

Noise

Noise impacts are typically determined by using a computer model to predict existing and future noise levels for a project. Sound level measurements are taken in some locations to provide a comparison of existing measured and modeled conditions to validate use of the model. Whether the changes would create an “impact” depends on how much worse than existing conditions noise would become at specific locations (called a substantial increase) or whether the expected noise would reach an absolute threshold noise level. Sometimes impacts meet both the absolute and relative increase criteria.

ODOT’s impact criterion for the relative change in noise levels is 10 dBA or more over existing noise levels. A 10 dBA increase is perceived as a doubling of loudness. A 3 dBA increase in traffic noise is the minimum that is normally perceptible to people. ODOT’s absolute impact criteria are different for different land uses, which are grouped according their sensitivity to noise into one of two general categories. The first includes residences, recreational areas, places of worship, schools, libraries, and hotels, and the second category includes commercial and industrial uses. The absolute criteria are as follows:

- 65 L_{eq} -dBA *exterior use areas of residences, recreation sites, places of worship, schools, libraries, and hotels.*
- 50 L_{eq} -dBA *inside residences, recreation sites, places of worship, schools, and hotels.*
- 70 L_{eq} -dBA *outside commercial and industrial sites.*
- 10 decibel increase over existing noise level for all land use types.

dBA means A-weighted decibels. For comparative purposes, human breathing is approximately 10 dBA, a calm room ranges 40-50 dBA, normal talking ranges 40-60 dBA, typical television setting is about 60 dBA at 10 feet, and a passing car is 60-80 dBA at 50 feet.

L_{eq} , or the energy equivalent sound level, is the level of a constant sound for a specified period of time that has the same sound energy as an actual fluctuating noise over the same period of time.

Noise impacts occur when traffic noise levels exceed the ODOT impact criteria or if levels increase by 10 dBA or more over existing levels.

The Noise Technical Report provides details on the following:

- Federal and state regulations and standards.
- Methodology.
- Affected environment.
- Environmental consequences.
- Proposed abatement.

Noise Technical Report Appendices:

- A General Noise Information
- B Traffic Data
- C Modeling Data
- D SDEIS Monitoring Locations
- E Clackamas County Comprehensive Plan
- F Noise Mitigation Considered
- G Bluff Neighborhood Cost Table and Quiet Pavement Fact Sheet
- H Traffic Noise Modeling Input and Output Files

Traffic noise impacts typically do not occur farther than 500 feet from a major highway; for that reason, the noise analysis focuses on areas within 500 feet of project roadways.

Project Area Noise Modeling

Noise monitoring of existing conditions showed that noise levels adjacent to I-205 and OR 212/224 currently exceed the ODOT noise abatement criteria (NAC) except in some areas with existing sound walls, such as west of I-205 and the residential area east of OR 224 south of Rock Creek Junction.

In 2007, the Traffic Noise Model was used to predict future sound levels from the traffic volumes projected for 2030. Noise levels were predicted for 175 noise prediction sites representing 574 residential units, schools, commercial properties, and industrial properties. Sound levels were predicted at 5 feet aboveground level in most locations. At a few properties, sound

levels were predicted at second, third, or fourth floor heights. Figure 37, Noise Impact Sites **Alternatives 2 and 3** shows approximate locations where sound levels were predicted in the noise model and identifies whether the impact was due to noise exceeding either the absolute or relative increase criteria, or both. At some locations, the road would move away from some properties, and sound levels are expected to diminish if the project is built.

Preferred Alternative

FHWA's Traffic Noise Model was used to predict future sound levels from the traffic volumes projected for the **Preferred Alternative** in 2030. Noise levels were predicted for the 175 noise prediction sites from 2007 as well as an additional 116 modeling locations in response to new roadway modifications associated with the **Preferred Alternative** along SE Johnson Road and OR 212/224 near SE Webster Road and SE Rusk Road. In order to simplify the modeling locations and provide for an easier method of discussing existing and future noise levels, the sites were renumbered into 15 groups that represent a specific geographical area.

Out of the 690 units examined, 220 are currently at or above the noise abatement criteria: 204 residences, one school, one hotel, and 14 commercial properties. This includes new receptor sites along OR 212/224 west of SE Rusk Road and along SE Johnson Road.

Project Area Impacts

Alternative 1—No Build

Noise from traffic would increase in the project area as traffic volumes increase between 2005 and 2030. Noise levels are predicted to increase by 1 to 3 dBA over existing levels next to roadways that do not have planned improvements (such as road and bridge widening, construction of a new connector road, or the addition of a climbing lane). In areas where improvements are planned, future noise levels would increase from 3 to 4 dBA.

This includes areas north of OR 212/224, adjacent to OR 224 south of Rock Creek Junction, and north of Carver Bridge. There are some residences along SE Johnson Road where traffic noise level increases of up to 7 dBA are predicted, which are due to an increase in cut-through traffic on local streets as the main arterials become more congested. All other locations are predicted to have increases of 1 to 4 dBA.

Alternatives 2 and 3

Noise level projections for **Alternatives 2 and 3** are essentially identical (within 1 dBA) in areas where the alignment is the same. Properties that would only be affected by one build alternative are noted on Figure 37. The locations of sound levels are also shown where they are predicted to decrease, because those properties would be farther from the proposed alignment than from existing OR 212/224.

Table 15 summarizes the total number of residential, commercial, and institutional properties impacted by **Alternatives 2 and 3** and the design options. Noise impacts remaining after inclusion of abatement measures determined to be reasonable and feasible are also listed.

Noise levels adjacent to I-205 and to OR 212/224 are predicted to be above the ODOT noise impact criteria except in some areas that already have sound walls. Overall, noise levels were predicted to increase by up to 20 dBA over levels under **Alternative 1**. Sound levels at properties adjacent to the proposed alignment would generally exceed ODOT absolute noise impact criteria and would also exceed the substantial increase criteria in many locations.

