

3.10 Noise

Human response to sound is subjective and can vary greatly from person to person. Factors that can influence individual responses include loudness, frequency, amount of background noise present and the nature of the work or activity (for example, sleeping) that the sound affects. When sounds become unpleasant or unwanted, people tend to classify them as noise. Environmental noise can interfere with a broad range of human activities in ways that degrade public health and welfare. Sound levels of typical noise sources, their relative loudness, and typical public responses are detailed in Appendix L, Noise Technical Memorandum.

What laws and regulations govern noise levels?

Federal, state, and local governments provide guidance on acceptable noise levels to ensure the public's health and well-being, both now and in the future. The primary regulations governing noise levels in the study area are contained in the Washington state noise control ordinance (WAC Chapter 173-60, Maximum Environmental Noise Levels). Local jurisdictions, such as the City of Hoquiam, also often place additional restrictions on noise levels certain noise-generating activities, such as construction projects.

Under federal law, a traffic noise analysis is required only for projects that are considered "Type 1" under the FHWA criteria. For a project to be considered Type 1, the project must involve construction of a highway at a new location or the physical alteration of an existing highway that significantly changes either the horizontal or vertical alignment or increases the number of through-lanes. The SR 520 Pontoon Construction Project would not add any new highway construction nor significantly change or increase the number of through-lanes of an existing highway; therefore, this project is exempt from a traffic noise analysis. WSDOT elected to provide details on noise from haul routes and other offsite noise-producing sources to fully disclose any increase in noise levels that could occur as part of the project. WSDOT also chose to use the FHWA traffic noise criteria as a reference level for those comparisons.

How are noise levels characterized?

Human response to noise is subjective and can vary greatly from person to person. Factors that can influence individual response include the loudness, frequency, and amount of background noise present before an intruding noise. The unit used to measure the loudness of noise is the decibel (dB). To better approximate the sensitivity of the human ear to sounds of different frequencies, the A-weighted decibel scale was

What is the Noise Technical Memorandum?

This section was derived from the Noise Technical Memorandum, which details the following information:

- Existing noise conditions in the study area
- Detailed methodology for measuring and evaluating noise effects
- Typical construction equipment noise levels
- Noise-monitoring and modeling data and locations
- Exemptions to state noise control limits
- Potential project effects on noise
- Noise levels produced by equipment needed to develop the casting basin facility
- A complete list of abatement measures

Please refer to the Noise Technical Memorandum in Appendix L for more information.

What is a decibel?

A decibel (dB) is a unit used to measure the loudness of noise.

What is dBA?

The A-weighted decibel (dBA) scale is an adjusted dB scale that measures sound's loudness and the ear's sensitivity to frequency.

What is L_{eq} ?

L_{eq} is the energy average noise equivalent sound level, in dBA, for a specific time period (1 hour, for example). The L_{eq} is used to account for variances in loudness over time.

What is L_{max} ?

L_{max} is the maximum sound level over a preset measurement period for a given event adjusted toward the frequency range of human hearing.

developed (dBA). The A-weighted scale is used in most ordinances and standards, including the applicable standards for this project.

There are several different descriptors used to define noise. The L_{max} is the greatest root-mean square (RMS) sound levels, in dBA, measured during a specified measurement period. To account for the time-varying nature of noise, the energy equivalent sound pressure level metric (L_{eq}) is normally used. The L_{eq} is defined as the average noise level, on an energy basis, for a stated time period (for example, hourly). More details on noise can be found in Appendix L, Noise Technical Memorandum.

What are the noise levels in the study area now?

The noise study area includes residential areas near the proposed build alternative sites and areas close to potential haul routes. WSDOT used 500 feet as a starting point for the study area but, where applicable, expanded that area to account for potential effects. WSDOT noise analysts collected information on land use and the existing noise environment in the study area as a baseline for evaluating the project's potential noise effects. Current average noise levels in the study area near each site are described in the following subsections.

