5.2 Noise and Vibration Analysis

Noise levels will increase in some locations. WSDOT will construct a new noise barrier along the east edge of I-405, north of I-90 to reduce traffic noise levels in this area.

Sound is an element of daily life that we call noise when we perceive it as unpleasant, unwanted, or disturbingly loud. We considered the effects of noise to understand the potential effect of traffic and construction noise on public health and welfare.

In this section of the EA, we consider the project's potential to cause traffic noise and noise during construction, and whether the project will include mitigation measures such as noise barriers to buffer noise-sensitive areas from the roadway.

What is our study area for this analysis?

The study area for the noise analysis extends approximately 500 feet from roadway improvements associated with the project. In some special circumstances we expand the study area to include the nearest sensitive receptor as determined by best professional judgment.

How did we evaluate existing and future noise levels?

We use the FHWA Traffic Noise Model to estimate traffic noise levels. The model uses current noise levels and traffic volumes to make projections for the future. We modeled existing year (2002) and future year (2030) both with and without the project.

We modeled existing noise levels at 66 sensitive receptor locations within the study area that represent 253 residences, two hotels, and a park. Exhibit 5.2-1 shows locations of the 66 monitoring receptors and the future modeled noise effect results.

Noise regulations and guidelines are the basis for evaluating potential noise effects. For state and federally funded highway projects, traffic noise effects occur when predicted $L_{eq}(h)$ noise levels approach or exceed the noise abatement criteria (NAC) established by the FHWA, or substantially exceed existing noise levels. ($L_{eq}(h)$ is defined in the sidebar on page 5.2-5.)

An existing noise wall

Please refer to the Bellevue Nickel Improvement Project Noise and Vibration Discipline Report in Appendix M (on CD) for a complete discussion of the Noise and Vibration analysis.

What is a sensitive receptor?

We use this term to identify land uses and activities eligible for protection from freeway noise under FHWA's noise abatement criteria. Common sensitive receptors include: picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.

Exhibit 5.2-1. Modeled Receptor Noise Levels and Locations (Sheet 1 of 3)