Table 15. Number of Sites Meeting or Exceeding the NAC for Existing Conditions and Alternatives 1, 2, and 3 and Design Options (without/with Abatement)

	Residential Units Meeting or Exceeding the NAC		Commercial / Industrial Units Meeting or Exceeding the NAC		School Units Meeting or Exceeding the NAC		Total ¹
	Exceeds Absolute Threshold	Substantial Increase over Existing (>10 dBA)	Exceeds Absolute Threshold	Substantial Increase over Existing (>10 dBA)	Exceeds Absolute Threshold	Substantial Increase over Existing (>10 dBA)	
Existing	179	n/a	9	n/a	1	n/a	189
Alternative 1	225	0	20	0	1	0	246
Alternatives 2 and 3 ¹	296 / 143	111 / 69	19 / 17	5 / 5	1 / 0	0 / 0	352 / 175
I-205 Interchange Area							
Alternative 2	155 / 43	0	18 / 16	4 / 4	1 / 0	0	174 / 59
Design Option A-2	163 / 51	0	18 / 16	4 / 4	1 / 0	0	182 / 67
Midpoint Area: SE 106th Avenue to SE 135th Avenue							
Alternative 2	103 / 99	101 / 78	1	5	0	0	144 / 121
Alternative 3	100 / 96	121 / 98	1	5	0	0	141 / 118
Design Option B-2	94 / 90	91 / 68	1	8	0	0	134 / 111
Midpoint Area: SE 135th Avenue to SE 152nd Avenue							
Alternatives 2 and 3	93 / 82	58 / 45	0	0	0	0	97 / 84
Design Option C-2	78 / 67	40 / 27	0	0	0	0	81 / 68
Design Option C-3	78 / 67	81 / 68	0	0	0	0	83 / 70
Rock Creek Junction Area							
Alternative 2 and 3	25 / 19	10 / 4	0	0	0	0	25 / 19
Design Option D-2	27 / 13	7 / 7	0	0	0	0	31 / 17
Design Option D-3	20 / 14	7 / 1	0	0	0	0	24 / 18

¹Units above the NAC are not changed by the midpoint interchange and resulting traffic volumes. Differences in impacts are caused by variations in alignment with the alternatives and design options. Only noise prediction sites affected by the alignment changes are shown in the impacts for the area summaries and so are not directly comparable to the total alignment impacts.

n/a=not applicable

Construction of **Alternatives 2 and 3** may cause localized, short-duration noise impacts. Clackamas County exempts construction noise from regulations between the hours of 6 a.m. and 10 p.m. Use of standard ODOT specifications for control of noise sources during construction can minimize construction impacts.

I-205 Interchange area

Under **Alternatives 2 and 3**, portions of the residential areas west of I-205 are predicted to have improved noise conditions compared to **Alternative 1—No Build**, because the main line of I-205 would move slightly to the east.

However, the shift to the east increases noise levels on the east side of I-205, and several multi-family units and a school would experience sound levels exceeding the absolute threshold.

Six locations at the north side of the manufactured home park east of SE 106th Avenue are predicted to undergo substantial noise increases ranging from 13 to 19 dBA over existing levels, but only one location would have predicted noise levels above the absolute noise abatement criteria.

Design Option A-2 affects sound levels at a small number of locations relative to **Alternatives 2 and 3** in the same area. **Design Option A-2** would decrease noise levels adjacent to the proposed connector roads in the Lawnfield area. A slight increase in sound levels adjacent to SE 97th Avenue would occur because traffic would not be diverted from this area as it is for **Alternatives 2 and 3**. **Design Option A-2** increases the number of residences exceeding the NAC in the I-205 Interchange area by eight residences.

Midpoint area

Substantial increases in noise levels would impact the residential area north of the proposed Sunrise Project, on SE Diamond Court and SE Bluff Drive. Numerous residences would also exceed the absolute threshold. East of SE 135th Avenue and north of the proposed highway alignment, several isolated residences and a new, partially developed neighborhood would have substantial increases; however, the absolute noise abatement criterion is predicted to be exceeded only at the portions of the new development located closest to SE 142nd Avenue.

Noise levels at properties adjacent to the proposed Sunrise Project and west of SE 152nd Avenue would exceed the substantial impact and absolute impact criteria.

Design Option B-2 would slightly reduce residential impacts. Most of the changes in impacts are due to small changes in sound levels for properties with predicted levels right at the impact criterion of 65 dBA.

Differences among impacts for **Design Options C-2 and C-3** are primarily driven by whether or not the new development north of the alignment and east of SE 142nd Avenue is impacted and the apartments just west of SE 135th Avenue are impacted.

Rock Creek Junction area

Numerous properties south of the proposed alignment between SE 162nd and SE 172nd

avenues would undergo a decrease in noise levels compared to both existing conditions and **Alternative 1**. One location would be impacted under **Alternative 2** but not **Alternative 3**, and another location would be impacted under **Alternative 3** but not **Alternative 2**.

Changes in the number of impacts between **Design Options D-2 and D-3** result from variations at individual properties with changes in the alignments that occur in several areas.

Preferred Alternative

As with **Alternatives 2 and 3**, under the **Preferred Alternative** traffic noise levels in the project area will change substantially depending on the location. Table 16 and Figures PA-19 through PA-21 present the results of the noise modeling for the **Preferred Alternative**. The NAC and criterion levels used to evaluate the **Preferred Alternative's** traffic noise levels were taken from the ODOT Noise Manual. Noise mitigation must be considered when traffic noise levels exceed the NAC at a unit (each unit being a single structure or multi-family apartment or condominium). The number of units predicted to meet or exceed the NAC are as follows:

- Total existing units = 204
- Total units under **No Build** = 262
- Total units under **Preferred Alternative** = 416

Noise levels would increase by up to 21 dBA over existing conditions, although a majority of increases are predicted to rise between 1 to 4 dBA. The areas with the highest traffic noise level increases are in areas where there are no existing major aerial roadways, like the Bluff Drive Residential area, Oak Acres manufactured home park, and around the KEX and Lawnfield Road area. There will be reduced noise levels of up to 8 dBA south of OR 212/224 near Rock Creek Junction compared to existing conditions because traffic will be redirected to the new highway.

By 2030, a substantial portion of heavy trucks (those currently using the existing OR 212/224

alignment along Carver Road) will relocate to the Sunrise Project. That shift in the traffic route will move a significant source of noise closer to many homes that currently have relatively low ambient noise levels. In contrast, many receivers that are adjacent to the existing OR 212/224 alignment along Carver Road will have a reduction in noise levels compared to

Alternative 1, because fewer vehicles will be using that alignment. There will also be a noticeable reduction in traffic volumes along I-205 between the Milwaukie Expressway interchange and the interchange with OR 212/224, with peak hour volumes dropping to below 2004 conditions by 2030.