CTC Facility

When the Northern Pacific Railroad terminus arrived on Commencement Bay in the late nineteenth century, Tacoma began to grow. The land surrounding the CTC facility has been a major industrial, commercial, and shipping area for many years, with associated noise in this area since the early 1900s. The CTC site is a fully constructed facility in the Port of Tacoma industrial area, and the facility is routinely used for industrial activities, including pontoon building. Daytime noise levels in established industrial areas like this typically range from 65 to 90 A-weighted decibels (dBA), with average hourly noise levels of 68 to 74 dBA equivalent continuous noise level (L_{eq}). The two main routes to and from the existing CTC facility site—East Portland Avenue to East 11th Street and Port of Tacoma Road—directly access I-5 without traversing any noise-sensitive areas. Typical average sound levels along the routes would likely range from 68 to 74 dBA L_{eq} , with the passing of heavy truck ranging from 78 to 84 dBA maximum sound pressure (L_{max}).

Anderson & Middleton Alternative

WSDOT measured ambient noise levels at seven locations near the Anderson & Middleton Alternative site and along the site's potential truck haul access routes (Exhibit 3.10-1).

What are noise-sensitive properties?

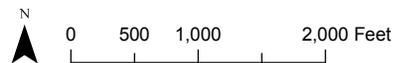
Typically noise-sensitive properties include residences, hotels, hospitals, and other locations where people sleep. Commercial properties can also be noise sensitive if quiet is necessary for operation; as a result, this would not include most retail, offices, or general business, but it could include an audiology laboratory or some medical facilities.

What are typical noise level ranges?

The smallest change in noise level that a human ear can perceive is about 3 dBA; increases of 5 dBA or more are clearly noticeable. Normal conversation ranges between 44 and 65 dBA when speakers are 3 to 6 feet apart. Noise levels in a quiet, rural area at night are typically between 32 and 35 dBA. Quiet urban nighttime noise levels range from 40 to 50 dBA. Noise levels during the day in a noisy urban area frequently reach 70 to 80 dBA. Noise levels that exceed 110 dBA become intolerable, then painful, while levels higher than 80 dBA over continuous periods can cause hearing loss. Typical construction equipment and their reference maximum noise levels are detailed in Appendix L, Noise Technical Memorandum.



- Long-term noise-monitoring location
- Short-term noise-monitoring location
- Potential haul route
- Build Alternative Site
- City limits
- 54(45) Daytime (nighttime) sound level (dBA L_{eq})



Source: Grays Harbor County (2006) GIS Data (Waterbody and Street). Horizontal datum for all layers is State Plane Washington South NAD 83; vertical datum for layers is NAVD88.

Exhibit 3.10-1. Grays Harbor Study Area Noise-Monitoring Locations
SR 520 Pontoon Construction Project



Short-term noise levels (measured over 15-minute periods) were monitored at five locations in Hoquiam, and long-term noise levels (measured over 48 hours) were monitored at two locations near the Grays Harbor National Wildlife Refuge, east of the site. Noise-sensitive residences near the site have existing measured hourly L_{eq} noise levels ranging from 53 to 75 dBA during daytime hours, reducing in evening hours to 40 to 50 dBA. The higher noise levels are along Emerson Street. The two long-term noise-monitoring locations provided a baseline of noise levels near the Grays Harbor National Wildlife Refuge. Existing maximum daytime noise levels range from 59 to 63 dBA L_{eq} .

Nighttime maximum noise levels near the Grays Harbor National Wildlife Refuge ranged from 41 to 54 dBA L_{eq} , with average noise levels near the site ranging from 35 to 46 dBA L_{eq} . The average daytime maximum noise level near SR 109 was measured at 82 dBA, with nighttime average maximums of 75 dBA. The higher noise levels along SR 109 are due to a high level of existing truck traffic in this corridor. More information on wildlife can be found in the Pontoon Project Biological Assessment (WSDOT 2009d) and in Appendix C, Ecosystems Discipline Report.

Noise sources near the site are local traffic and miscellaneous local noise from nearby commercial and industrial land uses. At monitoring locations M1 through M3 (along Emerson Avenue), traffic is the dominant noise source. At location M3, a permanent water pumping station also contributes to noise in the area. At the two residential monitoring locations near the site (M4 and M5), the only noise sources are local activities such as lawn care, occasional traffic, and some local commercial activities. Exhibit 3.10-1 summarizes the measured sound levels at these seven locations.