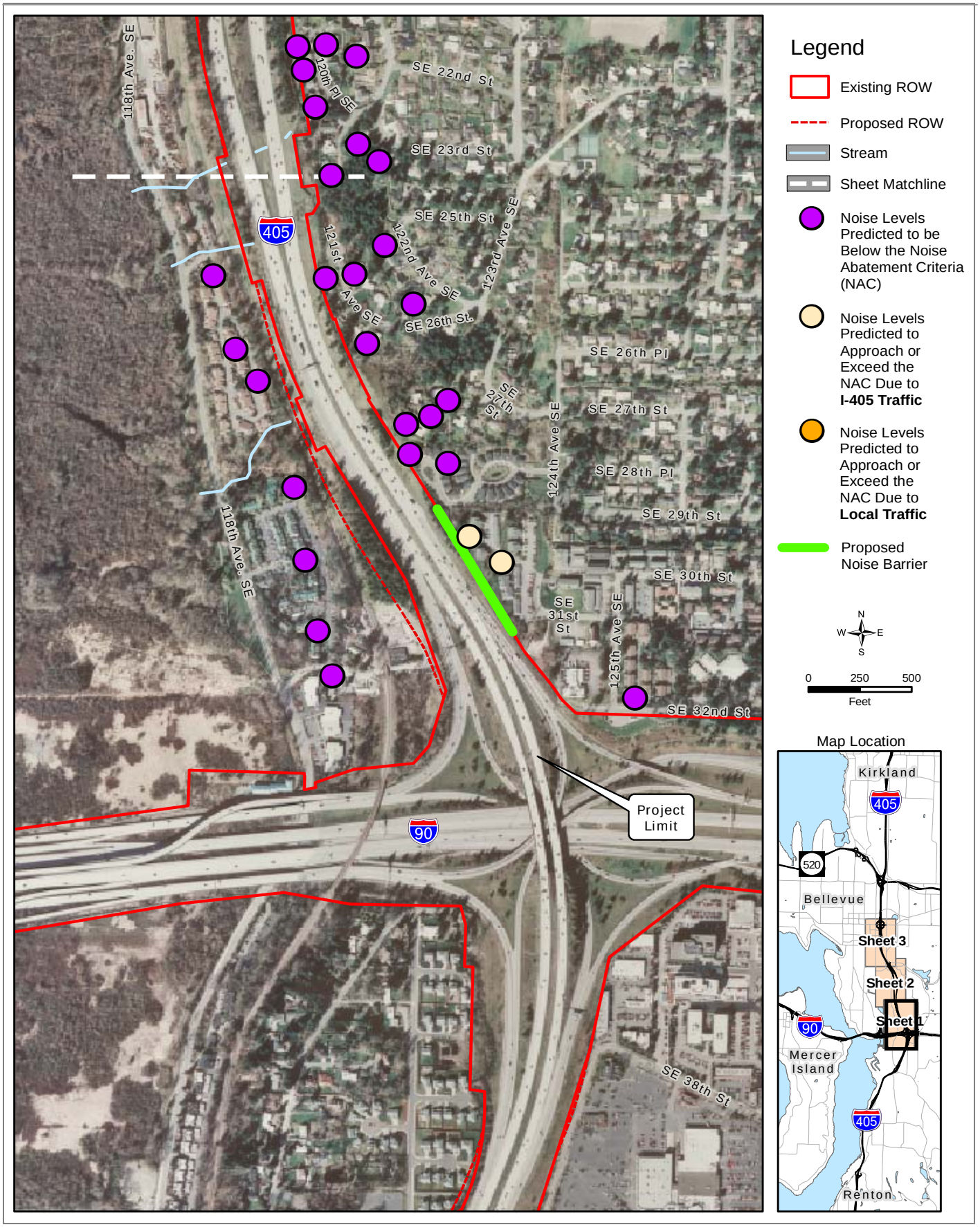


Exhibit 5.2-1. Modeled Receptor Noise Levels and Locations (Sheet 2 of 3)