Table 16. Comparison of Number of Noise Units Meeting or Exceeding the NAC, by Type of Receptor

Location	Single-/ Multi-family Residential			School			Places of Worship		Hotel			Commercial		
	Extg Cond	Alt 1-		Extg Cond	Alt 1-		Extg Cond	Alt 1 and Pref Alt	Extg Cond	Alt 1-		Extg Cond	Alt 1-	
		No Build	Pref Alt		No Build	Pref Alt				No Build	Pref Alt		No Build	Pref Alt
Sunnybrook	20	28	28	-	-	-	-	-	-	-	-	-	-	1
Webster	10	12	13	-	-	-	-	-	-	-	-	-	1	2
Johnson	54	66	77	-	-	-	-	-	-	-	-	12	14	12
West of I-205N	15	19	14	-	-	-	-	-	-	-	-	-	-	-
West of I-205S	22	22	25	-	-	-	-	-	-	-	-	2	-	-
East of I-205S	8	8	8	-	-	-	-	-	-	-	-	-	2	2
East of I-205N	39	39	39	1	1	1	-	-	1	1	1	-	1	3
KEX	-	-	-	-	-	-	-	-	-	-	-	-	-	10
Oak Acres	-	-	23	-	-	-	-	-	-	-	-	-	-	-
Midpoint Commercial	-	-	-	-	-	-	-	-	-	-	-	-	7	4
Bluff	-	-	113	-	-	-	-	-	-	-	-	-	-	-
Riverbend	1	14	14	-	-	-	-	-	-	-	-	-	-	-
NE of Midpoint	-	-	9	-	-	-	-	-	-	-	-	-	-	-
Goosehollow	1	3	3	-	-	-	-	-	-	-	-	-	-	-
Rock Creek	18	24	14	-	-	-	-	-	-	-	-	-	-	-
Receptors above NAC	188	235	380	1	1	1	-	-	1	1	1	1	25	34

I-205 Interchange area

One major difference in this area between **Alternatives 2 and 3** and the **Preferred Alternative** is the realignment of SE Lawnfield Road along the KEX site, but it is not predicted to change noise levels in this area by a noticeable amount. Noise levels of the same 28 multi-family units are predicted to exceed the noise abatement criteria under the **No Build Alternative** and the **Preferred Alternative**. The third westbound lane between SE Webster Road and SE Rusk Road will result in increased noise levels by 1 to 3 dBA over the existing levels.

In the area of SE Johnson Road, the number of residences meeting or exceeding the NAC will increase from 54 residences to 77 residences, 11 more than under the **No Build Alternative**. Many of the exceedances would occur at multi-family residential buildings.

Similar to **Alternatives 2 and 3**, the **Preferred Alternative** alignment will shift noise levels to the east relative to residences west of I-205, reducing the number of exceedances in some areas. Little difference in the number of units meeting or exceeding the NAC will occur on the east side of I-205 between the **No Build** conditions and any of the build alternatives.

Midpoint area

Future traffic noise levels at the Oak Acres manufactured home park are predicted to increase by 12 to 18 dBA compared to no increase under the **No Build Alternative**, similar to the units meeting or exceeding the NAC predicted for **Alternatives 2 and 3** at that location, because of the addition of the new highway. The **Preferred Alternative** will affect 23 single-family residences, 16 of which will also meet the NAC. Four commercial structures near the midpoint interchange will meet the ODOT substantial increase criterion.

Currently, and under the **No Build Alternative**, no units would meet or exceed the NAC at any of the single-family and multi-family residences near SE Bluff Drive. The **Preferred Alternative** will cause a noticeable increase in traffic noise at an estimated 113 residential units. Of these, an estimated 77 residences are predicted to meet the 10 dBA substantial increase criterion, while 91 of the 113 would exceed the ODOT 65 dBA threshold criterion. Also, 58 residences will meet both criteria. Those impacts are substantially similar to predicted impacts under **Alternatives 2 and 3**. Future traffic noise levels at the Riverbend manufactured home park under the **Preferred Alternative** are predicted to be similar to the **No Build Alternative** traffic noise levels.

Rock Creek Junction area

Traffic noise impact noise levels from the **Preferred Alternative** in this segment will range from 60 to 66 dBA L_{eq} during peak noise hour, with nine residences that are predicted to either meet the 10 dBA substantial increase criterion or meet the ODOT 65 dBA criterion.

Three single-family residences east of OR 224 along SE Goosehollow Drive will be affected because they are located near the end points of an existing sound wall. Fewer residences will be affected by traffic noise levels meeting or exceeding the NAC than under both existing and future **No Build** conditions, because the new highway will be farther north, away from

the dense residential area south of existing OR 212.

Indirect Effects

Noise levels at or above the NAC are generally considered direct effects. The effects of growth in the Sunrise Project area are included in the predicted sound levels as a result of the cumulative traffic data used. The forecast traffic volumes used in this analysis were based on land use and employment forecasts and included traffic from all sources, including projected development in the area.

Unavoidable noise impacts

Because of substantial potential noise increases in the Bluff neighborhood, 14 additional mitigation options were evaluated for the Bluff area based on variations of noise wall mitigation, adjustments to the location or operating characteristics of the highway, surface treatments, and compensation. A description and the reasons for rejection as mitigation measures are presented below (for a comparison table, see Table D-2, "Evaluation of Noise Impact Mitigation Measures along Bluff" in Appendix D).

Noise Walls

Option 1: Wall at north edge of proposed Sunrise Project (35 to 60 feet high)

- Would have poor effect for noise reduction on first row of Bluff residences because of distance and topography relative to the residences on the bluff. The proposed wall would need to be at least 35 feet high to reduce noise levels by 5 dBA for Bluff residences and would likely need to be 40 to 60 feet to result in meaningful noise level reductions of at least 5 dBA in accordance with ODOT design guidelines.
- The distance between the wall and the Bluff residences would be too far to effectively reduce noise levels.
- The cost of the wall (\$400,000 to \$1 million per residence) would exceed ODOT

reasonable criteria for providing noise mitigation.

- Would result in potential sunlight impacts that would have a negative effect on the adjacent wildlife passage area by partially shading the corridor, potentially affecting types of vegetation communities there and affecting species who rely on sunlight for thermal regulation.

Option 2: Wall in center median (30 to 60 feet high) combined with a north-edge wall (Option 1) which would allow lower height of north-edge wall)

- Would have poor effect on noise reduction at first row of Bluff residences due to distance and topography relative to residences. This wall would have to be at least 30 feet high to have any effect on noise levels (reductions of 2 to 4 dBA are predicted), and would need to be much higher to result in meaningful noise level reductions (5 dBA or higher) in accordance with ODOT design guidelines.
- This would not effectively mitigate noise impacts without the construction of the wall described for Option 1 because westbound traffic noise would not be blocked by the median wall.
- Proposed roadway footprint would need to be widened to accommodate the median wall, requiring purchase of additional right-of-way, and resulting in additional environmental impacts associated with a larger project footprint, such as additional property acquisition.
- The cost of the wall (\$400,000 to \$1 million per residence) would exceed ODOT reasonable criteria for providing noise mitigation.

