Washington State
Department of Transportation

SR 3 Freight Corridor – New Alignment

MP 22.81 to MP 29.49

Noise Discipline Report

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Executive Summary

What is the Proposed Action?

The proposed SR 3 Freight Corridor – New Alignment project would construct a two-lane 6.5 mile limited access highway with a design speed of 50 miles per hour (mph) on a new alignment approximately 3,000 feet to the east of existing State Route (SR) 3. The major portion of the highway would run through Mason County while the northern end would be located in Kitsap County. The proposed alignment would begin at MP 22.81 on SR 3 and connect back to the existing SR 3 alignment at MP 29.49 (see Exhibit 2). The north end connection to existing SR 3 is proposed just north of SW Lake Flora Road, and the south connection is just south of the intersection with SR 302. The proposed bypass highway would carry regional through traffic from Shelton to Bremerton and would be the mainline for SR 3. The existing SR 3 would become a "Business Loop" serving downtown Belfair with connections to SR 106, SR 300, and the Old Belfair Highway.

Current Noise Environment

The project area is a mix of residential and commercial land uses at the south end, dense forest for the most part of the alignment with scattered residences at the northeast end of the project. This noise study covers up to 500 feet east and west of the centerline of the SR 3 alignment.

Predicted peak hour noise levels were compared to FHWA's Noise Abatement Criteria (NAC) of 66 dBA or a substantial increase from the existing environment of 10 dBA or more to determine if the project would result in traffic noise impacts.

- Existing noise levels within the existing SR 3 area are between 43 and 68 dBA.
- In the design year 2050, without the project, noise levels are predicted to be between 40 to 70 dBA.
- The existing noise levels along the proposed Corridor are predicted between 38 and 50 dBA with the higher noise levels near the proposed connections with SW Lake Flora Road and SR 302.
- In design year 2050, with the project, noise levels are predicted to be between 44 to 68 dBA.

Noise Impacts of Alternatives

The analysis of the noise impacts in the project area is based on a comparison of future sound levels with existing levels and applicable criteria. Construction noise impacts are based on the maximum noise levels of construction equipment published by the U.S. Environmental Protection Agency (EPA, 1971).

Federal Highway Administration (FHWA) noise abatement criteria are used to evaluate traffic noise impacts. Traffic noise levels are predicted at sensitive receivers based on projected future traffic operations using FHWA Traffic Noise Model (TNM) version 2.5. Abatement measures that may be taken to avoid or reduce potential noise impacts are discussed where appropriate.

The project environment was evaluated for the presence of receivers sensitive to traffic noise. Forty-seven receivers were modeled to identify current and future noise impacts under this project's Build and No Build Alternatives. Predicted peak-hour noise levels were compared to FHWA's Noise Abatement Criteria (NAC) to determine if the project would result in traffic noise impacts.

Our noise analysis revealed that seven residences currently approach or exceed WSDOT's noise abatement criteria (NAC) for noise of 66 dBA L_{eq} (equivalent sound pressure level in A-weighted decibels). Under the No Build Alternative, the number of residences that would approach or exceed WSDOT's NAC would increase to 12 residences due to a slight increase in area noise levels.

Under the 2050 Build Alternative, an estimated 25 residences are expected to exceed the NAC of 66 dBA or experience a substantial increase of 10 dBA or more, by 2050 without abatement.

Abatement Not Recommended

Noise walls along the right-of-way evaluated to protect those affected homes were evaluated for feasibility and reasonableness. While all four evaluated noise walls were determined to be feasible, none of the walls met the reasonableness criteria.

Therefore, noise walls are not recommended for this project. Exhibit 1 summarizes the existing and predicted noise conditions at the modeled locations.

Exhibit 1: Summary of Noise Impacts and Abatement

Alternative	Construction Noise	Operational Impacts	Abatement Measures
2018 Existing Conditions (pm peak)	None	Noise levels exceed 66 dBA NAC at seven locations.	None required.
2050 No Build (pm peak)	None	Noise levels exceed 66 dBA NAC at 12 locations.	None required.
2050 Build (pm peak)	Nearby receivers could experience temporary noise impacts during construction. Nighttime construction will require a noise variance from local jurisdictions.	Noise levels exceed 66 dBA or incur a substantial increase of 10 dBA or more at 25 locations.	Noise walls were considered at four locations within the project limits. Noise walls are not recommended for construction, because they do not meet both WSDOT's feasibility and reasonableness criteria.

Introduction

Description of the Build Alternative (Proposed Action)

The proposed SR 3 Freight Corridor – New Alignment project would construct a two-lane 6.5 mile limited access highway with a design and posted speed of 50 miles per hour (mph) on a new alignment approximately 3,000 feet to the east of existing State Route (SR) 3. The major portion of the highway would run through Mason County while the northern end would be located in Kitsap County. The proposed alignment would begin at MP 22.81 on SR 3 and connect back to the existing SR 3 alignment at MP 29.49 (see Exhibit 2). The north end connection to existing SR 3 is proposed just north of SW Lake Flora Road, and the south connection is just south of the intersection with SR 302. The proposed bypass highway would carry regional through traffic from Shelton to Bremerton and would be the mainline for SR 3. The existing SR 3 would become a "Business Loop" serving downtown Belfair with connections to SR 106, SR 300, and the Old Belfair Highway.

The typical cross-section of the proposed improvement is shown in Exhibit 3 and its construction elements would include the following:

- Two 12-foot travel lanes with 8-foot shoulders.
- Stormwater treatment facilities – natural dispersion and infiltration, compost-amended vegetated filter strips, and treatment wetlands.
- Acquiring right-of-way and implementing managed access.
- A roundabout at the north end of the alignment to connect the existing SR 3 corridor to the new corridor at Lake Flora Road
- Two roundabouts to connect the south end of the new corridor to the existing SR 3 corridor at SR 302
    - The western roundabout would provide access to the existing SR 3 corridor
    - The eastern roundabout would provide access to SR 302 and the proposed SR 3 Freight Corridor
- Right-in-right-out access to provide access to North Mason High School and Belwood Lane

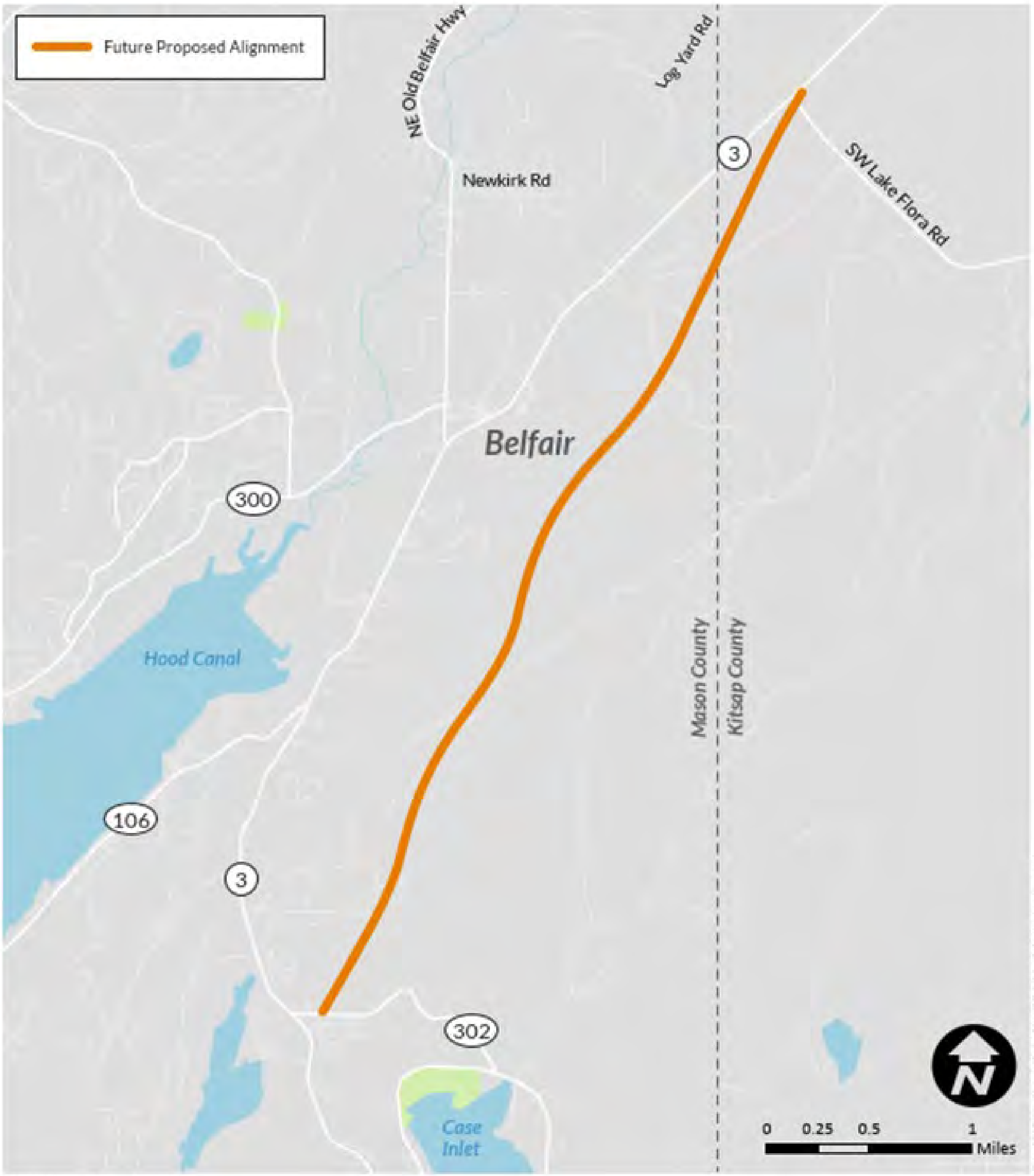


Exhibit 2: SR 3 Freight Corridor Project Vicinity

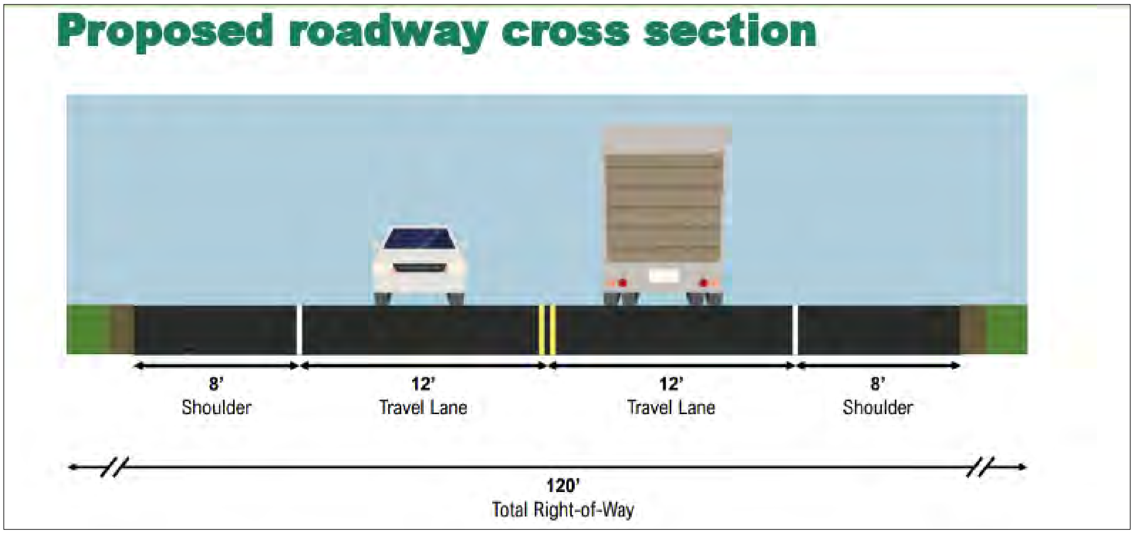


Exhibit 3: SR 3 Proposed Highway Cross-section

What is the Purpose of this Project?