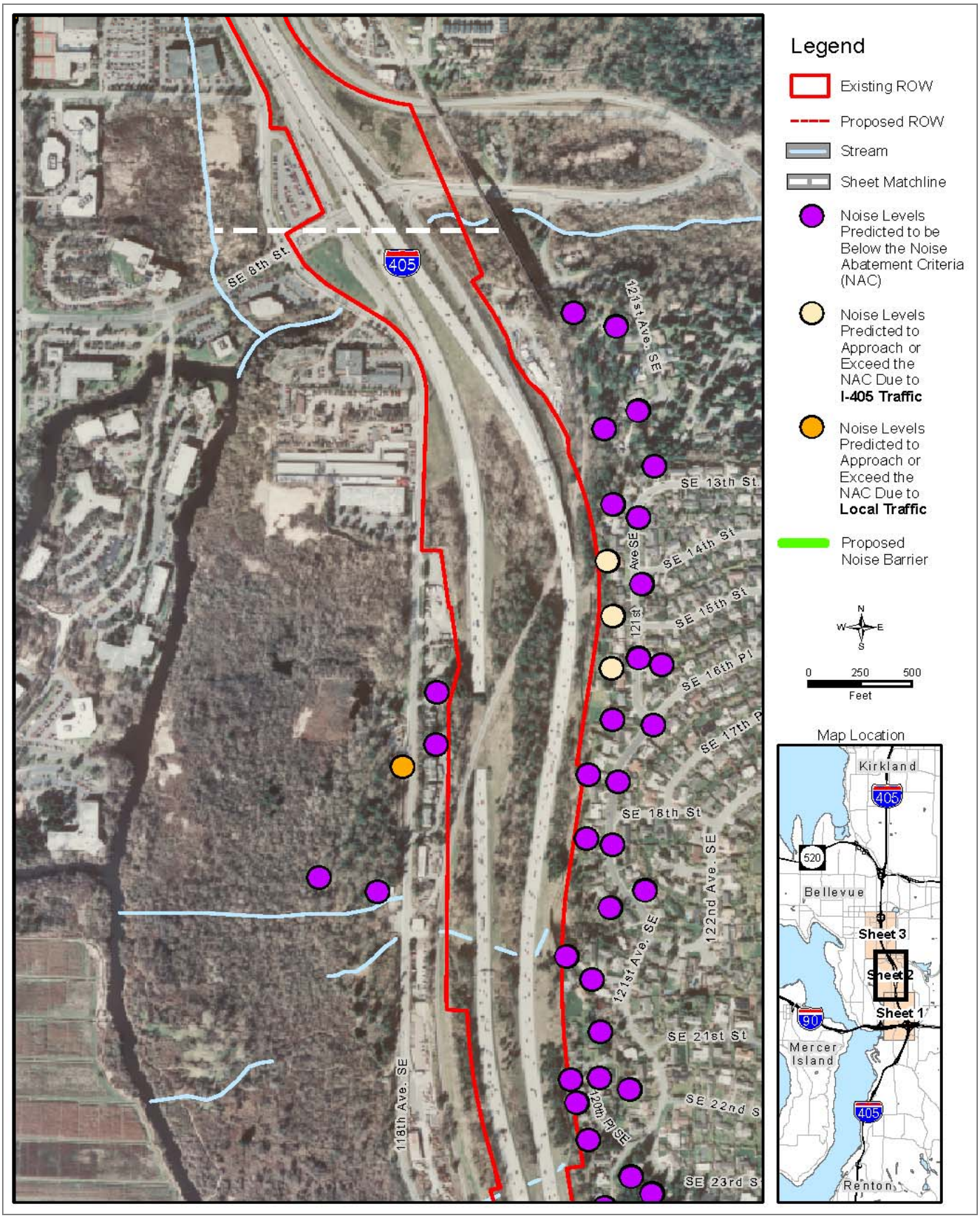
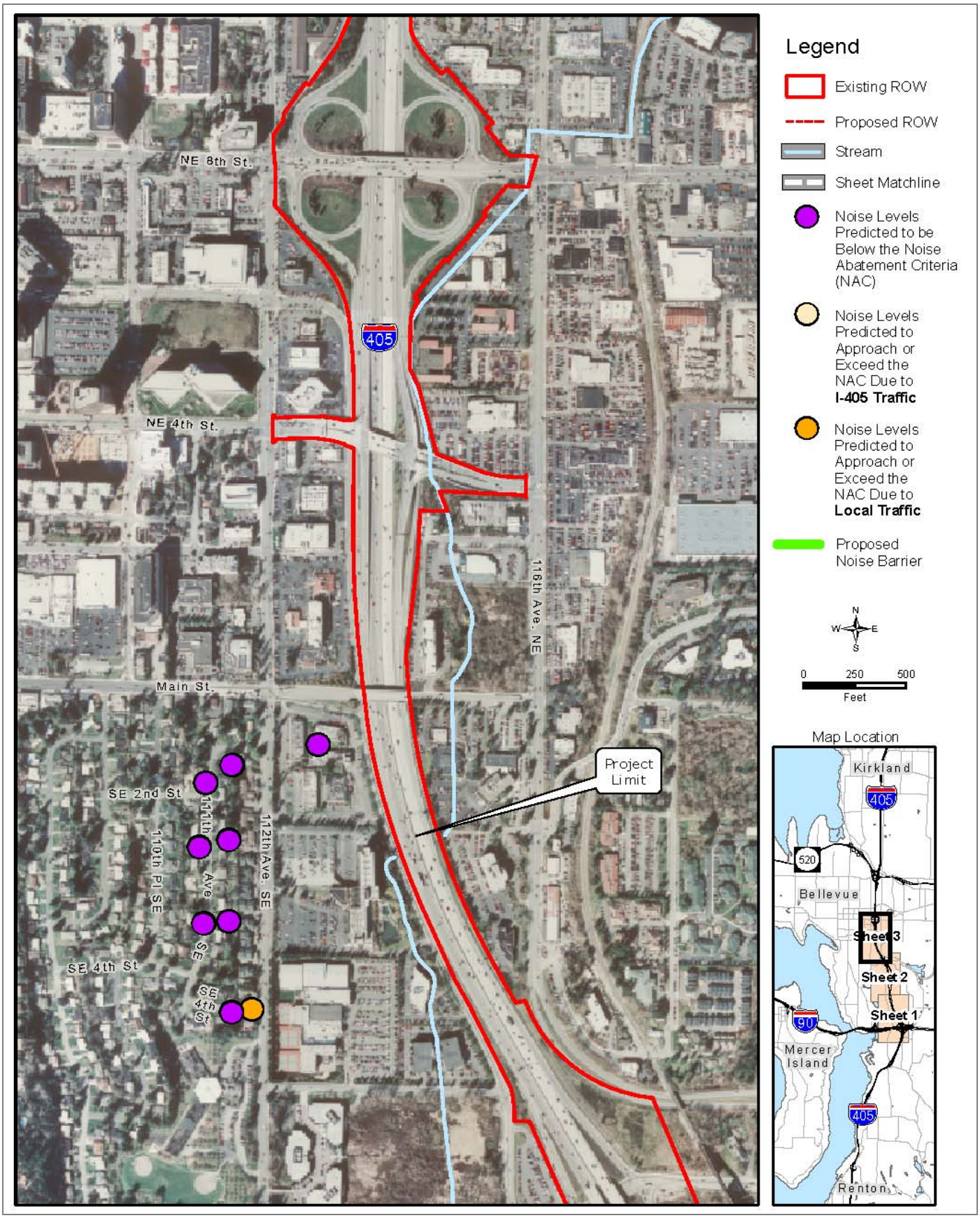