Option 3: Partially cover the proposed Sunrise Project highway (open structure on south side)

- Would require widening right-of-way to accommodate wider footprint (5 to 20 feet) in order to provide protection for fixed objects in the clear zone.

- Wider footprint would create more impacts on resources, particularly visual resources.
- The cost (\$1 million to \$2 million per residence) would exceed ODOT cost effectiveness policies for providing noise mitigation.

Option 4: Construct Concrete Wall at top edge of bluff (12 to 16 feet high)

- Would have the most effective noise reduction effect, though not in all locations.
- Would be difficult to construct.
- Would require permanent easements onto private property, and may require construction of a new access road. To avoid construction of an access road, the wall would have to be constructed with masonry blocks, with no large/heavy equipment, which could increase cost substantially. If some property owners resisted easements resulting in discontinuous wall segments, then effectiveness would be substantially diminished.
- Would limit or eliminate views from back yards of homes.
- Cost (\$100,000-300,000 per residence) would exceed ODOT policy for cost effectiveness on noise mitigation measures.
- Could result in removal of trees and vegetation in wildlife corridor.

Option 5: Construct Transparent Acrylic Wall at top edge of bluff (minimum 16 feet high)

- Would have essentially the same abatement effects as Option 4, except views would be retained (through the wall).
- Would be difficult to construct.
- Would require permanent easements onto private property, and may require construction of a new access road.
- Would increase cost by 30 to 50 percent compared to standard post and panel construction. Cost (\$100,000 to \$300,000 per residence) would exceed ODOT reasonable criterion for cost effectiveness on noise mitigation measures.

Option 6: Move new Sunrise Project alignment close to existing OR 212/224

- Would have a moderate impact on the decibel level on the bluff but does not meet purpose and need because it would preclude a midpoint interchange, a major feature that provides the mobility and congestion relief needed to meet the project need.
- Would preclude any midpoint interchange due to the shorter distance at 122nd Avenue between the Sunrise Project and OR 212.
- Would result in loss of (estimated) 31 businesses, 792 jobs, \$29 million in annual payroll (2004), 30 industrial buildings, 36 mobile homes, 4 houses and approximately \$41.6 million in assessed value.
- Would still negatively affect some residences (approximately 20 percent), so a sound barrier would likely be needed in addition to moving the alignment on the west end.
- Would have a substandard design.
- Costs (\$1 million to \$2 million per residence) would exceed ODOT reasonable criteria for noise mitigation measures.

Option 7: Build Sunrise Project on top of existing OR 212/224

- Would have a moderate impact on the decibel level on the bluff.
- Would still negatively affect about 20 percent of residences, so a sound barrier would likely be needed in addition to moving the alignment on the west end.
- “Double decker” design would be substandard and preclude a midpoint interchange.
- Would result in removal of (estimated) 32 businesses, over 400 jobs, \$17 million in annual payroll (2004), 30 lots, 6 mobile homes, one house and approximately \$11.8 million in assessed value.
- Cost (\$1 million to \$2 million per residence) would exceed ODOT policy for cost-effectiveness on noise mitigation measures.

- Would not meet purpose and need because it would preclude a midpoint interchange, a major feature that provides the mobility and congestion relief needed to meet the project need.

Option 8: Reduce speed limit on Sunrise Project

- No direct costs to project.
- To achieve full mitigation, speed limit would need to be reduced to 20 mph, which would not meet project purpose and need because the facility would not function as a regional expressway.
- The minimum noise reduction for noise mitigation is 5 dBA to qualify as “feasible” mitigation. However, most affected residences are predicted to experience over 10 dBA increases. A reduction to approximately 42 mph would be needed to meet the 5 dBA criterion. At that speed limit, about 80 percent of impacted houses would still be negatively impacted.

Option 9: Reduce traffic volumes/number of travel lanes

- Reduction of traffic volumes by one-half only gains noise reduction of 3 dBA
- Assumption of reduced traffic volumes by one-half is inconsistent with project traffic forecasts, and therefore would not meet the project purpose and need to accommodate future traffic volumes and relieve safety and mobility problems.

Option 10: Lower grade of Sunrise Project through bluff area

- Unknown costs to balance cut and fill quantities.
- Geotechnical issues much greater than under other alternatives due to large cuts that would be required to lower the grade.
- Would result in many new structures for local roads.
- Would preclude midpoint interchange.
- Additional grade loss near bluff would increase grade approaching Rock Creek Junction, making it unattractive to trucks.

Option 11: Apply Quiet Pavement

- Increases paving cost.
- Would have minimal noise mitigation qualities compared to predicted impacts, reductions of approximately 1 to 7 dBA.
- Would add to paving costs due to higher cost of pavement type, greater maintenance requirements for cleaning, and a more frequent paving schedule.
- Rubberized pavement mix is not used in Oregon because studded tires degrade the open-grade pavement mix, eroding noise abatement effects after only six months.

Option 12: Purchase Homes along the bluff

- ODOT policies currently do not allow purchase for noise impact reasons (noise issues are not compensable, no exceptions). Would only be available with county funds.
- Cost (\$300,000 to \$600,000 per residence) would exceed ODOT policy for cost-effectiveness on noise mitigation measures.

Option 13: Offer financial compensation to affected property owners

- Unknown cost.
- Would only be available with county funding.
- Could consist of obtaining appraisals, selling the houses, and paying homeowners the difference between the sales price and what the price would have been had the Sunrise Project not been built.
- Could also entail “buying” the right to pollute the area with noise, which would be in the deed.

Option 14: Quiet pavement, reduced speed, and reduced traffic volumes

- Poor noise mitigation effectiveness.
- Approximately 40 percent higher cost compared to standard paving and shorter pavement lifespan/higher life cycle costs.
- Requires higher maintenance attention (application and sweeping).

- Reduced noise levels not sustainable over time due to limited durability of quiet pavement.
- Reduction of traffic volumes by one-half not supported by traffic forecasts.
- A reduction to approximately 42 mph would be needed to meet the minimum noise reduction of 5 dBA to qualify as feasible.
- An additional, initial noise reduction of 3 to 5 dBA would be possible with application of quiet pavement; however, that noise reduction is not sustainable beyond four to eight years without need to re-pave.
- Additional reduction of 3 dBA possible if traffic volumes reduced by one-half; however, traffic volumes forecast, based on planned land uses and employment in project area, is inconsistent with such assumptions.