Aberdeen Log Yard Alternative

The closest noise-sensitive properties to the Aberdeen Log Yard Alternative site are single-family residences located on Garfield Street approximately 470 feet northeast of the site. Existing commercial structures shield these residences from the site. Some single-family residences are 500 feet north of the site along Market Street; existing commercial structures also shield them from the site.

Along the proposed truck haul routes the land uses are mostly commercial, but there are several single-family homes along West Wishkah and West Heron streets between Garfield and Park streets, as well as some additional residences past Park Street. Schools near the project area include Harbor High School, A. J. West Elementary, and Hopkins Preschool.

WSDOT measured ambient noise levels at three locations near the Aberdeen Log Yard site, including two along proposed truck haul

What are the applicable noise regulations?

The primary regulations reviewed for the noise analysis are in the Washington State Noise Control Ordinance (WAC 173-60, Maximum Environmental Noise Levels) and the City of Hoquiam code. The ordinance is divided by land use types (residential, commercial, and industrial). The build alternative sites are considered industrial sites, which have the highest thresholds for maximum permissible environmental noise levels.

In addition to the WAC, the City of Hoquiam has restrictions on construction activities in Chapter 3A.30.010(1)(d)(i) of the City code that limit the hours of construction to between 7 a.m. and 8 p.m.

Municipal codes for Grays Harbor County and the cities of Aberdeen and Hoquiam do not contain special noise ordinances or regulations that would apply to SR 520 Pontoon Construction Project operations.

access routes and one along Market Street (Exhibit 3.10-1). Because of substantial truck traffic and acceleration noise close to Garfield Street, noise levels near the site are fairly high for a residential area. Peak-hour noise levels of 67 to 68 dBA are typical at residences on Wishkah, Garfield, and Heron streets. Along Market Street, which is shielded from the major roadways by existing commercial and residential structures, noise levels are much lower and typically range from 50 to 55 dBA L_{eq} . The monitored short-term noise level at location M8 on Market Street at Thornton Street was 51.3 dBA L_{eq} . Nighttime noise levels decrease by 6 to 8 dBA over daytime levels. The reduced nighttime noise levels are due to a reduction in traffic volumes during late night hours. WSDOT performed 15-minute traffic counts concurrently at all noise-monitoring locations shown in Exhibit 3.10-1. There is a high existing frequency of heavy truck traffic along the monitored portions of the potential haul route.

How did WSDOT evaluate direct effects on noise levels?

WSDOT calculated the project's potential construction and operational noise levels using the methods described in the FHWA document *Highway Construction Noise: Measurement, Prediction and Mitigation* (USDOT 1997) and the FHWA Roadway Construction Noise Model (USDOT 2006). In addition to the methods established by FHWA, WSDOT also relied on its noise analysts' professional experience with similar major construction projects. The potential noise levels were then compared to the current ambient noise levels to estimate the potential increase in noise as a result of this project.

Because the CTC site is an existing facility in an established industrial area, detailed analysis of the site is not required; WSDOT instead reviewed the type of noise from site operations without noise monitoring or modeling. For the Grays Harbor build alternative sites, WSDOT performed studies at noise receiver locations near the sites and along haul routes where noise levels could increase during project construction and operation. Noise increases at the Grays Harbor National Wildlife Refuge were also considered. More information on wildlife can be found in the Pontoon Project Biological Assessment (WSDOT 2009d) and in Appendix C, Ecosystems Discipline Report.

WSDOT noise analysts followed guidelines and procedures provided by the American National Standards Institute for community noise measurements. Noise measurement locations were at least 5 feet from any solid structure to prevent acoustical reflections.

How would construction of the casting basin directly affect noise levels?

Grays Harbor Build Alternatives

Noise levels would increase during casting basin development at Grays Harbor, although the increase would be temporary. All noise related to casting basin construction occurring between 7 a.m. and 10 p.m., Monday through Saturday, would be exempt from the state noise control ordinance (WAC 173-60). The Washington state noise control ordinance does not apply to sound originating from temporary construction sites as a result of construction activities. The ordinance noise limits would apply, however, to facility construction beyond those hours and on Sundays and legal holidays. The state ordinance daytime and nighttime limits would apply to pontoon-building operations, and are more restrictive between 10 p.m. and 7 a.m. As noted in the sidebar previously, the City of Hoquiam does limit construction hours to between 7 a.m. and 8 p.m., and construction beyond these hours would require a noise variance from the city. WSDOT would work with the City to obtain a noise variance between 8 p.m. and 7 a.m. If necessary, WSDOT could restrict using especially noisy construction equipment during a nighttime shift.