The purpose of constructing a Freight Corridor around the Belfair urban area is to provide a reliable high speed regional route between Kitsap and Mason Counties. The Freight Corridor project ensures the efficient movement of freight, commuter trips and other regional traffic between Shelton and Bremerton in a manner that bypasses the urban center of Belfair. The project would provide a solution to the immediate and long-range regional transportation mobility needs of the SR 3 corridor through the design year of 2050 by reducing congestion and lowering the existing crash rate on SR 3 through Belfair. It would provide an alternate route during recurring highway closures resulting from vehicular crashes and other incidents. It would provide safe and reliable regional access to jobs, goods, and services; accommodate seasonal influxes of tourist traffic; and improve efficiencies for all public services.

Why is the SR 3 Freight Corridor – New Alignment Project Needed?

A new Freight Corridor around Belfair is needed to improve regional mobility for freight, passenger vehicles and transit. The improvements would increase mobility, reduce congestion through Belfair, and improve safety.

Regional Mobility

SR 3 in the Belfair urban area experiences chronic traffic congestion and declining operational Levels of Service (LOS) for traffic. Because SR 3 is the major north- south link between Mason and Kitsap counties, Belfair is a choke point on this regional highway and serves as the only freight route through southwest Kitsap and northeast Mason Counties. SR 3 is designated as a critical rural freight corridor and is part of the National Highway Freight Network (NHFN). SR 3 is also identified as a National Highway System (NHS) route and as a Highway of Statewide Significance (HSS). The National Highway System route designation extends from the Hood Canal Bridge in the north to Shelton in the south, passing through the Belfair urban area, the City of Bremerton, the Puget Sound Industrial Center - Bremerton (PSIC - B), and connecting with SR 16.

SR 3 carries most of the daily commute trips from SR 106, SR 300 and populated coastal areas in Mason County north to Bremerton and via SR 16 to points in Pierce and King Counties. Regional traffic using SR 3 must pass through the commercial area of Belfair having numerous access points with high turning volumes. Southbound traffic destined for Shelton, Grays Harbor, and Olympia also must pass through Belfair.

Traffic Operations

A combination of freight, commute, and recreational traffic volumes cause severe commute hour congestion through the Belfair urban area. Congestion is occurring during peak commute hours, weekends, holidays, and during the tourist season. SR 3 had up to 19,000 annual average daily vehicles per day in 2018 south of Lake Flora Road.

Highway LOS analysis shows the one-mile segment of the SR 3 mainline segment north of Lake Flora Road (MP 28.78 to MP 29.78) is LOS D. The signalized intersection at NE Clifton Lane operates at LOS D and E during the AM and PM peak periods, respectively, failing to meet LOS standards. The unsignalized intersection at Old Belfair Highway is operating at failing conditions of LOS E and F during the AM and PM peak periods, respectively.

Several studies conducted over the last decade have demonstrated that traffic congestion and safety concerns will eventually overwhelm SR 3 in the approaching years. Traffic projections show that without the Freight Corridor, operational performance for freight and regional through traffic on the portion of existing SR 3 through Belfair will continue to decline to the point of chronic failure. It is expected that the corridor will operate at LOS E in 2050 and that, if no action is taken, travel times in the project area will continue to worsen as future traffic volumes increase.

Crash Data

Crash records in the study area indicate that the type and severity of crashes appears to be consistent with congested urban conditions. Rear-end and property damage only (PDO) or non-injury crashes account for the greatest number of crashes. The number of crashes tends to increase under congested conditions, but the severity of those crashes is generally lower, due to lower speeds. At the study area intersections, between January 2014 and May 2019, two serious injury crashes occurred. There were no fatal crashes. The intersections of SR 3/NE Clifton Lane and SR 3/Lake Flora Road had the highest number of crashes in the study area, ranging from 3.8 crashes per year to 4.7 crashes per year. On SR 3 segments, between the study intersections, 350 crashes were reported, with the majority occurring between Lake Flora Road and NE Clifton Lane (41 percent) and between NE Clifton Lane and SR 106 (38 percent).

Regional System Linkage

The current highway does not support regional transportation needs. This route experiences seasonal fluctuations from tourist traffic and recreational users and is the most direct and expedient alternate land route for traffic from Bremerton to Interstate 5 if SR 16 or the Tacoma Narrows Bridge becomes blocked. Southbound traffic destined for Shelton, Grays Harbor, and Olympia must pass through Belfair. As land located in the corridor continues to be developed, and regional trips continue to increase, traffic congestion through Belfair will be exacerbated. The Bremerton Economic Development (BED) Study for US 101, SR 3 and SR 16 in Mason and Kitsap Counties (WSDOT 2012a) showed the Freight Corridor project was the top priority project for the local communities and stakeholders.

If the Freight Corridor project is not built, the SR 3 will be an important regional facility that will fail to provide efficient regional and local traffic mobility. The operational analysis of the project area indicates that the roadway currently operates below minimum acceptable service standards on this portion of the highway. Operating conditions will reach failing conditions by 2050. A bypass would improve the roadway system around Belfair and would reduce travel time.

Support of Local Plans

The area is developing based on local agency comprehensive plans and zoning. However, the area lacks a completed transportation network appropriate for the community. Many traffic studies show that a SR 3 bypass around Belfair is needed to improve regional mobility, reduce congestion through Belfair, and improve safety. As already discussed, the BED Study showed the SR 3 Freight Corridor is the top priority project for the local communities and stakeholders. The Freight Corridor has been included in the transportation elements of the Mason County and the City of Bremerton comprehensive plans.

Type 1 Trigger for Noise Analysis

A traffic noise analysis is required by law[1] for federally funded projects and required by state policy[2] for other funded projects that:

- Involve construction of a new highway,
- Significantly change the horizontal or vertical alignment,
- Increase the number of through traffic lanes on an existing highway, or
- Alter terrain to create new line-of-sight to traffic for noise sensitive receivers.

The project proposes to construct a bypass (a new alignment) around the Belfair Urban area to provide a reliable high speed regional route between Kitsap and Mason Counties. The proposed bypass would reduce congestion and improve safety through Belfair, and provide an alternate route for emergency vehicles. Implementation of this project to build a new alignment is a Type 1 trigger for traffic noise analysis.

Noise Relevant Project Information

The proposed SR 3 Freight Corridor Project would provide a solution to the immediate and long-range regional transportation mobility and safety needs of the SR 3 corridor in northeast Mason and

[1] 23 CFR 772, "Procedures for Abatement of Highway Traffic Noise and Construction Noise"
[2] 2011 WSDOT Traffic Noise Policy and Procedures, WSDOT

southwest Kitsap counties. The completed project would provide a 2-lane highway on a new alignment with the proposed design speed of 50 miles per hour that would move regional traffic from Shelton to Bremerton through Belfair. It would also serve as an alternate route during recurring highway closures from accidents on existing SR 3 in Belfair. This would ensure efficient movement between Kitsap and Mason counties and serve general traffic needs through to the design year 2050.

Land use at the end junctions consists of residential, commercial and public services. The land adjacent to the rest of the Bypass consists of few residential properties at the south end and vacant undeveloped forested land. Mason County's Wastewater and Water Reclamation facility property is also located within the project limits.

FHWA requirements and WSDOT policy dictate that noise studies assess properties adjacent to highway projects that may be potentially affected by traffic noise. Primary consideration must be given to areas of frequent outdoor use such as residences with yards, decks, or patios. Parks and schools with outdoor play areas also warrant primary consideration of potential noise impacts. With that in mind, the project area was assessed for these types of areas. See Exhibit 2, a vicinity map of the project area.

Description of Alternatives

After conducting preliminary studies, WSDOT narrowed the number of potential alternatives to the Build and No Build Alternatives. As outlined above, the proposed Build Alternative would provide one general-purpose lane in each direction, standard shoulders, and turn lanes at major intersections along the new route. Details regarding the Build Alternative are included in the above Description of Proposed Action section.

Alternative 1: No Action Alternative

Under the No Build Alternative, the project would not be built. Only routine maintenance, repair, and minor safety improvements would take place on SR 3 in the study area over the next 20 years. WSDOT is evaluating the No Build Alternative to provide a reference point for comparing the effects, both positive and negative, associated with the proposed build alternative.

Alternative 2: Build Alternative (Proposed Action)

The proposed SR 3 Freight Corridor – New Alignment project Build Alternative would construct a two-lane 6.5-mile limited access highway with a design speed of 50 miles per hour (mph) on a new alignment approximately 3,000 feet to the east of existing SR 3. The major portion of the highway would run through Mason County while the northern end would be located in Kitsap County. The proposed alignment would begin at MP 22.81 on SR 3 and connect back to the existing SR 3 alignment at MP 29.49 (see Exhibit 2). The north end connection to existing SR 3 is proposed just north of SW Lake Flora Road, and the south connection is just south of the intersection with SR 302. The proposed bypass highway would carry regional through traffic from Shelton to Bremerton and would be the mainline for SR 3. The existing SR 3 would become a "Business Loop" serving downtown Belfair with connections to SR 106, SR 300, and the Old Belfair Highway.

Characteristics of Sound and Noise

Definition of Sound

Sound is created when objects vibrate, resulting in a minute variation in surrounding atmospheric pressure, called sound pressure. The human response to sound depends on the magnitude of a sound as a function of its frequency and time pattern (EPA, 1974). Magnitude is a measure of the physical sound energy in the air. The range of magnitude the ear can hear, from the faintest to the loudest sound, is so large that sound pressure is expressed on a logarithmic scale in units called decibels (dB). Loudness refers to how people subjectively judge a sound and varies between people.

Sound is measured using the logarithmic decibel scale, so doubling the number of noise sources, such as the number of cars on a roadway, increases noise levels by 3 dBA. Therefore, when you combine two noise sources emitting 60 dBA, the combined noise level is 63 dBA, not 120 dBA. The human ear can barely perceive a 3 dBA increase, while a 5 dBA increase is about one and one-half times as loud. A 10 dBA increase appears to be a doubling in noise level to most listeners. A tenfold increase in the number of noise sources will add 10 dBA.

In addition to magnitude, humans also respond to a sound's frequency or pitch. The human ear is very effective at perceiving frequencies between 1,000 and 5,000 Hz, with less efficiency outside this range. Environmental noise is composed of many frequencies. A-weighting (dBA) of sound levels is applied electronically by a sound level meter and combines the many frequencies into one sound level that simulates how an average person hears sounds of low to moderate magnitude

Definition of Noise

Noise is unwanted or unpleasant sound. Noise is a subjective term because, as described above, sound levels are perceived differently by different people. Magnitudes of typical noise levels are presented in Exhibit 4.

Traffic Noise Sources

An increase in traffic volumes, vehicle speeds, or the amount of heavy trucks would increase traffic noise levels. Traffic noise is a combination of noises from the engine, exhaust, and tires. Defective mufflers, truck compression braking, steep grades, the terrain, and vegetation near the roadway, shielding by barriers and buildings and the distance from the road can also contribute to the traffic noise heard at the roadside.

Exhibit 4: Typical Noise Levels

Transportation Noise Sources	Noise Level (dBA)	Other Sources	Description
	130		
Jet takeoff (200 feet)	120		Painfully loud
Car horn (3 feet)	110		
	100	Shout (.5 foot)	Very annoying
Heavy truck (50 feet)	90	Jack hammer (50 feet)	Hearing loss with prolonged exposure
Train on structure (50 feet)	85	Backhoe (50 feet)	
City bus passing (50 feet)	80	Bulldozer (50 feet)	
		Vacuum cleaner (3 feet)	
Train (50 feet)	75	Blender (3 feet)	Annoying
City bus at stop (50 feet)	70		
Freeway traffic (50 feet)		Lawn mower (50 feet)	
Train in station (50 feet)	65	Washing machine (3 feet)	
Light traffic (50 feet)	60	TV (10 feet)	Intrusive
		Talking	
Light traffic (100 feet)	50		Quiet

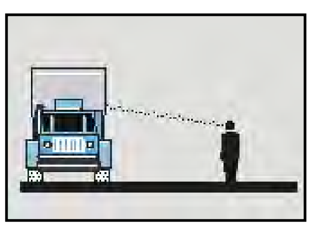
Source: FTA 1995

Sound Propagation

Sound propagation, or how far the sound travels, is affected by the terrain and the elevation of the receiver relative to the noise source. Noise levels can be reduced by breaking the line of sight between the receiver and the noise source.