This evaluation was based on procedures used to determine whether noise abatement would be considered reasonable and feasible as provided in the ODOT Noise Manual. In particular, the criteria noted that:

- Mitigation must provide a 5 dBA reduction in noise levels at the first row of receivers.
- Cost of abatement should not exceed \$25,000 per benefited residence, or \$35,000 for areas with one or more of the following: build noise levels exceeding 70 dBA for residences; areas with a 10 dBA increase over existing levels; homes constructed prior to 1996; and provision of for logical wall terminations.
- Environmental impacts—effects such as visual issues, and effects on cultural and wildlife resources—must be considered.

As indicated above, none of the additional options evaluated meet these criteria. All potential mitigation measures studied for the Bluff neighborhood, including the wall at the top of the bluff, were expected to have very high costs, with preliminary estimates in the range of \$100,000 to \$1,000,000 per residence for the 113 predicted homes that could exceed the NAC. None would provide effective mitigation without excessive heights. The need

for additional height and/or right-of-way area would have other potential environmental impacts and add to the costs of these measures.

No other options were identified that would effectively reduce potential noise impacts while also preventing additional project-related impacts, and meeting cost requirements for mitigation under ODOT policy for reasonable mitigation costs. Therefore, it was concluded that no feasible and reasonable methods of noise reduction are available for potential impacts to the Bluff neighborhood north of the proposed project alignment. The results are summarized in the 2010 Noise Technical Report and discussed in the most detail in the 2007 Noise Technical Report, in the section “Bluff Neighborhood Mitigation Analysis.”

Noise Abatement Measures for the Preferred Alternative

During construction, the project will comply with Clackamas County noise regulations and ODOT Standard Specifications (Section 00290.32) to minimize construction impacts.

Federal funds may be used for noise abatement measures when an impact has been identified, the measures would substantially reduce the noise impact (feasibility criteria), and the overall benefits from abatement outweigh other potential adverse effects and the cost of abatement (reasonableness criteria). ODOT’s Noise Manual (ODOT 2009) has procedures and guidelines for whether abatement meets the criteria for feasibility and reasonableness, including the following criteria that should be considered in recommending mitigation:

- Noise mitigation must provide a 5 dBA reduction in noise levels with a typical goal of 7 to 8 dBA, or higher, at first row receivers.
- Cost of abatement is typically capped at \$25,000 per benefited residence. Costs up to \$35,000 can be considered under specific circumstances.
- Opinions of impacted residents (property owners).

- Absolute noise levels of 60 dBA L_{eq} or higher.
- Residences constructed after 1996 generally not offered mitigation unless there is an increase of 5 dBA or more.
- Other environmental impacts from mitigation need to be considered, such as impacts on visual, cultural or wildlife resources.
- Other sources of noise.

Several methods of noise abatement were considered to mitigate permanent impacts, such as truck restrictions, speed restrictions, and alignment changes. Of all abatement measures considered, noise walls appear to be the most feasible form of mitigation for the Sunrise Project. Restricting trucks and speed on the Sunrise Project would not support the purpose and need for the project. Changes in alignment were considered with all of the design options. In addition, further potential alignment changes were analyzed for the residences on the bluff north of OR 212/224.

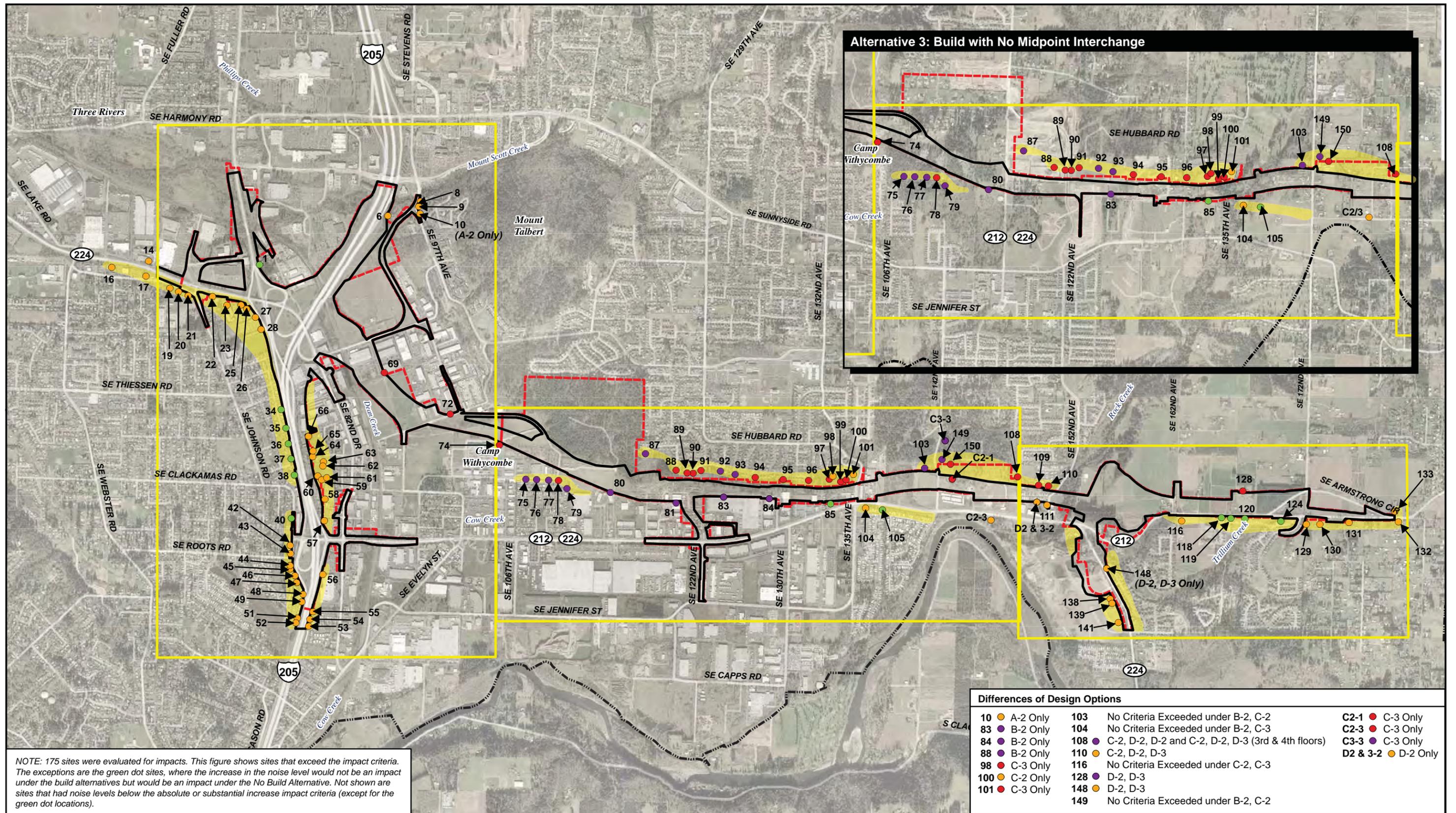
Seven sound walls are recommended for inclusion in the project (Table 17 and Figures PA-19 through PA-21): W-2, J-1, J-2, E205N-3, W205S-4, E205S-5, and ZM-6. Two walls that were recommended in the 2007 noise analysis were re-evaluated by the modeling for the **Preferred Alternative**. Since no noise impacts were identified in these areas, these walls are not needed. After mitigation, the number of units meeting or exceeding the NAC as a result of constructing the **Preferred Alternative** would be reduced to 241 compared to 262 under the **No Build Alternative**. The final decision and recommendation to include the approved mitigation noise abatement walls will be made during the final design process. Should the project design significantly change, or should affected residents be in opposition to the recommended noise mitigation, the recommended abatement may not be incorporated into the project. Table 17 provides a summary of the recommended noise walls for the corridor.