Some casting basin construction noise levels would likely exceed the state ordinance limits; therefore, site construction occurring after the allowed hours would likely require a noise variance from the City of Aberdeen or City of Hoquiam.

Pile-driving would be required to construct the pontoon site foundations and support dolphins at both Grays Harbor build alternative sites. Pile-driving can produce maximum short-term noise levels of 105 to 115 dBA at a distance of 50 feet. Actual levels could vary and would depend on the distance and topographical conditions between the pile-driving and the receiver locations. Pile-driving is exempt from WAC 173-60 noise requirements between 7 a.m. and 10 p.m. Information on the effects of pile-driving noise on fish and wildlife can be found in the *Fish and Aquatic Resources* and *Wildlife* sections of Section 3.1, Ecosystems, and Appendix C, Ecosystems Discipline Report.

Anderson & Middleton Alternative

During construction of the casting basin facility at the Anderson & Middleton site, noise levels could increase as much as 10 to 24 dBA over existing levels (which range from 53 to 65 dBA) during peak construction hours (7 a.m. to 9 p.m.), including truck noise along the haul routes. The actual noise-level increases would vary substantially, depending on the location. For example, receivers along SR 109 would experience minimal increases relative to existing conditions because of the already high traffic volumes on the highway. In contrast, some

residences located near the site could have much larger increases in noise levels. Currently, these residences experience low noise levels because they are shielded from highways and local area traffic volumes are low. This anticipated noise-level increase would result from the following factors:

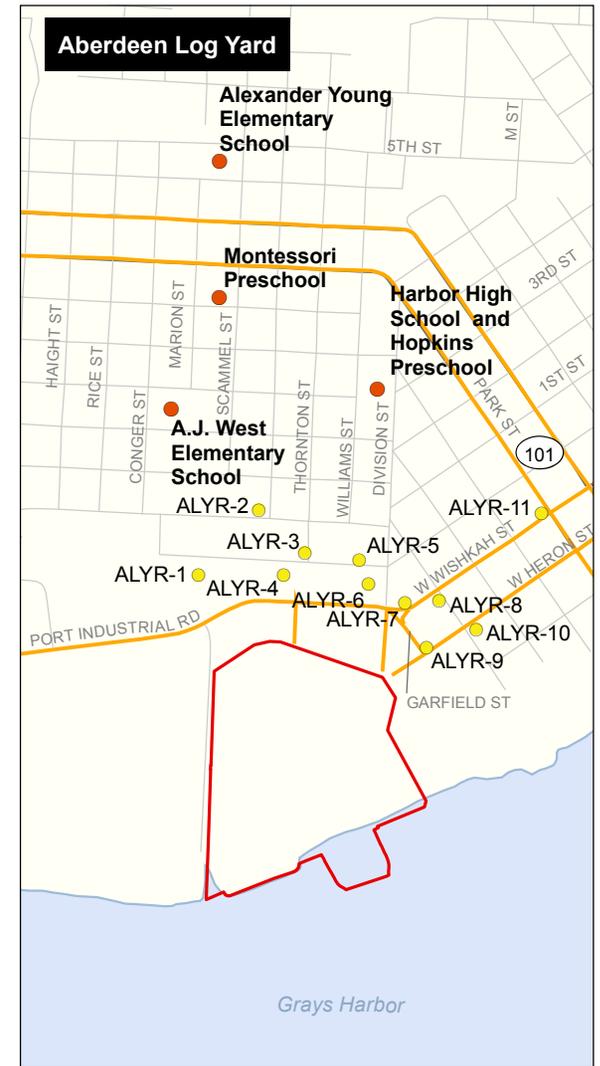
- The property is mostly undeveloped, inactive, and current noise levels are low.
- Casting basin and pontoon construction activities would result in new sources of noise.
- Potential truck haul routes would be near residences.
- Residences near the site would have little shielding from site construction.