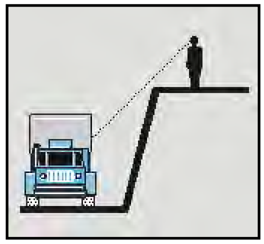
- Level ground: noise travels in a straight path between the source and receiver.

Level Ground



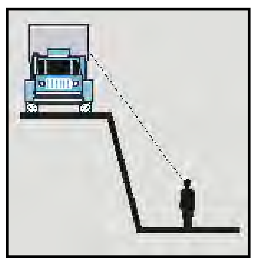
- Depressed source/elevated receiver: terrain may act like a partial noise barrier and reduce noise levels if it crests between the source and receiver.

Depressed source/elevated receiver



- Elevated source/depressed receiver: the edge of the roadway acts as a partial noise barrier. Even a short barrier, like a concrete safety barrier, can reduce traffic noise levels

Elevated source/depressed receiver



Line and Point Sources

Noise levels decrease with distance from the noise source. For a line source, like a highway, noise levels decrease 3 dBA for every doubling of distance, e.g., from 50’ to 100’, between the source and the receiver over hard ground (concrete, pavement) or 4.5 dBA over soft ground (grass). For point source, like most construction noise, the levels decrease between 6 and 7.5 dBA for every doubling of distance.

Effects of Noise

The FHWA noise abatement criteria are based on speech interference, which is a well-documented impact that is relatively reproducible in human response studies. Environmental noise indirectly affects human welfare by interfering with sleep, thought, and conversation. Prolonged exposure to very high levels of environmental noise can cause hearing loss and the Environmental Protection

Agency (EPA) has established a protective level 70 dBA $L_{eq}(24)$[3] for hearing loss. Noise also can affect some types of wildlife during certain activities.

Noise Level Descriptors

The equivalent sound level (L_{eq}) is a measure of the average noise level during a specified period of time. A one-hour period, or hourly L_{eq} [$L_{eq}(h)$], is used to measure highway noise. L_{eq} is a measure of total noise during a time period that places more emphasis on occasional high noise levels that accompany general background noise levels. For example, if you have two different sounds, and one contains twice as much energy, but lasts only half as long as the other, the two would have the same L_{eq} noise levels.

Either the total noise energy or the highest instantaneous noise level can describe short-term noise levels, such as those from a single truck passing by. The sound exposure level (SEL) is a measure of total sound energy from an event, and is useful in determining what the L_{eq} would be over a period in time when several noise events occur. L_{max} is the maximum sound level that occurs during a single event and is related to impacts on speech interference and sleep disruption. L_{min} is the minimum sound level during a period of time.

With L_n, "n" is the percent of time that a sound level is exceeded and is used describe the range of sound levels recorded during the measurement period. For example, the L_{10} level is the noise level that is exceeded 10% of the time. Sound varies in the environment and people will generally find a higher, but constant, sound level more tolerable than a quiet background level interrupted by higher sound level events. For example, steady traffic noise from a highway is normally less bothersome than occasional aircraft flyovers in an otherwise quiet area.

Noise Regulations and Impact Criteria

Traffic noise impacts occur when predicted L_{eq} (h) noise levels approach or exceed noise abatement criteria (NAC) established by the FHWA, or substantially exceed existing noise levels[4]. WSDOT considers a noise impact to occur if predicted L_{eq} (h) noise levels approach within 1 dBA of the noise abatement criteria. The FHWA noise abatement criteria specify exterior $L_{eq}(h)$ noise levels for various land activity categories as described in Exhibit 5. WSDOT also considers an increase of 10 dBA or more to be a substantial increase and constitute a traffic noise impact.

[3] U.S. EPA, 1974

[4] U.S. Department of Transportation, 1982, Noise Abatement Council

Exhibit 5: FHWA Noise Abatement Criteria by Land Use

Activity Category	L_{eq}(h)* at Evaluation Location (dBA)	Description of Activity Category
A	57 (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	67 (exterior)	Residential (single and multi-family units)
C	67 (exterior)	Active sport 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	52 (interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72 (exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F. Includes undeveloped land permitted for these activities.
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

Construction Noise Levels Limits

Traffic noise and construction noise are exempt from the property line noise limits during daytime hours, but noise limits still apply to construction noise at night. Noise levels in Exhibit 6 apply only to construction noise at residential properties at "night": between 10 p.m. and 7 a.m. At night, construction noise must meet Washington State Department of Ecology property line regulations[5] that set limits based on the Environmental Designation for Noise Abatement (EDNA) of the land use: residential (Class A), commercial (Class B), and industrial (Class C).

Allowable nighttime (10:00 PM to 7:00 AM) noise levels at Class A receiving properties (residential) are reduced by 10 dBA.

[5] WAC Chapter 173-40

Exhibit 6: Maximum Permissible Environmental Noise Levels

	EDNA of Receiving Property (dBA)		
EDNA of Noise Source	**Class A**	**Class B**	**Class C**
Class A	55	57	60
Class B	57	60	65
Class C	60	65	70

Short-term exceedance of the sound levels in Exhibit 6 is allowed. During any one-hour period, the maximum level may be exceeded by:

- 5 dBA for a total of 15 minutes,
- 10 dBA for a total of 5 minutes, or
- 15 dBA for a total of 1.5 minutes[6].

The allowed exceptions are defined by the percentage of time a given level is exceeded. For example, L_{25} is the noise level exceeded 15 minutes during an hour. Therefore, the permissible L_{25} would be 5 dBA greater than the values in Exhibit 5, provided that the noise level is below the permissible level for the rest of the hour and never exceeds the permissible level by more than 5 dBA.

[6] WAC 173-60-040

Traffic Noise Analysis Methodology

Determination of the Traffic Noise Study Area

The project area is a mix of residential and commercial land uses at the south end, dense forest for the most part of the alignment with scattered residences at the northeast end of the project. The proposed alignment would begin at milepost (MP) 22.81, just south of the intersection with SR 302 on and ends north of Lake Flora Road at MP 29.49, connecting back to existing SR 3. The length of the proposed bypass corridor would be 6.5 miles.

This noise study covers up to 500 feet east and west of the centerline of the SR 3 alignment throughout the project limits. A straight line traffic noise model was used to establish the study area. The model used the existing measured noise and the future predicted noise level to identify substantial increase of 10 dBA or more. The study area then extended to the limits where there exists a substantial increase in the future noise level.

Traffic Noise Measurement and Validation

Ambient noise levels were measured to describe the existing noise environment, identify major noise sources in the project area, and validate the noise model. Noise measurements were collected out to 1300 feet from the roadway to confirm the straight line model predictions as well as validate the model out to just beyond the 66 dBA contour.

Fifteen-minute L_{eq} measurements were collected at locations representative of all sound level environments within the study area during free-flowing traffic conditions. FHWA allows 15-min L_{eq} measurements to represent the L_{eq} (h). These traffic noise measurements are not a representation of “average” existing noise levels.

To ensure that the noise model used to predict traffic noise impacts accurately reflects the sound levels in the noise study area, a model is constructed using the same traffic volumes, speed, and vehicle types that were present during the sound level measurements. Modeled values must be within ±2.0 dBA of the measured levels for the model to be validated.

FHWA's Traffic Noise Model (TNM) Version 2.5 (FHWA, 2004) was used for validation and to predict future L_{eq} (h) traffic noise levels. TNM calculates precise estimates of noise levels at discrete points. The model estimates the sound levels from a series of straight-line roadway segments. TNM also considers the effects of existing barriers, topography, vegetation, and atmospheric absorption. Noise from sources other than traffic is not included so when non-traffic noise is present, such as aircraft noise, TNM will under predict the actual noise level. To create the model, design files outlining major roadways, topographical features, and sensitive receptors were imported into the TNM model as background features and the corresponding values were entered manually. Aerial photographs and site visits were used to verify site conditions.

Exhibit 7 describes the validation locations and the comparison of measured to modeled values. Noise levels were field measured at seven locations adjacent to the existing alignment. Fifteen-minute noise measurements were taken at each location. The measured noise levels were used to validate the noise model as described in the methodology section of this report. The noise levels at all seven measured sites were modeled using TNM. All of these sites were within 2.0 dBA of the measured values indicating that the model accurately represented site conditions. Although the noise validation was conducted in 2011, no new noise measurements were required for this analysis and the previously validated models were used for this study, with updated information from the design team.

No new noise readings were performed for this analysis for several reasons. First, much of this study was performed during the COVID-19 outbreak, and therefore traffic volumes are expected to be lower than normal. Also, based on a review of the area, there have not been any new developments in the general vicinity of the project that would be expected to result in a measurable difference in the existing noise environment. Finally, because the noise monitoring was primarily used to validate the model, and that task was completed, a validated model was available, no additional measurements were taken.

Recorded traffic information during the measurements is included in Appendix B. Exhibits 8 and 9 show the proposed SR 3 Freight Corridor alignment, the existing SR 3 highway and identify the locations of the receivers used in the noise analysis. Due to the length of the corridor two additional higher resolutions exhibits are provided for the Belfair area, Exhibit 10 is for the area north of Mason High School and Exhibit 11 for the area just east of the school. Note that receiver locations identified with noise impacts are under the Build Alternative only and on-site measurement locations are denoted by the letter V followed by a number.

Exhibit 7: Noise Model Validation

Location	Date	Start Time	Measured L_{eq} (dBA)	Modeled L_{eq} (dBA)	Difference (dBA)
V04	8/11/2011	12:43 pm	61.2	62.9	1.7
V05	8/11/2011	12:38 pm	54.5	53.2	-1.3
V06	8/11/2011	3:46 pm	69.9	69.5	-0.4
V07	8/11/2011	5:33 pm	59.6	60.3	0.7
V08	8/11/2011	4:36 pm	59.6	58.8	-0.8
V10	8/11/2011	4:30 pm	63.4	62.9	-0.5
V12	10/13/2011	4:10 pm	62.1	62.1	0.0