Exhibit 5.2-1. Modeled Receptor Noise Levels and Locations (Sheet 3 of 3)



Although FHWA does not define "substantially exceed," WSDOT considers an increase of 10 A-weighted decibels (dBA) or more to be a substantial increase.

WSDOT considers a noise effect to occur if predicted $L_{eq}(h)$ noise levels approach within 1 dBA of the noise abatement criteria in Exhibit 5.2-2.

Exhibit 5.2-2. FHWA Noise Abatement Criteria

Activity Category	$L_{eq}(h)$ (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)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	No criteria	Undeveloped lands.
E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: US DOT, 1982.

$L_{eq}(h)$

The equivalent sound level is widely used to describe environmental noise. It is a measure of the average sound energy measured during an hour.

How noisy is the study area?

WSDOT modeled noise levels of existing conditions in the project area ranging between 53 and 70 dBA. These levels range from typical suburban outdoor sound levels, between 50 and 60 dBA, to very noisy levels (above 70 dBA), that are typical of locations within 100 feet of a busy freeway.

Traffic noise from I-405 and local surface streets is the primary source of noise in the study area, with periodic air and rail noise. Modeled noise levels at 5 of the 66 sites currently approach or exceed the FHWA criteria of 67 dBA for existing conditions. These modeling results represent the loudest traffic hour of the day when volumes are heavy (but not congested) and traffic speeds remain high.

What will future noise levels be like if we do not build the project?

WSDOT noise specialists determined that noise levels for the No Build Alternative would increase by 0 to 2 dBA. Noise levels at five locations would approach or exceed the NAC of 67 dBA. All of these sites currently approach or exceed the NAC.

How will the project affect noise levels in the project area?

For the Build Alternative, modeling indicates that without mitigation, noise levels in 2030 will approach or exceed the NAC of 67 dBA at seven locations, representing Mercer Slough Park and 27 residences.

Noise levels at two receptors located adjacent to 118th Avenue Southeast and 112th Avenue Southeast, will exceed the NAC due to noise caused by local traffic on 118th Avenue Southeast and 112th Avenue Southeast respectively. Because local traffic would be the primary cause of these future noise effects, and the results do not relate to the I-405 Bellevue Nickel Improvement Project, we cannot mitigate the adverse noise effects by reducing traffic noise from I-405.

Even with the noise abatement measures included as part of the Bellevue Nickel Improvement Project, noise levels at Mercer Slough Park and four locations representing 15 residences in the Woodbridge Neighborhood will still approach or exceed the NAC criterion in 2030.

How will we minimize the effects of traffic noise?

FHWA regulations (23 CFR 772) specify that when agencies planning a project identify noise effects, they must evaluate abatement (mitigation) measures to reduce the effects. Agencies must incorporate all noise abatement measures that they determine to be "feasible and reasonable," into the project design before FHWA will approve the project. For more information on the criteria used to determine what noise abatement measures are "feasible and reasonable," please see the Noise and Vibration Discipline Report (Appendix M) appended to this EA.

To minimize the effects of traffic noise along I-405 northbound in the neighborhood of Factoria Square, we will construct a new noise barrier along the east edge of the I-405 ROW approximately 1,000 feet north of the I-90 interchange (see Exhibit 5.2-3). At this location, the noise barrier will be approximately 16 feet high and 725 feet long. The noise barrier will reduce traffic noise levels by 11 dBA, a level below the federal noise criteria.

Exhibit 5.2-3. Location of New Noise Barrier

How will project construction affect noise levels?

Roadway construction activities that generate noise include clearing, cut-and-fill (grading) activities, removing old roadways, importing fill, and paving.