For the Anderson & Middleton Alternative, WSDOT modeled noise levels at 17 locations along the proposed haul routes and next to the site (see Exhibit 3.10-2). The noise analysis assumed the highest volume of traffic, both for haul trucks and passenger vehicles. Analysts also assumed that most construction equipment would be used simultaneously and under a normal load. The analysis was performed for noise-sensitive properties, including residences, schools, and the Grays Harbor National Wildlife Refuge.

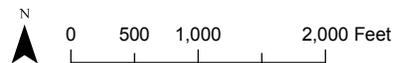
Because construction activities would occur generally after 7 a.m. and end before 9 p.m.—and daytime construction is exempt from the state noise control ordinance maximum allowable sound levels—casting basin facility construction would not likely exceed the Washington state noise control ordinance. Noise related to haul trucks, while increasing traffic noise levels along the haul routes, is normally exempt from noise ordinances, as is all traffic on public roadways. For this analysis, WSDOT compared the predicted haul route traffic to the existing traffic and to the WSDOT traffic noise criteria to understand the magnitude of haul route-related noise.

Noise levels at the Grays Harbor National Wildlife Refuge would likely increase by 5 to 12 dBA, ranging from 54 to 71 dBA, during peak hauling along Paulson Road. The proposed casting basin would be located far enough away that construction noise from the site would not likely result in a notable noise increase within the preserve (more information on wildlife can be found in the *Wildlife* section of Section 3.1, Ecosystems).

Noise levels at the Hoquiam High School athletic field would probably reach 69 dBA L_{eq} —which is an increase of up to 6 dBA over the existing level—when trucks hauling materials to and from the site pass by. WSDOT also predicts similar noise increases for Emerson Elementary.



- School
- Noise modeling location
- Potential haul route
- Build Alternative Site
- City limits



Source: Grays Harbor County (2006) GIS Data (Waterbody and Street), Grays Harbor County (2007) GIS Data (Point of Interest and City Limit). Horizontal datum for all layers is State Plane Washington South NAD 83; vertical datum for layers is NAVD88.

Exhibit 3.10-2. Sites Representing Noise-Sensitive Properties in the Grays Harbor Study Area
SR 520 Pontoon Construction Project



Noise levels at Hoquiam Middle School would not likely increase because it is farther from Emerson Avenue and shielded from the road by some residences and Emerson Elementary. For residents just north of the site, noise levels would likely range from 57 to 66 dBA, with most noise resulting from batch plant and haul trucks. Exhibits 3.10-3, -4, and -5 provide a comprehensive look at the potential maximum noise levels during site construction. Exhibit 3.10-3 focuses on maximum construction noise directly related to site construction; this analysis is for all construction equipment on the site, including the batch plant, mixer trucks, excavators, and other typical construction equipment. Overall, the maximum construction noise levels could reach 42 to 66 dBA L_{eq} . The highest noise levels would be at receivers AMR-10 through AMR-14 because they are closest to the facility.

EXHIBIT 3.10-3

Predicted Maximum Project Construction Noise Levels for the Anderson & Middleton Alternative

Modeling Location	Noise Level (L_{eq})				
	Existing Measured Noise Levels	Existing Data Source ^a	Project Site Construction	Potential Noise Effect ^b	Increase over Existing
AMR-1	63	M6	45	No	--
AMR-2	59	M7	45	No	--
AMR-3	59	M7	46	No	--
AMR-4	59	M7	48	No	--
AMR-5	59	M7	57	Nighttime	--
AMR-6	63	M6	42	No	--
AMR-7	57	M4	59	Nighttime	--
AMR-8	57	M4	58	Nighttime	--
AMR-9	57	M4	61	Nighttime	4
AMR-10	57	M4	65	Nighttime	8
AMR-11	57	M4	66	Nighttime	9
AMR-12	57	M4	64	Nighttime	7
AMR-13	57	M4	61	Nighttime	4
AMR-14	57	M4	64	Nighttime	7
AMR-15	53	M5	56	Nighttime	3
AMR-16	53	M5	59	Nighttime	6
AMR-17	53	M5	60	Nighttime	7

^a Existing data for this analysis came from the corresponding noise-monitoring locations shown on Exhibit 3.10-1.