Exhibit 8: Southern Study Area Traffic Noise Measurement and Modeling Locations

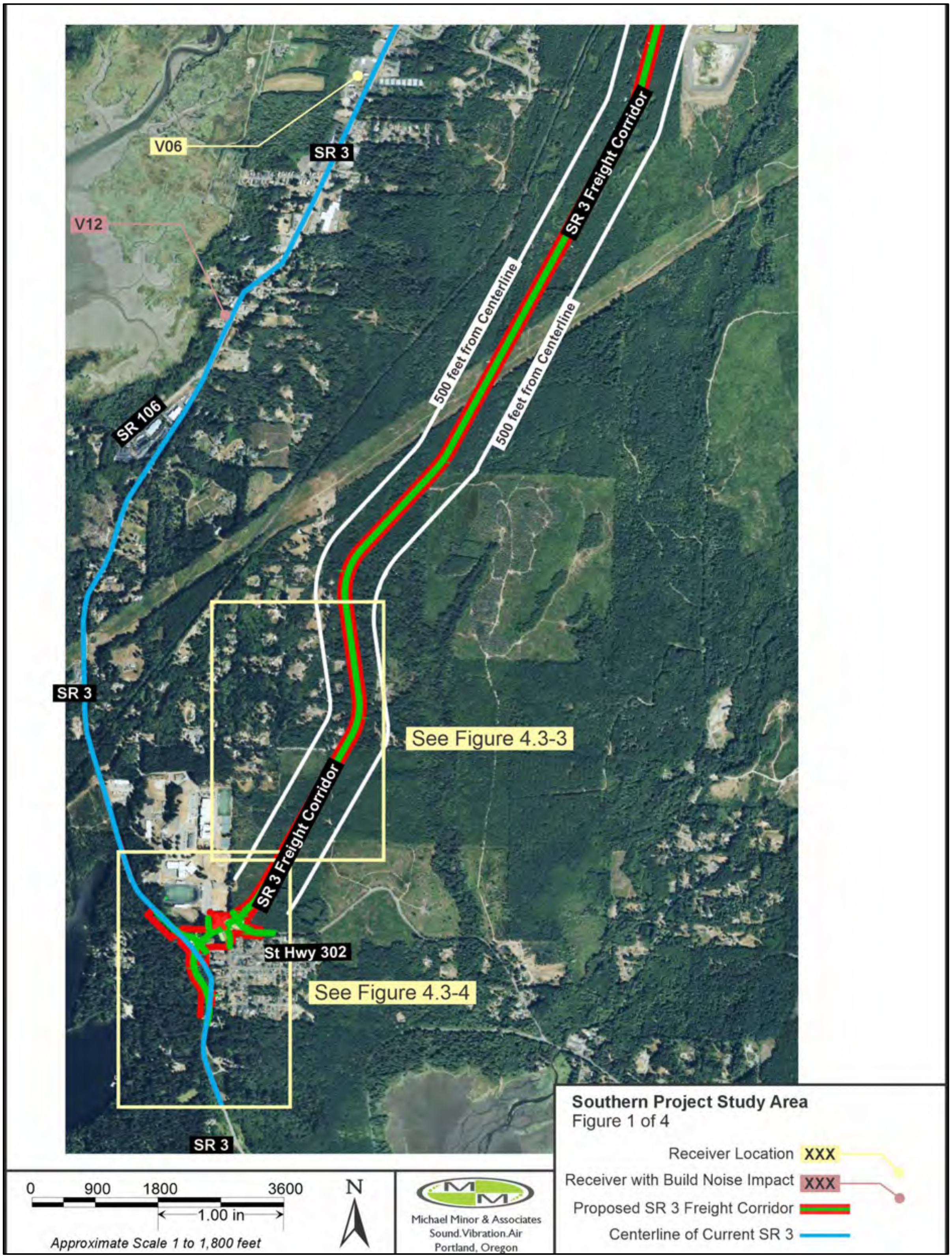


Exhibit 9: Northern Study Area Traffic Noise Measurement and Modeling Locations

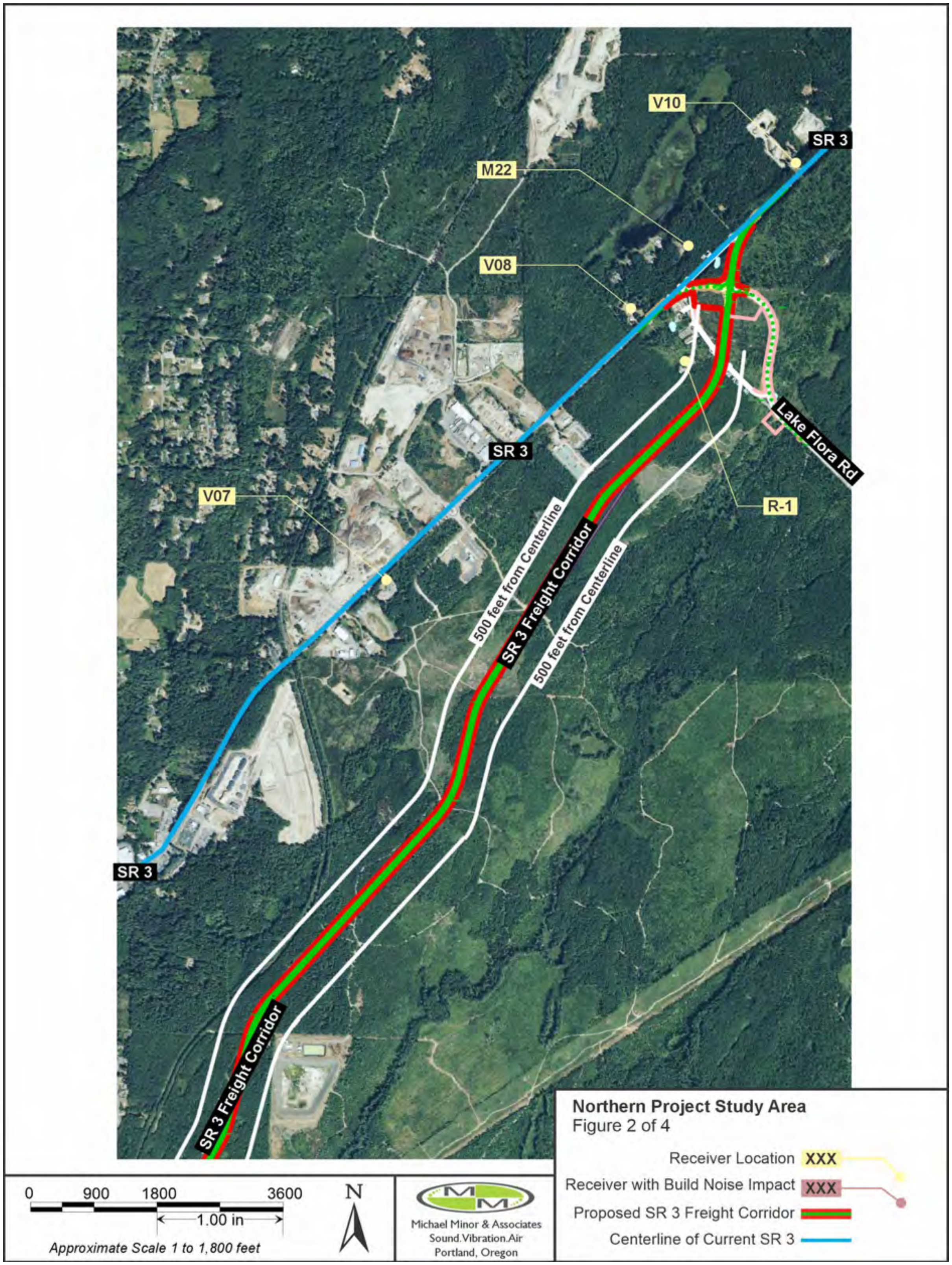


Exhibit 10: North Belfair Study Area Traffic Noise Measurement and Modeling Locations

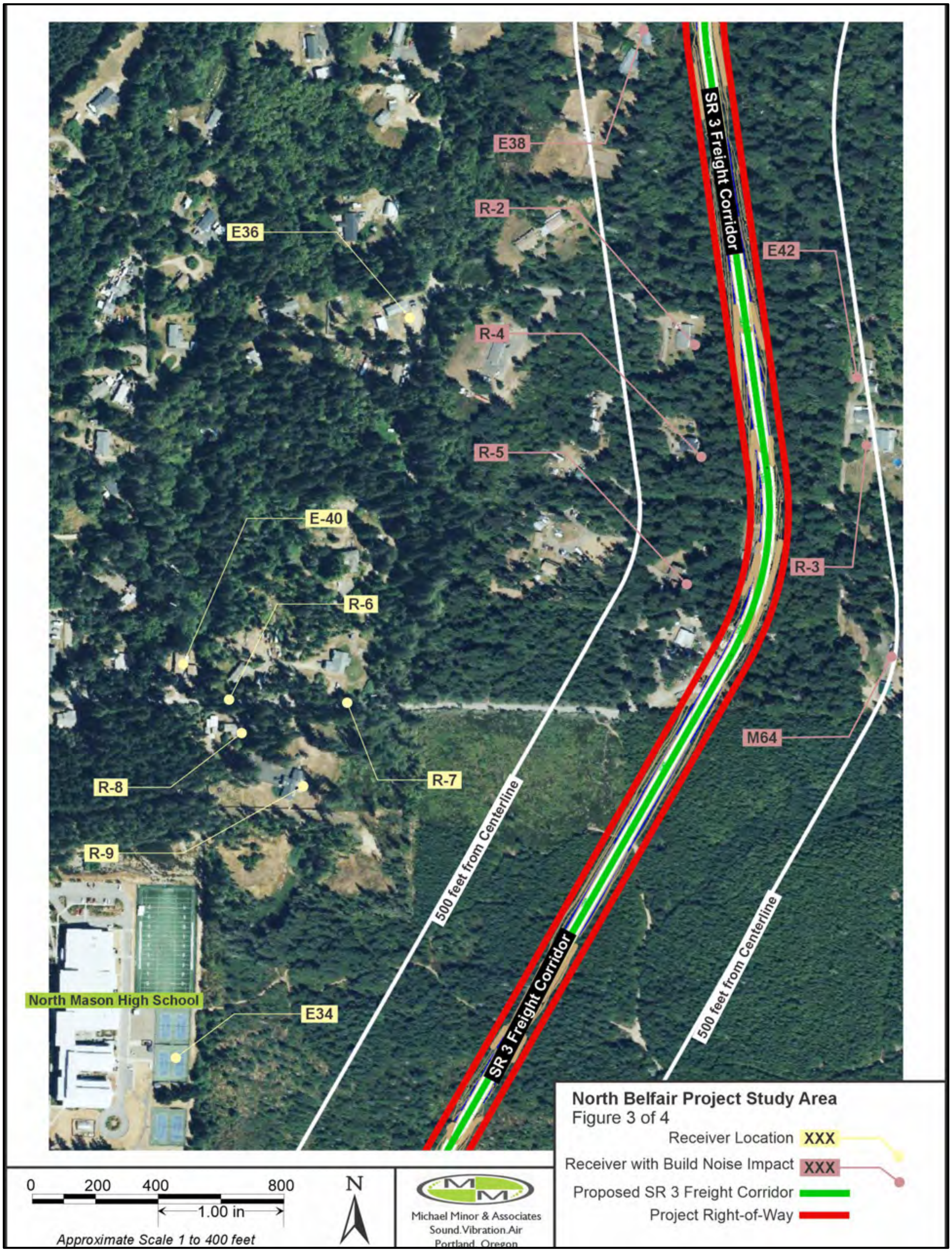
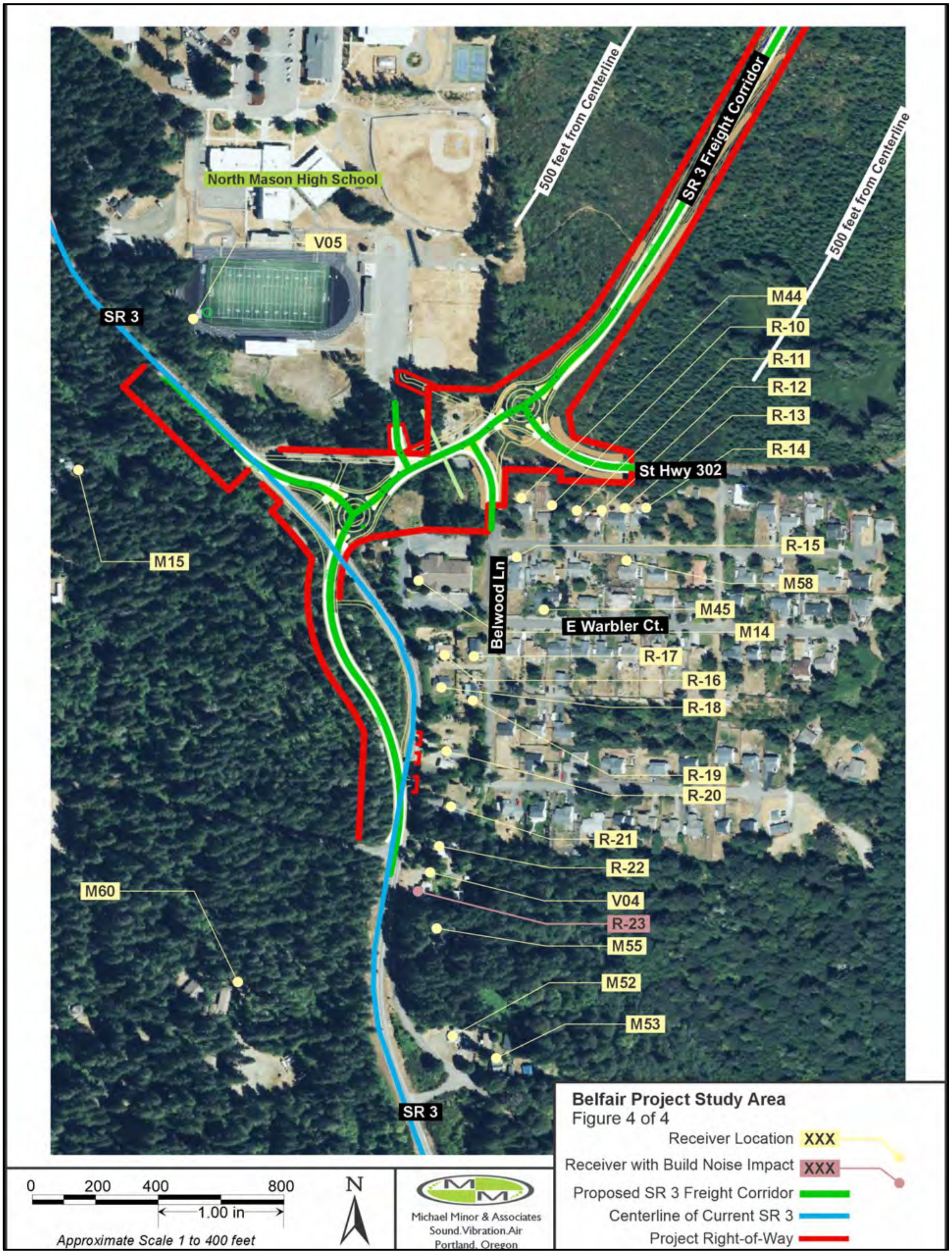


Exhibit 11: Belfair Study Area Traffic Noise Measurement and Modeling Locations



Traffic Noise Levels

Description of Study Area

The project study area extends 500 feet east and west of the centerline of the SR 3 alignment. As described above, the proposed project begins at the exiting highway MP 22.81 west of SR 302 intersection, and continues east through Mason County School District Property, bisecting the school property and undeveloped property to the east.