Table 17. Summary of Proposed Walls for Noise Abatement

Wall Name	Range of dBA Reduction	Location of Receivers Benefiting	Wall Height and Length Summary
W-2	3 to 10	South side of Highway 212 between SE Webster Road and SE Rusk Road	10 ft high, 960 ft long
J-1	2 to 8	Provides mitigation for SE Johnson Road area, for all but 5 receivers on SE Johnson Road and some 2 nd floor apartment units	14 ft high, 890 ft long
J-2	4 to 9	Provides mitigation for SE Johnson Road area, for all but 5 receivers on SE Johnson Road and some 2 nd floor apartment units	16 ft high, 2040 ft long
E205N-3	2 to 12	East side of I-205 (existing OR 212/224 to SE Jannsen Road); remaining impacts are hotel and a commercial property	16 ft high, 2170 ft long
W205S-4	5 to 10	Provides mitigation for all but two of the noise impacts on west side of I-205 (OR 212/224 to end of project work area)	12 ft high, 1692 ft long
E205S-5*	12 to 13	East side of I-205 (existing OR 212/224 to end of project work area); though future noise levels may exceed criteria, reduction of 10 to 12 dBA provides justification	16 ft high, 619 ft long
ZM-6	7 to 10	All noise impacts at Oak Acres mitigated	10 ft high, 1511 ft long

*Wall E205S-5, shown as Wall 5 on Figure 38, which was recommended for special consideration in the SDEIS, is now part of the project plans, as shown in Figure PA-19.

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NOTE: 175 sites were evaluated for impacts. This figure shows sites that exceed the impact criteria. The exceptions are the green dot sites, where the increase in the noise level would not be an impact under the build alternatives but would be an impact under the No Build Alternative. Not shown are sites that had noise levels below the absolute or substantial increase impact criteria (except for the green dot locations).

Legend

- Urban Growth Boundary (UGB)
- Project Subareas
- Construction Impact Line
- Right-of-Way

Predicted Noise Impact Locations

- Exceeds Absolute Criteria Only
- Exceeds Absolute and Substantial Increase Criteria
- No Noise Impact and Lower Noise Level than Alternative 1
- Exceeds Significant Increase Criteria Only
- General Locations of Noise Prediction Sites