^b Noise effects would only occur after 8 p.m., because construction noise is exempt from the state noise control ordinance from 7 a.m. to 9 p.m.; however, the City of Hoquiam does limit construction noise from 7 a.m. to 8 p.m. Maximum allowable sound levels are 60 dBA during the day and 50 dBA at nighttime.

Exhibit 3.10-4 presents maximum noise levels related to haul route activity. Noise analysts modeled the existing traffic noise levels and compared those results to the existing traffic volumes with the added worst-case number of haul trucks. All modeling was performed assuming the posted speed limits and included shielding by existing structures. The modeling did not include miscellaneous noise sources, such as commercial, industrial, and residential activities and, therefore, can be considered a worst-case analysis. The analysis shows that noise levels could increase by up to 18 dBA L_{eq} at receivers located in quiet areas near a haul route. Overall, haul route noise levels are predicted to range from 48 to 69 dBA L_{eq} . Only 3 of the 17 modeling locations are predicted to meet the WSDOT 66 dBA traffic noise criteria, with maximum haul route noise levels of 69 to 71 dBA.

EXHIBIT 3.10-4

Predicted Maximum Haul Route Noise Levels during Project Construction for the Anderson & Middleton Alternative

Modeling Location	Noise Level (L_{eq})				
	Existing Modeled (Traffic Noise)	Project Construction Traffic	WSDOT Traffic Criteria	Exceed WSDOT Criteria	Amount over Existing (over Criteria)
AMR-1	61	71	66	Yes	10 (5)
AMR-2	43	55	66	No	12 (--)
AMR-3	50	54	66	No	4 (--)
AMR-4	51	69	66	Yes	18 (3)
AMR-5	41	58	66	No	17 (--)
AMR-6	63	69	66	Yes	6 (3)
AMR-7	42	53	66	No	11 (--)
AMR-8	42	53	66	No	11 (--)
AMR-9	42	55	66	No	13 (--)
AMR-10	42	56	66	No	14 (--)
AMR-11	42	57	66	No	15 (--)
AMR-12	42	58	66	No	16 (--)
AMR-13	41	55	66	No	14 (--)
AMR-14	41	55	66	No	14 (--)
AMR-15	41	49	66	No	8 (--)
AMR-16	41	48	66	No	7 (--)
AMR-17	40	48	66	No	8 (--)

EXHIBIT 3.10-5

Predicted Maximum Cumulative Project Construction Noise Levels for the Anderson & Middleton Alternative

Modeling Location	Noise Level (L_{eq})		
	Cumulative Project Worst Case	Change over Modeled Traffic Noise Levels	Change over Measured Ambient Noise Levels
AMR-1	71	10	8
AMR-2	55	12	-4
AMR-3	55	5	-4
AMR-4	69	18	10
AMR-5	60	19	1
AMR-6	69	6	6
AMR-7	60	18	3
AMR-8	59	17	2
AMR-9	62	20	5
AMR-10	65	23	8
AMR-11	66	24	9
AMR-12	65	23	8
AMR-13	62	21	5
AMR-14	64	23	7
AMR-15	57	16	4
AMR-16	59	18	6
AMR-17	60	20	7

WSDOT analysts also performed a cumulative analysis to predict the maximum worst-case construction-related noise levels at all 17 locations by acoustically summing the haul route noise levels with the onsite construction noise levels. As presented in Exhibit 3.10-5, cumulative noise levels ranged from 55 to 69 dBA L_{eq} for the 17 modeling sites. The highest levels are at locations located near haul routes and near the northwest corner of the site. Haul route noise would dominate at sites AMR-4 and AMR-6, while general construction noise would be dominant at sites AMR-10 through AMR-14. Although noise levels are predicted to increase at some locations by up to 24 dBA L_{eq} , actual noise levels increases would likely be less because this analysis assumes the worst-cast construction and hauling activities.

Aberdeen Log Yard Alternative

During casting basin facility construction at the Aberdeen Log Yard site, noise levels could increase 5 to 14 dBA over existing measured noise

levels (which range from 51 to 68 dBA) during peak construction hours; truck noise along the haul routes is included in this increase. The primary noise source for this alternative would be trucks along the proposed haul routes during peak construction hours of 7 a.m. to 9 p.m. WSDOT modeled noise levels for 11 representative locations near this site (see Exhibit 3.10-2), the noise analysis assumed the highest volume of traffic for both haul trucks and passenger vehicles. The analysts also assumed that most construction equipment would be in use simultaneously. Because this would rarely, if ever, actually happen, the estimated noise-level increase is a worst-case analysis.