The highway continues north and passes through the eastern portion of the Alta neighborhood, serving as the connection to several properties. The mid portion of the highway runs through undeveloped forested land passing through the northwest corner of Mason County wastewater facility property. The northern portion goes from the Kitsap County Line passing through undeveloped, forested land to the connection with existing SR 3 at MP 29.49.

FHWA requirements and WSDOT policy dictate that noise studies assess properties adjacent to highway projects that may be potentially affected by traffic noise. Primary consideration must be given to areas of frequent outdoor use such as residences with yards, decks, or patios. Parks and schools with outdoor play areas also warrant primary consideration of potential noise impacts. With that in mind, the project area was assessed for these types of areas. See Exhibits 8 and 9 for aerial views of the project area with all measured and modeled sites denoted.

Operational Traffic Noise

Traffic operational noise analysis was conducted for three conditions:

- Existing condition – Five receivers representing seven residences meet or exceed the NAC.
- No Build condition – Nine receivers representing 12 residences meet or exceed the NAC.
- Build condition – Ten receivers representing 15 residences meet or exceed the NAC.

Existing Noise Level

Existing traffic noise levels for all modeled receivers are described in Exhibit 10 using 2018 PM peak traffic data generated for this project. Thirty-nine (39) receivers inclusive of the seven locations used for validation were included in the TNM model to represent properties within the project corridor. Exhibits 8 through 11 identify the location of the modeled sites labeled with numbers preceded by the letter M and R. Results of this model run are listed in Appendix C. Five receivers representing 7 dwelling units of the modeled receivers were at or above impact level under the existing conditions.

Design year Traffic Noise Level - No Build (Year 2050)

Under the No Build Alternative, noise levels are projected to increase by about 1-3 dBA from existing noise levels across all modeled receivers within the existing alignment vicinity (Exhibit 12). This change is a result of projected increases in traffic volumes on SR 3 in the design year of 2050. The result shows that nine receivers representing 12 dwelling units are projected to be at or above impact level under the No Build condition. Actual maximum noise level increases may be less than the predicted increase since congestion may reduce traffic speed during peak traffic hours. Should this occur, peak noise levels may be similar to existing noise levels; however, they would occur for a longer period each day.

Design Year Traffic Noise Level - Build (Year 2050)

Future 2050 PM Peak traffic data for all modeled roadways was used in the TNM model to determine the design year traffic noise levels at all modeled receiver locations. Under the Build Alternative, noise levels are projected to increase by 1 dBA to 20 dBA over existing noise levels within the project area. The modeling results show that three receivers representing five residences are projected to be at or above impact level under the Build condition. In addition, seven receivers representing 10 residences would meet the substantial increase impact criteria under the Build Alternative. All 15 properties projected to be at or above impact level or meet the substantial increase impact criteria in the Build scenario are analyzed for noise abatement later in this report.

Exhibit 12: Modeled Noise Results

Site #	Location (see Exhibits 7 & 8)	Dwelling Units	Existing (2018) L_{eq} (dBA)	No Build (2050) L_{eq} (dBA)	Build (2050) L_{eq} (dBA)	Build Vs Existing (dB)	Build Vs No Build (dB)
V04	Residential Property	2	**66**	**68**	**66**	0	-2
V05	H. School Track Field	1	61	63	59	-2	-4
V06	Residential Property	3	61	64	63	2	-1
V07	Church	2	63	**66**	64	1	-2
V08	Residential Property	1	57	59	57	0	-2
V10	Residential Property	2	60	61	61	1	0
V12	Residential Property	2	**67**	**69**	**67**	0	-2
M14	Residential Property	1	61	63	59	-2	-4
M15	Residential Property	1	52	54	52	0	-2
M22	Residential Property	1	55	56	53	-2	-3
E34	H. School Tennis Court	3	43	45	46	3	1
E36	Residential Property	1	40	42	45	5	3
E38	Residential Property	3	39	42	59	**20(s)**	17
E40	Residential Property	1	41	44	44	3	0
E42	Residential Property	2	38	40	54	**16(s)**	14
M44	Residential Property	4	58	60	58	0	-2
M45	Residential Property	4	52	54	53	1	-1
M52	Residential Property	1	58	60	58	0	-2
M53	Residential Property	2	55	57	55	0	-2
M55	Residential Property	3	61	63	61	0	-2
M58	Residential Property	4	51	53	52	1	-1
M60	Residential Property	2	50	52	51	1	-1
M64	Residential Property	1	38	41	50	**12(s)**	9
R-1	Residential Property	1	50	53	55	5	2
R-2	Residential Property	1	39	41	59	**20(s)**	18
R-3	Residential Property	1	38	40	54	**16(s)**	14

Site #	Location (see Exhibits 7 & 8)	Dwelling Units	Existing (2018) L_{eq} (dBA)	No Build (2050) L_{eq} (dBA)	Build (2050) L_{eq} (dBA)	Build Vs Existing (dB)	Build Vs No Build (dB)
R-4	Residential Property	1	39	41	57	**18(s)**	16
R-5	Residential Property	1	39	41	56	**17(s)**	15
R-6	Residential Property	1	41	43	44	3	1
R-7	Residential Property	1	40	43	45	5	2
R-8	Residential Property	1	41	43	44	3	1
R-9	Residential Property	1	41	43	45	4	2
R-10	Residential Property	1	56	58	57	1	-1
R-11	Residential Property	1	55	57	57	2	0
R-12	Residential Property	1	55	57	57	2	0
R-13	Residential Property	1	56	58	57	1	-1
R-14	Residential Property	1	56	58	57	1	-1
R-15	Residential Property	1	53	55	54	1	-1
R-16	Residential Property	1	64	**66**	59	-5	-7
R-17	Residential Property	1	59	61	56	-3	-5
R-18	Residential Property	1	**67**	**69**	61	-6	-8
R-19	Residential Property	1	61	64	57	-4	-7
R-20	Residential Property	1	**66**	**68**	64	-2	-4
R-21	Residential Property	1	64	**66**	64	0	-2
R-22	Residential Property	1	65	**67**	65	0	-2
R-23	Residential Property	1	**68**	**70**	**68**	0	-2

Red Bold numbers represent noise levels at or above WSDOT impact level with substantial increase impacts of 10 dBA or greater denoted with (s).

Construction Noise

Construction Noise Background

Construction creates temporary noise. Construction is usually carried out in reasonably discrete steps, each with its own mix of equipment and noise characteristics. For example, roadway construction involves demolition, construction, and paving.

The most constant noise source at construction sites is usually engine noise. Mobile equipment generally operates intermittently or in cycles of operation, while stationary equipment, such as generators and compressors, generally operates at fairly constant sound levels. Trucks are present during most phases of construction and are not confined to the project site, so noise from trucks may affect more receivers than other construction noise. Other common noise sources include impact equipment, which could be pneumatic, hydraulic, or electric powered.

Noise levels during the construction period depend on the type, amount, and location of construction activities.

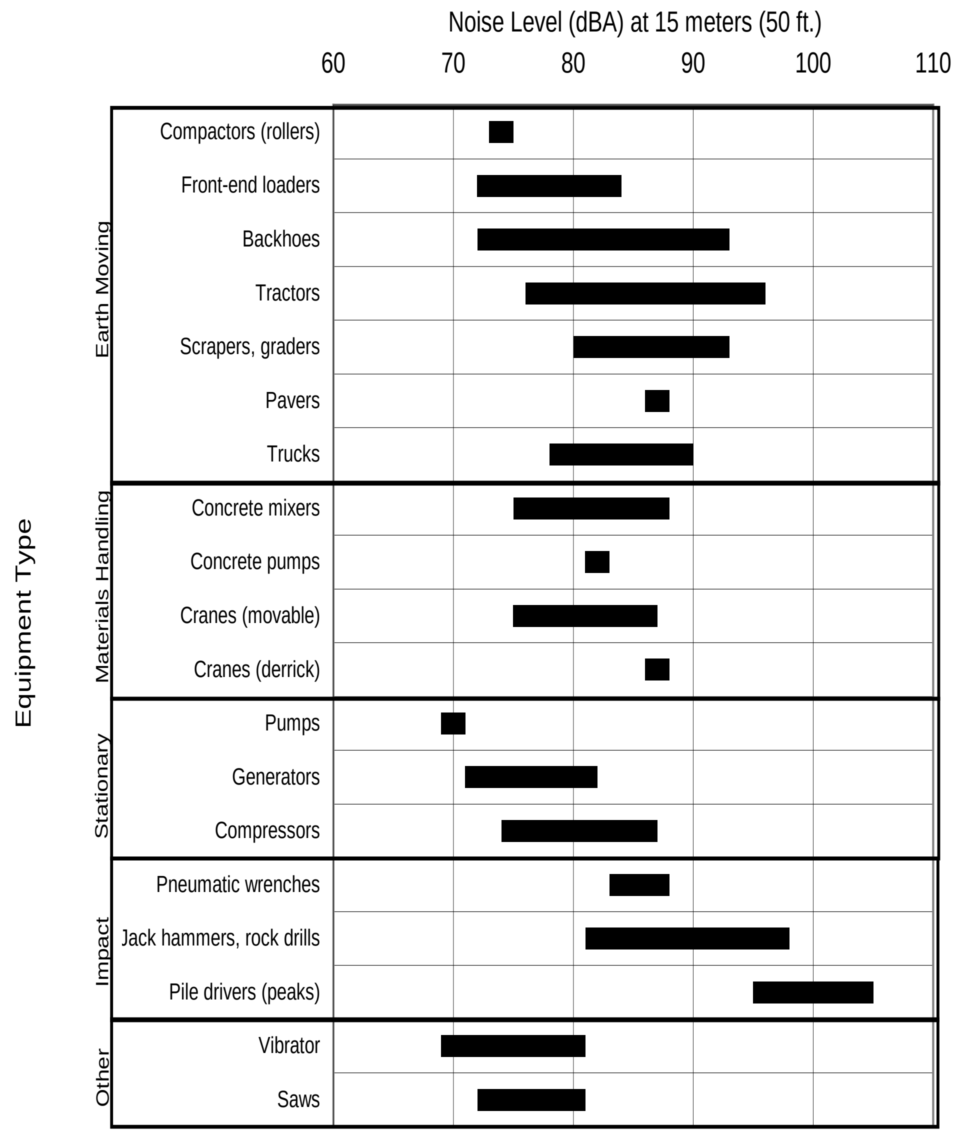
- The type of construction methods establishes the maximum noise levels.
- The amount of construction activity establishes how often certain construction noises occur throughout the day.
- The location of construction equipment relative to adjacent properties determines the effect of distance in reducing construction noise levels.