Internal combustion engines will generate the most prevalent noise source during construction. Engine-powered equipment includes earth-moving equipment, material-handling equipment, and stationary equipment. Truck noise could also affect area residents because trucks will also operate outside the project site. Other construction noise sources will include impact equipment and tools such as pile drivers.

Construction noise will be intermittent and construction noise levels will depend on the type, amount, and location of construction activities. The type of construction methods will establish the maximum noise levels of construction equipment used. The amount of construction activity will define how often construction noise will occur. The nearness of construction equipment to adjacent properties will affect the noise levels of the receptor. Maximum noise levels of construction equipment for the project will be similar to typical maximum levels presented in Exhibit 5.2-4 on the following page.

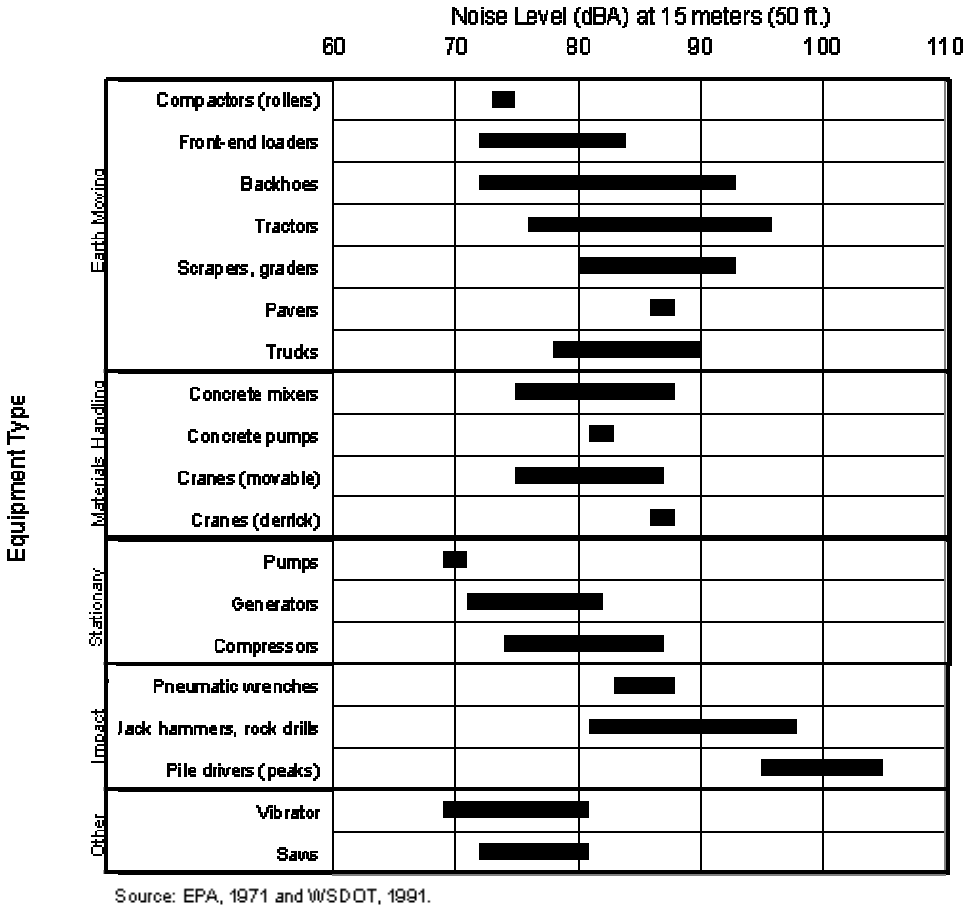
How can we minimize effects from construction noise?

We have included all avoidance and minimization measures that we will incorporate into the project in Appendix B.

What is the potential for vibration during construction?

During construction, various activities will create vibrations. Heavy construction equipment, such as large bulldozers and loaded trucks, frequently generate vibrations that can be felt as far as 25 feet away. Vibrations from pile driving can damage fragile structures as far as 100 feet away. People will feel minor ground movement at greater distances, but because the construction activities are temporary and there is negligible potential for damage to fragile structures, this will not constitute an effect.

Exhibit 5.2-4. Typical Construction Noise Levels



Source: EPA, 1971 and WSDOT, 1991.

How will we minimize the potential effects of vibration?

Construction crews will not conduct any pile driving within 100 feet of fragile structures. Use of large bulldozers and vibratory rollers will be limited to beyond 25 feet from fragile structures.