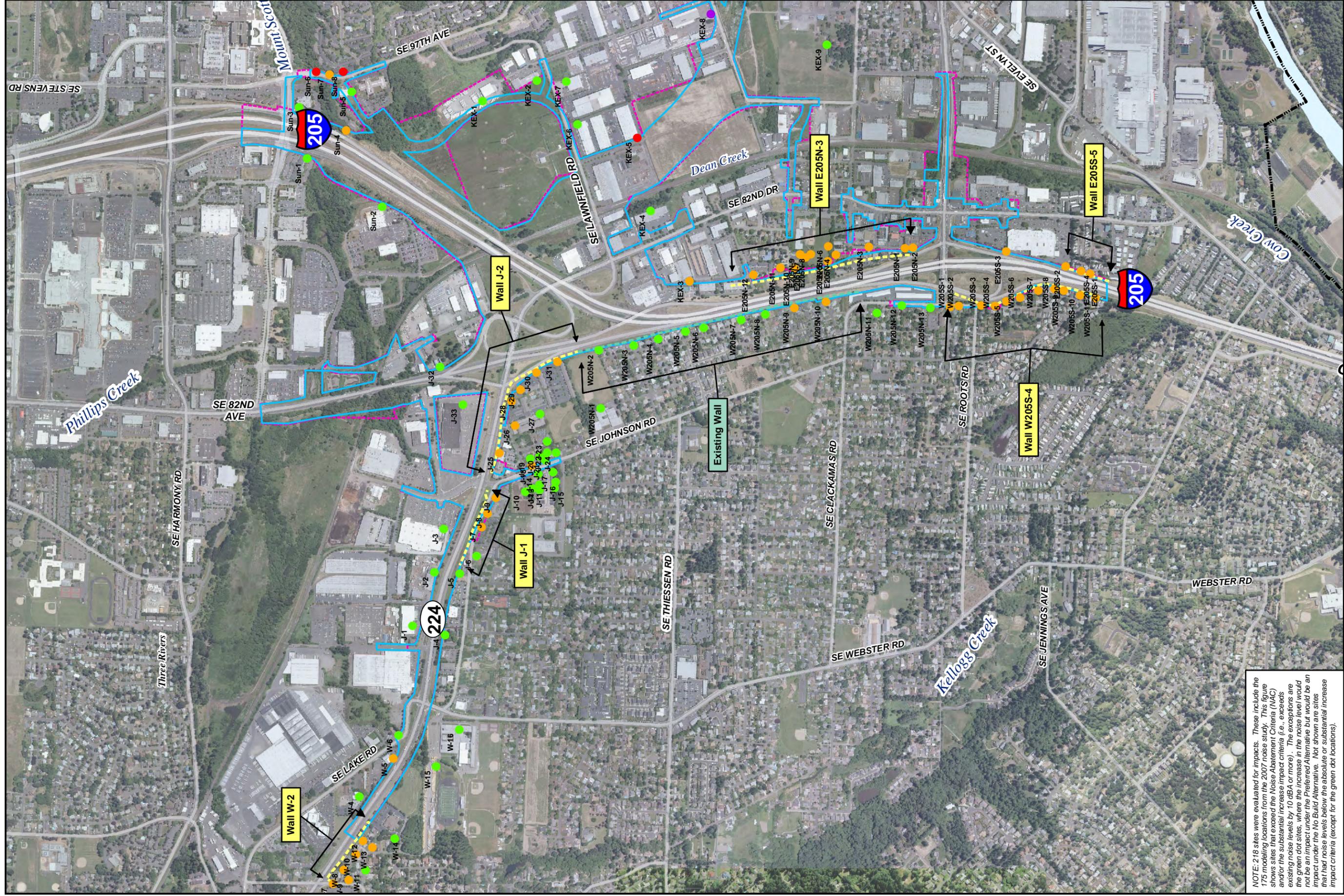
Scale: 2,000 0 2,000 Feet

Sources: ODOT and Metro, Portland OR

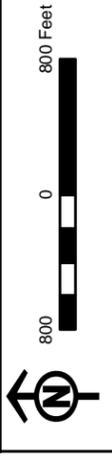
Figure 37

Noise Impact Sites, Alternatives 2 and 3

Sunrise Project, I-205 to Rock Creek Junction



NOTE: 218 sites were evaluated for impacts. These include the 175 modeling locations from the 2007 noise study. This figure shows sites that exceed the Noise Abatement Criteria (NAC) and/or the substantial increase impact criteria (i.e., exceeds existing noise levels by 10 dBA or more). The exceptions are the green dot sites, where the increase in the noise level would not be an impact under the Preferred Alternative but would be an impact under the No-Build Alternative. Not shown are sites that had noise levels below the absolute or substantial increase impact criteria (except for the green dot locations).



Legend

- Proposed Right-of-Way Line
- Construction Impact Line
- Sound Walls
 - Evaluated, Recommended
 - Existing

Predicted Noise Impact Locations

- No Noise Impact and Lower Noise Level than No-Build Alternative
- Exceeds Noise Abatement Criteria (NAC) & Substantial Increase Criteria
- Exceeds Substantial Increase Criteria Only
- Exceeds NAC Only

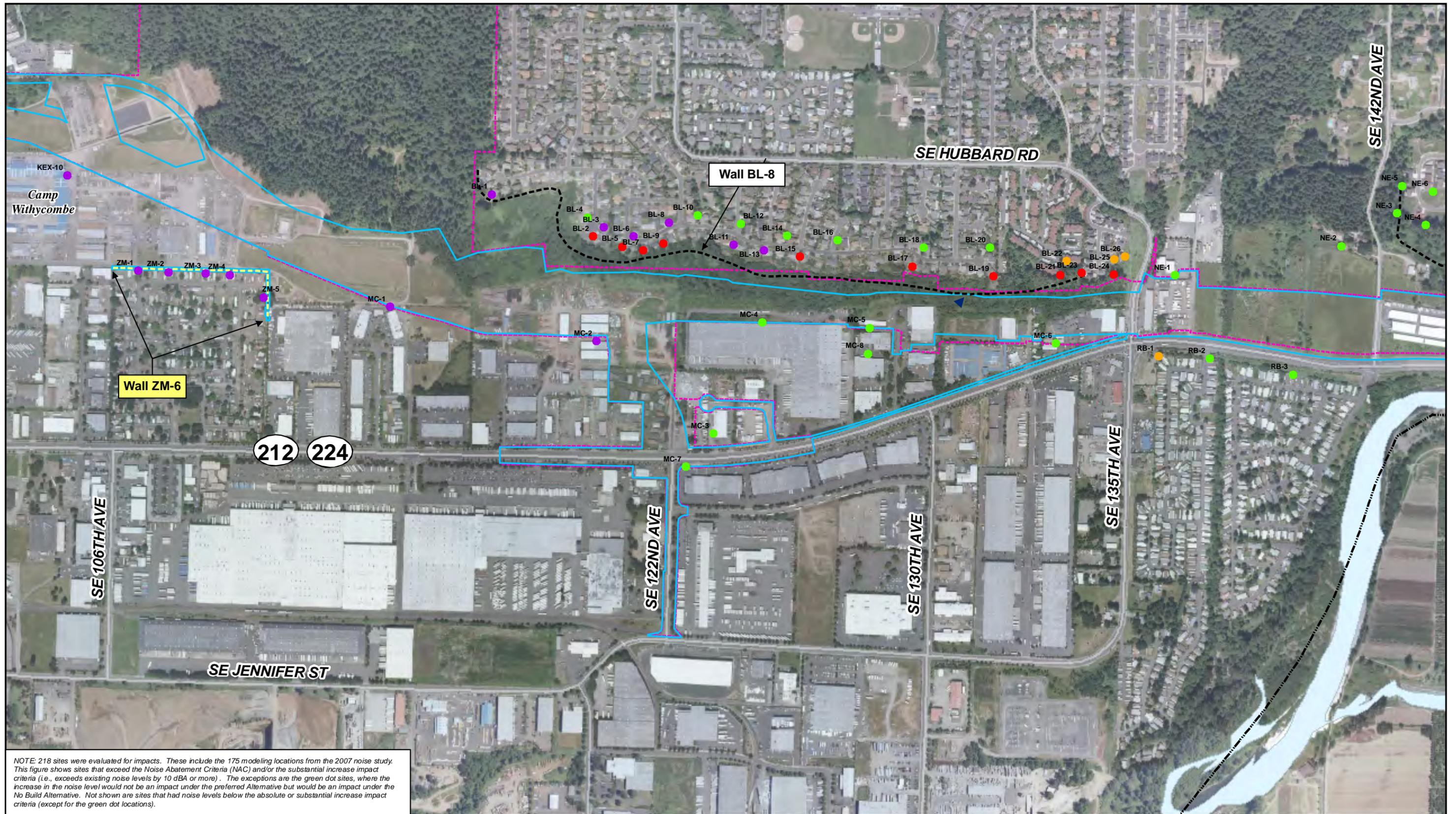
Figure PA-19
Noise Impacts and Noise Walls,
I-205 Interchange Area

Sources:
 ODOT and Metro, Portland OR (2008-09)

Printing Date:
 File: F:\O\DO\T00000648\0801\NOIS\arcmap\FEIS_Noise_Impacts_and_Walls_1205Area_0812010.mxd

Sunrise Project, I-205 to Rock Creek Junction





NOTE: 218 sites were evaluated for impacts. These include the 175 modeling locations from the 2007 noise study. This figure shows sites that exceed the Noise Abatement Criteria (NAC) and/or the substantial increase impact criteria (i.e., exceeds existing noise levels by 10 dBA or more). The exceptions are the green dot sites, where the increase in the noise level would not be an impact under the preferred Alternative but would be an impact under the No Build Alternative. Not shown are sites that had noise levels below the absolute or substantial increase impact criteria (except for the green dot locations).