The maximum noise levels of construction equipment would be similar to the maximum construction equipment noise levels presented in Exhibit 13 and typically range from 69 to 106 dBA at 50 feet. As a point source, construction noise decreases by 6 dBA per doubling of distance from the source moving away from the equipment. The various pieces of equipment are almost never operating simultaneously at full-power and some would be turned off, idling, or operating at less than full power at any time. Therefore, the average L_{eq} noise levels would be less than aggregate of the maximum noise levels in Exhibit 13.

Construction Noise Variance for Night Work

Construction noise is exempt from local property line regulations during daytime hours. If nighttime construction is required for this project, WSDOT will apply for variances or exemptions from local noise ordinances for the night work. Noise variances or exemptions require construction noise abatement measures that vary by jurisdiction. If night work is necessary for this project, noise variances are needed from the local jurisdictions.

Exhibit 13: Construction Equipment Noise Ranges



Source: EPA, 1971 and WSDOT, 1991.

Traffic Noise Abatement

Traffic Noise Abatement - Background

Noise abatement is considered only where there is an expected noise level of 66 dBA Leq or higher or an increase of 10 dBA over existing conditions for residences, schools, churches and other sensitive land uses (see Exhibit 5 FHWA Category B and C), or 71 dBA Leq for FHWA Category E. If such a situation exists, abatement is considered only where frequent human use occurs and where a lower noise level would have benefits (U.S. DOT, 1982). Noise levels can be reduced by the following types of abatement: (1) traffic management, such as restrictions on the types of vehicles and the time they may use a certain roadway; (2) change in vertical or horizontal alignment of the roadway; (3) acquisition of property; and (4) construction of noise barriers, such as noise walls.

Abatement was considered for this project because there are traffic noise impacts. Some of the modeled noise levels are at or above the WSDOT NAC levels or the 10 dBA substantial noise levels. Increases were modeled between the existing and Build conditions.

Abatement must be both feasible and reasonable for it to be recommended.

Feasibility

Feasibility is a combination of acoustic and engineering considerations. All of the following must occur for abatement (e.g., noise barrier) to be considered feasible:

- Abatement must be physically constructible.
- A minimum of three (3) first row impacted receivers must obtain a minimum 5 dBA of noise reduction as a result of abatement (insertion loss); assuring that every reasonable effort will be made to assess outdoor use areas as appropriate.

For this project, four noise barriers were evaluated to determine whether abatement could sufficiently reduce traffic noise levels. All four noise barriers were found to be feasible by reducing noise levels at a minimum of three (3) first row impacted receivers by a minimum of 5 dBA. For each noise barrier analysis, all receivers potentially benefited were included regardless of whether they are impacted. Additional noise wall dimensions for these noise barriers were evaluated as part of the reasonableness determination. (See Exhibits 14, 15, 16 and 17). The locations of these noise walls are shown in Exhibits 18 and 19.

Exhibit 14: Feasibility Analysis Wall 1

				Min. Design Goal	
Site and Land Use Category	Existing (L_{eq}) (dBA)	Build (L_{eq}) (dBA)	1st Row?	Noise Reduction (dBA)	% 1st Row ≥ 5 dBA
V04 (B)	66	66	Yes	5	
M55 (B)	61	61	Yes	2	
R-21 (B)	64	64	Yes	3	50 %
R-22 (B)	65	65	Yes	5	
R-23 (B)	68	68	Yes	7	
				Feasible?	Yes

Exhibit 15: Feasibility Analysis Wall 2

				Min. Design Goal	
Site and Land Use Category	Existing (L_{eq}) (dBA)	Build (L_{eq}) (dBA)	1st Row?	Insertion Loss (dBA)	% 1st Row ≥ 5 dBA
E38 (B)	39	59	Yes	7	100%
				Feasible?	Yes

Note: E38 represents 3 front row residences

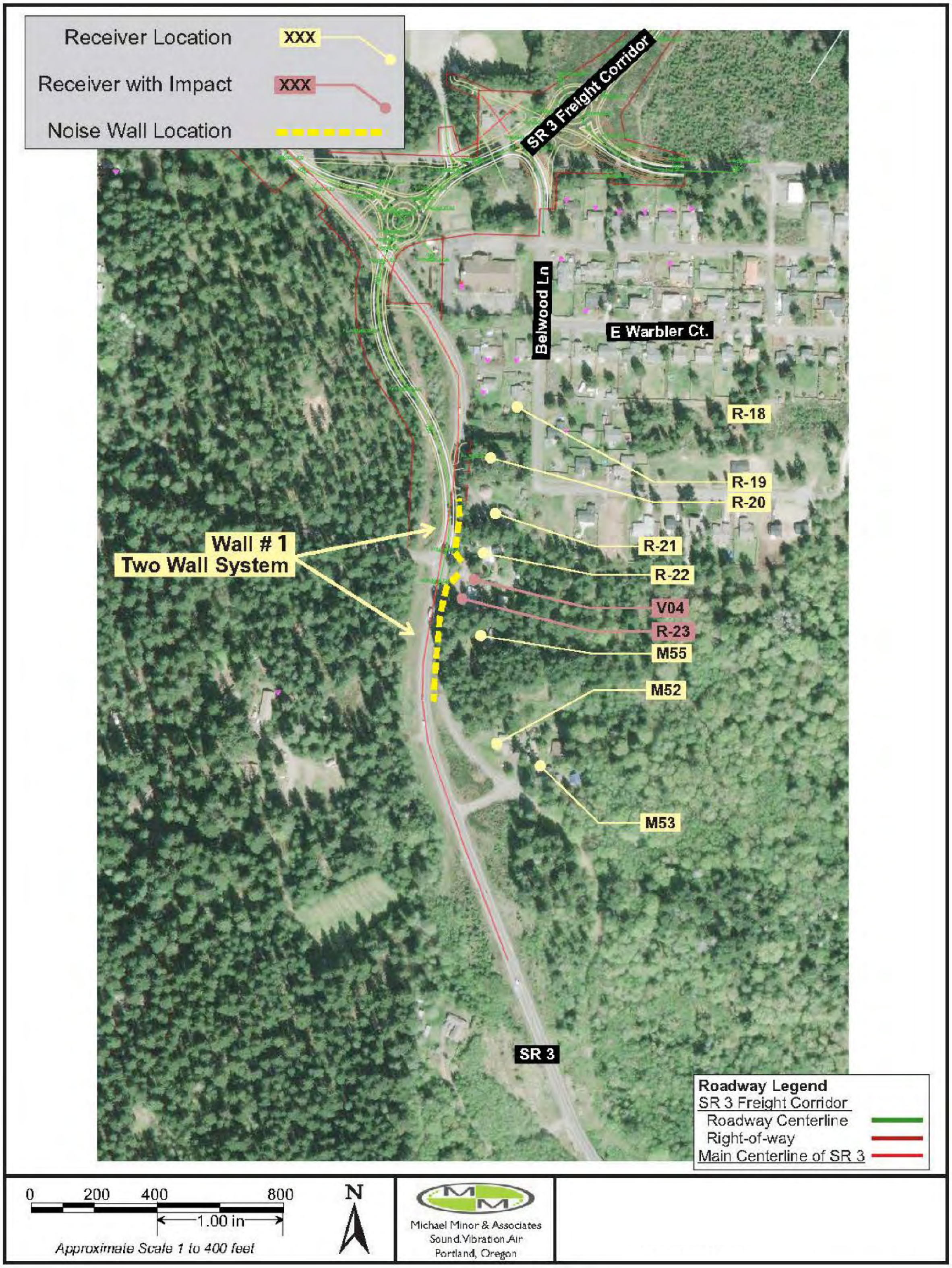
Exhibit 16: Feasibility Analysis Wall 3

				Min. Design Goal	
Site and Land Use Category	Existing (L_{eq}) (dBA)	Build (L_{eq}) (dBA)	1st Row?	Insertion Loss (dBA)	% 1st Row ≥ 5 dBA
E42 (B)	38	54	Yes	5	
M 64 (B)	38	50	Yes	5	100 %
R-3 (B)	38	54	Yes	7	
				Feasible?	Yes

Exhibit 17: Feasibility Analysis Wall 4

				Min. Design Goal	
Site and Land Use Category	Existing (L_{eq}) (dBA)	Build (L_{eq}) (dBA)	1st Row?	Insertion Loss (dBA)	% 1st Row ≥ 5 dBA
R-2 (B)	39	59	Yes	5	
R-4 (B)	39	57	Yes	7	100 %
R-5 (B)	39	57	Yes	5	
				Feasible?	Yes

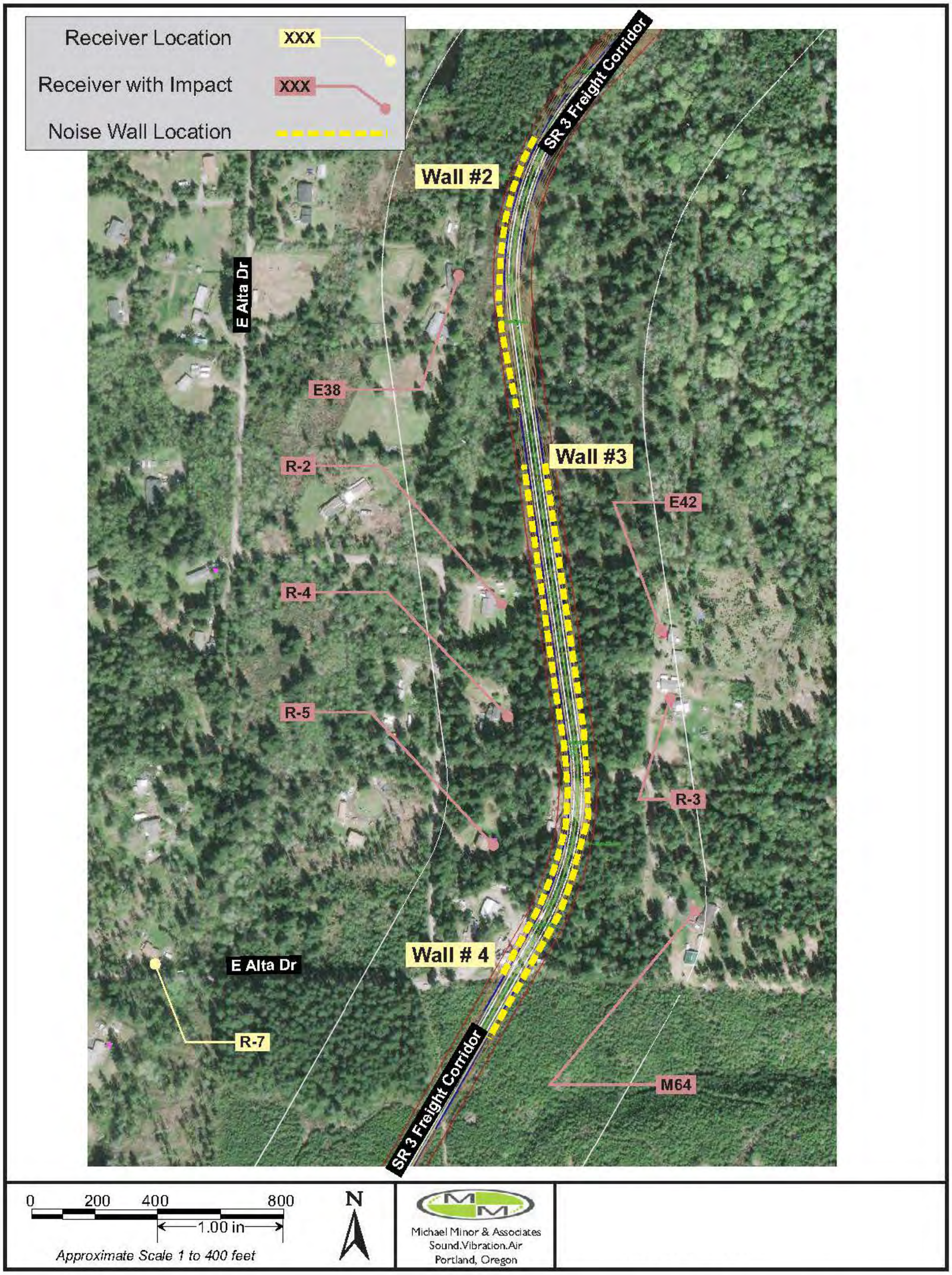
568 **Exhibit 18: Noise Abatement Considered – Wall #1**



569

570

Exhibit 19: Noise Abatement Considered – Walls #2, 3 and 4



Reasonableness

Since abatement for Walls 1 through 4 are feasible, the reasonableness of abatement was evaluated. Noise walls will only be constructed by the WSDOT if they have been determined to be reasonable by satisfying two criteria below.

