wall	Increase Over Existing	Receptors Impacted	Noise Level With 18-ft Wall	Noise Reduction	Front Row Receptors With 5 dBA Reduction	Front Row Receptors With 7 dba Reduction	Receptors With 5 dba Benefit	Noise Level With 20-ft Wall	Noise Reduction	Front Row Receptors With 5 dBA Reduction	Front Row Receptors With 7 dba Reduction	Receptors With 5 dba Benefit
488	1	Y	65	67	2	1	65	2	0	0	0	65	2	0	0	0
487	1	Y	65	69	4	1	67	2	0	0	0	67	2	0	0	0
					Total	2			0	0	0			0	0	0

Feasibility:		
# of First-Row 5 dBA Reduction:	0	0
% of First-Row 5 dBA Reduction:	0%	0%
Acoustic Feasibility (5 dBA reduction for 50% of front-row):	No	No
Reasonableness:		
# of First-Row 7 dBA Design Goal:	0	0
% of First-Row 7 dBA Design Goal:	0.0%	0.0%
Noise Abatement Design Goal (7 dBA reduction for 35% of front-row):	No	No
Cost:		
# of Benefited:	0	0
Cost of Noise Wall (Length x Height x $20/sq ft):	N/A	N/A
Cost of any other items critical to safety:	N/A	0
Anticipated Cost of Noise Abatement:	N/A	N/A
Allowable Cost ($30,000 per benefited receptor):	N/A	N/A
Cost Effective (Anticipated Cost < Allowable Cost):	N/A	Yes
5 dba Reduction Goal Met?	No	No
7 dba Recduction Goal Met?	No	No
Cost Criteria Met?	N/A	N/A
Feasible and Reasonable?:	No	No
Conclusion:	**Wall at 1200 S East side not recommended**	