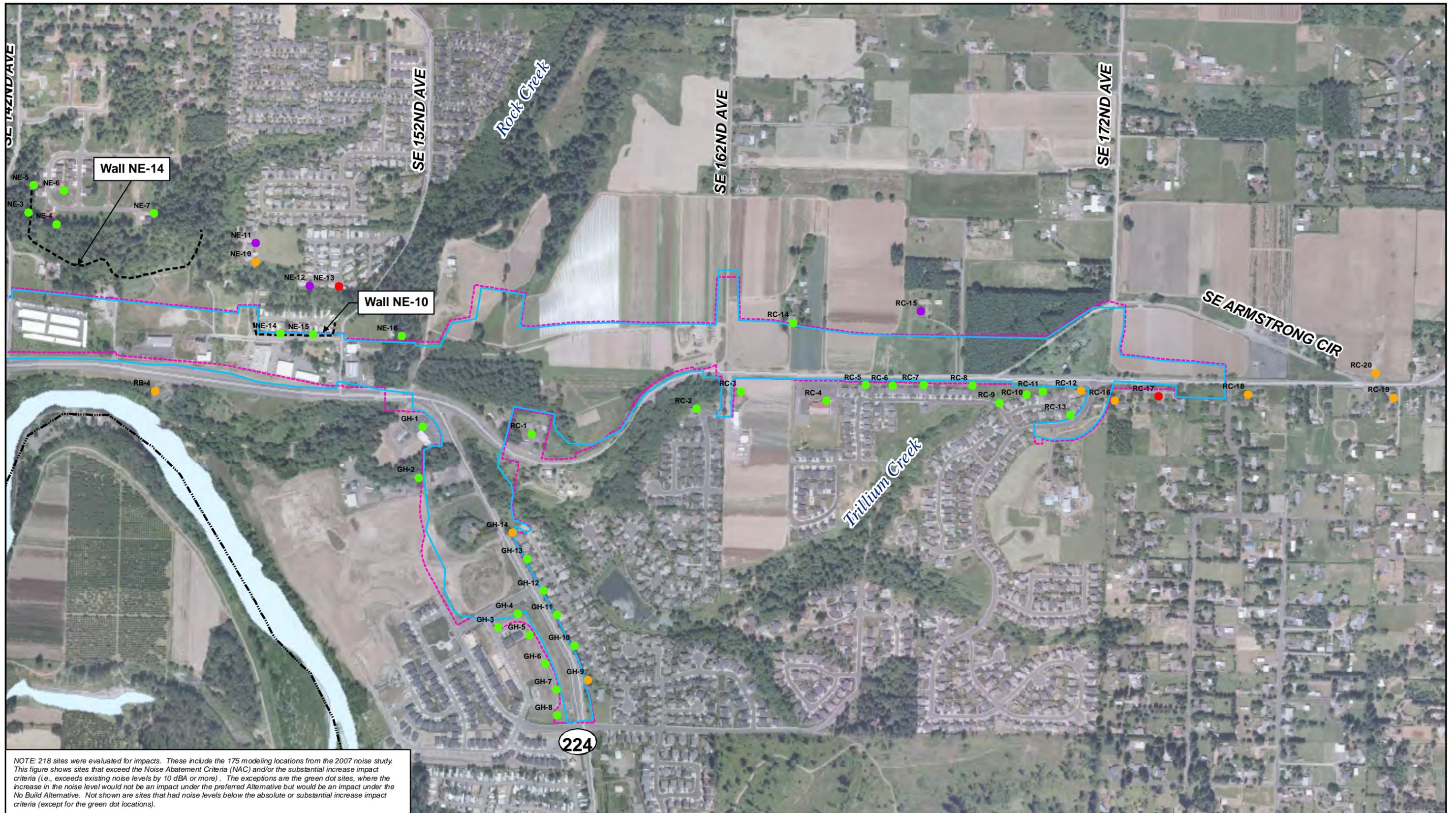


Sources:
ODOT and Metro, Portland OR (2008-09)

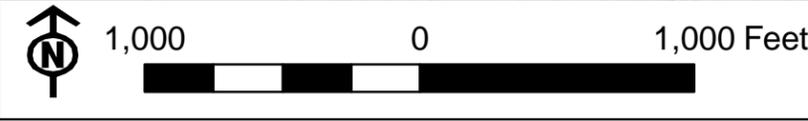
Legend		Predicted Noise Impact Locations	
Proposed Right-of-Way Line	Sound Walls Evaluated, Recommended	No Noise Impact and Lower Noise Level than No-Build Alternative	
Construction Impact Line	Evaluated But Not Recommended	Exceeds Noise Abatement Criteria (NAC) & Substantial Increase Criteria	
		Exceeds Substantial Increase Criteria Only	
		Exceeds NAC Only	

Figure PA-20
Noise Impacts and Noise Walls,
Midpoint Area

 Sunrise Project, I-205 to Rock Creek Junction



NOTE: 218 sites were evaluated for impacts. These include the 175 modeling locations from the 2007 noise study. This figure shows sites that exceed the Noise Abatement Criteria (NAC) and/or the substantial increase impact criteria (i.e., exceeds existing noise levels by 10 dBA or more). The exceptions are the green dot sites, where the increase in the noise level would not be an impact under the preferred Alternative but would be an impact under the No Build Alternative. Not shown are sites that had noise levels below the absolute or substantial increase impact criteria (except for the green dot locations).



Sources:
ODOT and Metro, Portland OR (2008-09)

Legend		Predicted Noise Impact Locations	
Proposed Right-of-Way Line	Sound Walls Evaluated, Recommended	No Noise Impact and Lower Noise Level than No-Build Alternative	
Construction Impact Line	Evaluated But Not Recommended	Exceeds Noise Abatement Criteria (NAC) & Substantial Increase Criteria	
		Exceeds Substantial Increase Criteria Only	
		Exceeds NAC Only	

Figure PA-21
Noise Impacts and Noise Walls,
Rock Creek Junction Area

 Sunrise Project, I-205 to Rock Creek Junction

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