1. Cost Effectiveness

The cost of noise abatement sufficient to provide at least the minimum feasible noise reductions must be equal to or less than the allowable cost of abatement for each noise wall location analyzed. Based on noise wall costs from 2010-2015, the current average costs for Washington State is $51.61. The cost is applied to the allowed wall surface area (ft^2) to generate the allowable cost per qualified resident described in Exhibit 20.

Either wall square footage or cost can be used to evaluate cost effectiveness, unless costs for the wall exceed the cost of a standard design noise wall, then cost must be used to compare the wall cost to the allowable cost. For this project, a standard noise wall design was evaluated, and costs are used to describe the cost effectiveness. The allowable cost per receiver, based on Build condition traffic noise levels is described in Exhibit 20.

Exhibit 20: Reasonableness Allowances

Column A	Column B	Column C	Column D
Design Year Traffic Sound Decibel Level (dBA)	Noise level increase as a result of the project (dBA)[2]	Allowed Wall Surface Area Per Qualified Residence or Residential Equivalent	Allowed Cost Per Qualified Residence or Residential Equivalent[1]
66		700 Sq Feet	$36,127
67		768 Sq Feet	$39,636
68		836 Sq Feet	$43,146
69		904 Sq Feet	$46,655
70		972 Sq Feet	$50,165
71	10 (substantial, step 1) [3]	1,040 Sq Feet	$53,674
72	11 (substantial, step 1)	1,108 Sq Feet	$57,184
73	12 (substantial, step 1)	1,176 Sq Feet	$60,693
74	13 (substantial, step 1)	1,244 Sq Feet	$64,203
75	14 (substantial, step 1)	1,312 Sq Feet	$67,712
76	15 (substantial, step 2)[4]	1,380 Sq Feet	$71,222

(1) Current costs based on $51.61 per square foot constructed cost developed in 2011.

(2) If the noise level increases 10 dBA or more as the result of the project (Column B), follow the allowed wall surface and cost for the level of increase in Column C in lieu of the total design year sound decibel level in Column A. For total highway related sound levels at 76 or more dBA or the project results in an increase of 15 or more decibels, continue increasing the allowance at the rate provided in the table unless circumstances determined on a case-by case basis require an alternative methodology for determining allowance.

(3) Step 1 is when the noise levels are 10 to 14 dBA over future No Build condition traffic noise as a result of the transportation project.

(4) Step 2 is when the noise levels are 15 or more dBA over existing traffic noise as a result of the transportation project (or total highway related noise levels are between 76 and 79 decibels). Additional consideration for abatement may be considered under these circumstances.

2. Design Goal Achievement

The design goal for abatement on all projects for reasonableness, is at least 7 dBA of reduction for one first row receiver. Noise walls cannot be recommended if they do not achieve the design goal. In addition to the design goal requirement, WSDOT makes a reasonable effort to get 10 dBA or greater insertion loss (noise reduction) at the first row of receivers for all projects where abatement is recommended.

Exhibit 20 describes the allowable cost per receiver and the cost of the minimum barrier size to achieve the design goal.

Noise Wall #1 (feasible but not reasonable)

A noise wall was analyzed to abate the impacts at receivers V04 and R-23. Additional non-impacted receivers that would potentially benefit from the noise wall were included in the reasonableness calculations. A 413 foot long noise wall with a height of 10 feet would provide a 7 dBA of noise reduction at R-23, therefore meeting the reasonableness requirement. However, the allowed cost of the wall is $72,254 whereas the cost of the wall would be $148,998 which does not meet WSDOT's reasonableness criteria and is not recommended for construction.

Noise Wall #2 (feasible but not reasonable)

A noise wall was analyzed for the three impacted front row residences represented by receiver E38. A 768 foot long noise wall with a height up to 12 feet would provide the required 7 dBA reduction, therefore meeting the reasonableness requirement. However, the allowed cost of the wall is $108,381 whereas the cost of the wall would be $446,014 which does not meet WSDOT's reasonableness criteria and is not recommended for construction.

Noise Wall #3 (feasible but not reasonable)

A noise wall was analyzed for the substantial increase impacts determined at receivers E42, M64 and R-3. A 1,636 foot long noise wall with a height up to 14 feet would provide the required 7 dBA reduction at R-3, thereby meeting the reasonableness requirement. However, the allowed cost of the wall is $144,508 whereas the cost of the wall would be $1,033,439 which does not meet WSDOT's reasonableness criteria and is not recommended for construction.

Noise Wall #4 (feasible but not reasonable)

A noise wall was analyzed for the substantial increase impacts determined at receivers R-2, R-3 and R-4. A 1,368 foot long noise wall with a height up to 16 feet would provide the required 7 dBA reduction at R-4, thereby meeting the reasonableness requirement. However, the allowed cost of the wall is $108,381 whereas the cost of the wall would be $923,819 which does not meet WSDOT's reasonableness criteria and is not recommended for construction.

Recommendation for Traffic Noise Abatement

Traffic noise abatement is not recommended because each noise wall analyzed was found to be feasible but not reasonable. Therefore, noise barriers are not recommended for this project.

Construction Noise Abatement

Construction noise can be reduced by using enclosures or walls to surround noisy equipment, installing mufflers on engines, substituting quieter equipment or construction methods, minimizing time of operation, and locating equipment farther away from noise sensitive receivers, e.g., homes. To reduce construction noise at nearby receptors, the following abatement measures can be incorporated into construction plans and contractor specifications:

- Limiting construction activities to between 7 a.m. and 10 p.m. would reduce construction noise levels during sensitive nighttime hours
- Using haul vehicles with rubber bed-liners would reduce noise from loading trucks
- Equipping trucks with ambient backup alarms would reduce the noise for equipment backing
- Equipping construction equipment engines with adequate mufflers, intake silencers, and engine enclosures would reduce their noise by 5 to 10 dBA (U.S. EPA, 1971)

- Specifying the quietest equipment available would reduce noise by 5 to 10 dBA
- Turning off construction equipment during prolonged periods of nonuse would eliminate noise from construction equipment during those periods
- Requiring contractors to maintain all equipment and train their equipment operators would reduce noise levels and increase efficiency of operation
- Locating stationary equipment away from receiving properties would decrease noise from that equipment in relation to the increased distance
- Constructing temporary noise barriers or curtains around stationary equipment that must be located close to residences would decrease noise levels at nearby sensitive receptors

References

1. U.S. Department of Transportation, Federal Highway Administration directive "Highway Traffic Noise: Analysis and Abatement," Revised December 2010.
2. U.S. Department of Transportation, Federal Highway Administration "Highway Traffic Noise: Analysis and Abatement Guidance," Revised December 2010.
3. United States Code of Federal Regulations (CFR) Part 772 (23 CFR Part 772), July 2010
4. U.S. Department of Transportation, Federal Highway Administration, 1996. *Measurement of Highway-Related Noise*. Washington D.C.
5. U.S. Department of Transportation, Federal Highway Administration, 1998. *FHWA Traffic Noise Model User's Guide*. Washington D.C.
6. U.S. Department of Transportation, Federal Transit Administration, 1995. *Transit Noise and Vibration Impact Assessment*. Washington D.C.
7. U.S. Environmental Protection Agency, 1971. Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances. Washington, D.C.
8. U.S. Environmental Protection Agency, 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. Report Number 550/9-74-004.
9. Washington Administrative Code, 1989. Chapter 173-60*. Maximum Environnemental Noise Levels*. Olympia, Washington.
10. Washington State Department of Transportation, July 2020. Traffic Noise Policy and Procedures. Olympia, Washington.

APPENDIX A - Traffic Noise Analysis and Abatement Process

When are Noise Reports and/or Recommendations Final?

The noise abatement process from the preparation of a noise wall to the final noise wall design (or decision not to build) can be confusing. The following process attempts to provide some clarification to project teams and outlines a recommended "standard" process, but acknowledges that variations to this process are likely because of the differences between projects.

Environmental Discipline Reports

The noise analyst works with the project team to model project elements affecting noise that include traffic, topography, and the location of noise sensitive receivers. If traffic noise impacts are discovered through modeling, then abatement is evaluated.

Abatement is compared to the feasibility (constructability, effectiveness) and reasonableness (allowable barrier size/cost) for a "standard" project. If abatement is feasible and reasonable, the report recommends the optimal (cost to benefit) noise barrier.

The traffic noise discipline report can be finalized.

Design Phase

Design Phase and Public Involvement steps (below) may be incorporated before report is finalized.

The project office reviews the recommended noise wall height and horizontal alignment to determine if there are any conflicts that were not realized at the time the discipline report was prepared.

If conflicts from utilities, steep slopes, etc. are present, the details and costs of the conflicts are provided to the noise analyst by the project team. The noise analyst will then add any additional ("but for" the noise wall) costs to the reasonableness evaluation. If noise wall costs including accommodation of conflicts are still less than the allowable costs for the noise wall, the barrier height and/or alignment are re-evaluated and a new barrier will be recommended. If barrier costs plus the new costs exceed the allowable costs, the barrier may not be recommended by the ANE Program.

If a noise wall is recommended, ANE Program will review and confirm noise wall dimensions throughout design process.

Public Involvement

If abatement is recommended in the Traffic Noise Discipline Report, public outreach to determine public desires for abatement must occur. The noise wall discussion may be introduced to the public before the Design Phase, but should happen after the noise wall alignment, height, and length (or other abatement description) is established so that people can understand any effects of the noise wall (or other abatement) on their community.

The final determination whether to construct a noise wall or other abatement that is recommend in the traffic noise analysis, cannot be made until public outreach has occurred.

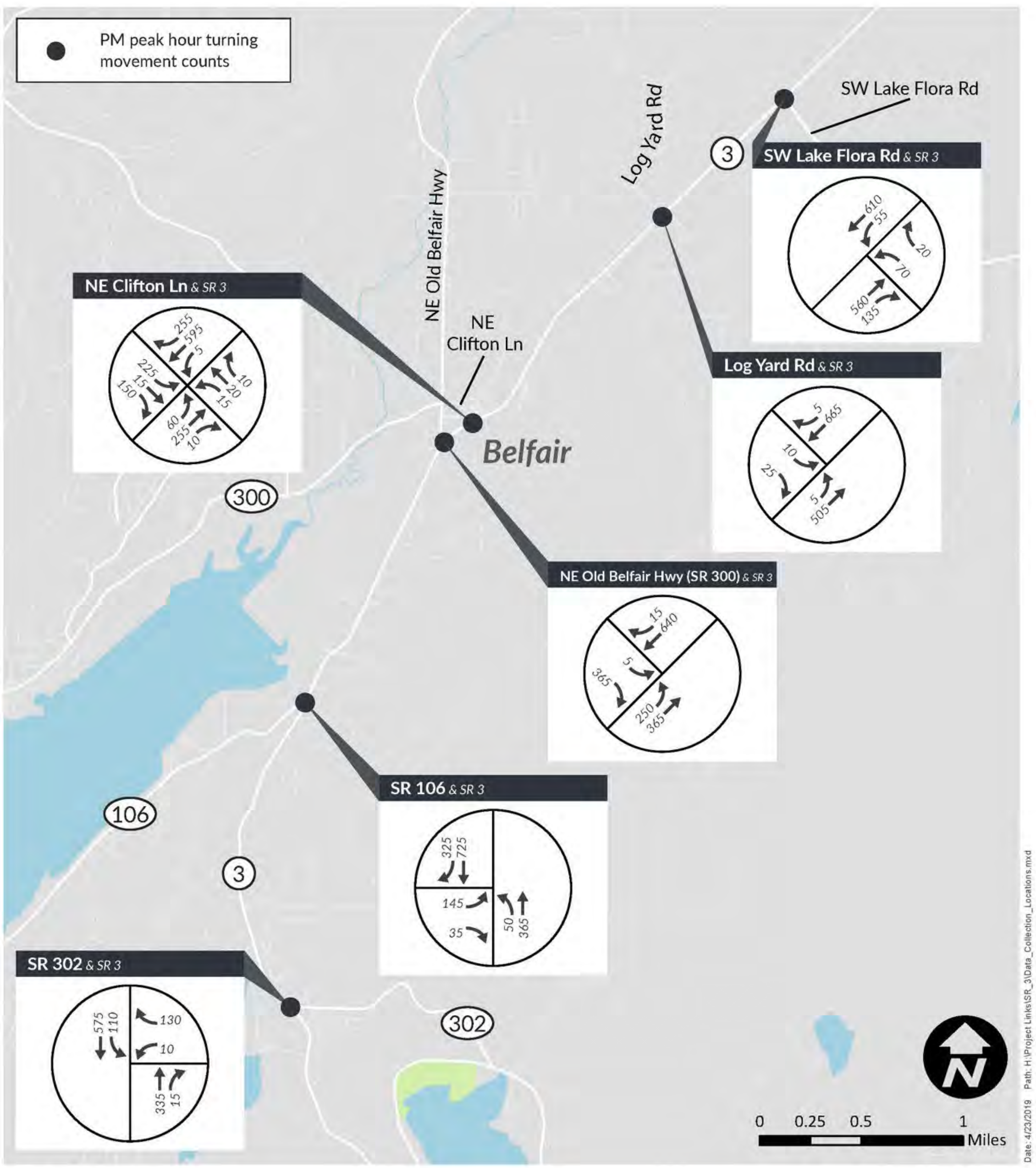
Final Steps

Any updates to the Traffic Noise Discipline report to clarify changes that occurred during the Design Phase or from Public Involvement can be made at the project engineering offices discretion. Addendum or supplementary memorandum to clarify changes can also be added to the discipline report or project file.

The noise wall is constructed or a letter from the ANE Program is added to the project file clarifying why a noise wall was not constructed.

Appendix B – Traffic Data

Data excerpted from SR 3 Freight Corridor Transportation Discipline Report, May 2021.



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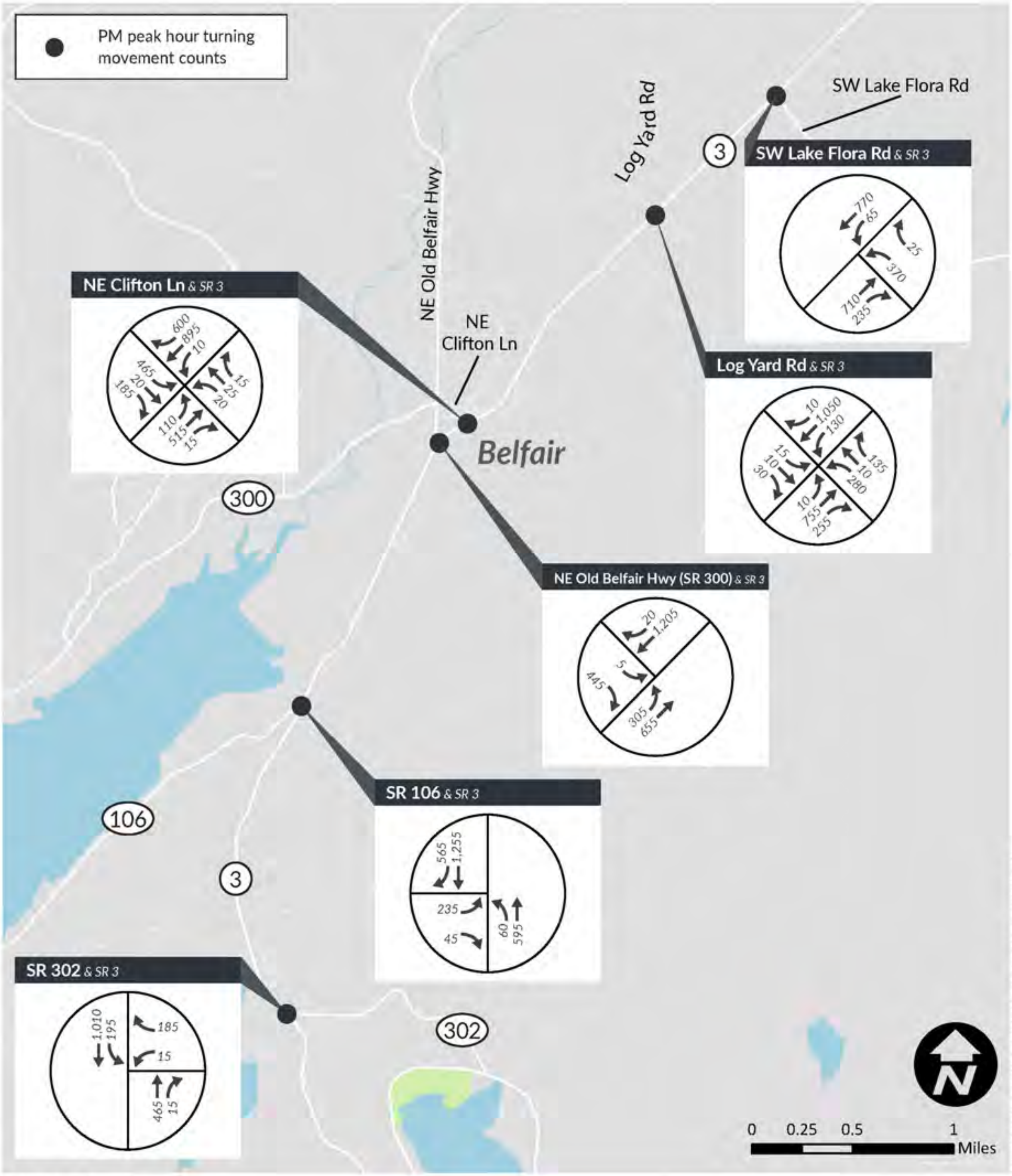
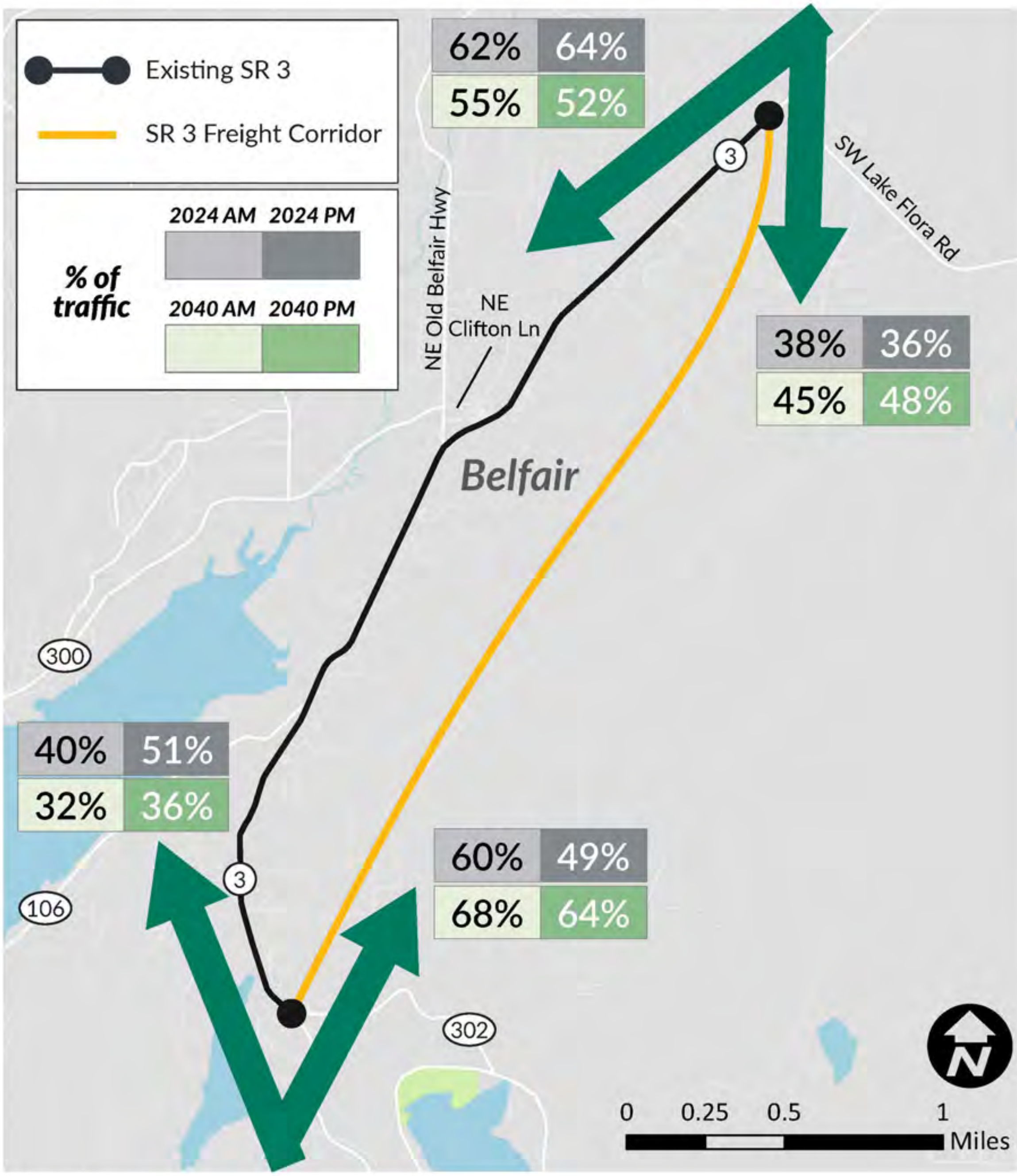
[redacted] Existing PM Peak Hour Volumes
SR 3 Freight Corridor



© Mapbox, © OpenStreetMap

[redacted] **2040 PM Peak Hour - No Build Volumes**
SR 3 Freight Corridor



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[redacted] **Forecasted Peak Hour Travel Patterns**
SR 3 Freight Corridor

APPENDIX C – Residential Equivalency Calculations

Residential equivalents are used to equate the use of common outdoor use areas to individual outdoor use areas. To determine residential equivalency for parks or other non-individual household uses, three types of information must be established: the usage factor of the area, the number of users, and the equation of users to residences.

Exhibit 21: Usage Factors Calculations

Site	Hours/Day	Days/Week	Months/Year	Usage Factor
School Track Field	3/24	7/7	9/12	0.09
Church	6/24	3/7	12/12	0.11
School Tennis Court	10/24	7/7	9/12	0.625
Hours/Day X	**Days/Week X**	**Months/Year =**	**Usage Factor**	

Exhibit 22: School Track Field Residential Equivalency Calculation

Description	Values
Usage Factor for School Track Field	0.09
Average number of users at one time	X 50
Average number of people per household (WA State average)	/2.53
Residential Equivalents	1

Exhibit 23: Church Residential Equivalency Calculation

Description	Values
Usage Factor for the Church	0.11
Average number of users at one time	X 50
Average number of people per household (WA State average)	/2.53
Residential Equivalents	2

Exhibit 24: School Tennis Court Residential Equivalency Calculation

Description	Values
Usage Factor for School Tennis Court	0.625
Average number of users at one time	X 12
Average number of people per household (WA State average)	/2.53
Residential Equivalents	3

Appendix D - TNM Modeling Files: for WSDOT Electronic Delivery