Exhibits 3.10-6, -7, and -8 provide a comprehensive look at the potential maximum noise levels during casting basin facility construction. Exhibit 3.10-6 focuses on maximum construction noise directly related to site construction, Exhibit 3.10-7 details the maximum noise levels related to haul route activity, and Exhibit 3.10-8 provides a cumulative noise analysis that predicted the maximum worst-case construction-related noise levels at all 11 modeling locations by acoustically summing the haul route noise levels with the onsite construction noise levels. Overall the maximum construction noise levels could reach 49 to 62 dBA L_{eq} . The highest noise levels would be at receiver ALYR-6 and ALYR-7 because they are closest to the site.

Noise levels could increase by up to 6 dBA L_{eq} at receivers near the haul route; haul route noise levels are predicted to range from 54 to 75 dBA L_{eq} . Five of the 11 modeling locations are predicted to meet the WSDOT 66 dBA traffic noise criteria, with maximum haul route noise levels of 70 to 75 dBA close to the haul route along West Wishkah and West Heron streets. The cumulative project noise levels would range from 56 to 75 dBA L_{eq} for the 11 modeling sites. The highest noise levels would be near haul routes. Haul route noise would dominate at sites ALYR-6 and ALYR-11. Although noise-level increases of up to 14 dBA L_{eq} are predicted at some locations, actual increases would likely be less because this analysis assumes the worst-case construction and hauling activities.

How would pontoon-building operations directly affect noise levels?

CTC Facility

Because WSDOT's potential use of the CTC facility to build pontoons is consistent with its current industrial purpose and recent uses, the project would not produce unavoidable noise effects that would warrant analysis and/or mitigation measures.

EXHIBIT 3.10-6

Predicted Maximum Project Construction Noise Levels for the Aberdeen Log Yard Alternative

Modeling Location	Noise Level (L_{eq})				
	Existing Measured Noise Levels	Existing Data Source ^a	Project Site Construction	Potential Noise Effect ^b	Increase over Existing
ALYR-1	51	M8	60	Nighttime	9
ALYR-2	51	M8	52	Nighttime	1
ALYR-3	51	M8	59	Nighttime	8
ALYR-4	51	M8	61	Nighttime	10
ALYR-5	67	M9	59	Nighttime	--
ALYR-6	67	M9	62	Nighttime	--
ALYR-7	67	M9	60	Nighttime	--
ALYR-8	68	M10	60	Nighttime	--
ALYR-9	68	M10	60	Nighttime	--
ALYR-10	68	M10	59	Nighttime	--
ALYR-11	68	M10	49	Nighttime	--

^a Existing data for this analysis came from the corresponding noise-monitoring locations shown on Exhibit 3.10-1.

^b Noise effects would only occur after 9 p.m. because construction noise is exempt from the state noise control ordinance from 7 a.m. to 9 p.m. Maximum allowable sound levels are 60 dBA during the day and 50 dBA at night.

EXHIBIT 3.10-7

Predicted Maximum Haul Route Noise Levels during Project Construction for the Aberdeen Log Yard Alternative

Modeling Location	Noise Level (L_{eq})				
	Existing Modeled (Traffic Noise)	Project Construction Traffic	WSDOT Traffic Criteria	Exceed WSDOT Criteria	Amount over Existing (over Criteria)
ALYR-1	55	59	66	No	4 (--)
ALYR-2	49	54	66	No	5 (--)
ALYR-3	53	58	66	No	5 (--)
ALYR-4	58	63	66	No	5 (--)
ALYR-5	54	59	66	No	5 (--)
ALYR-6	60	65	66	No	5 (--)
ALYR-7	66	72	66	Yes	6 (--)
ALYR-8	64	70	66	Yes	6 (--)
ALYR-9	69	75	66	Yes	6 (--)
ALYR-10	64	70	66	Yes	6 (--)
ALYR-11	67	72	66	Yes	5 (--)

EXHIBIT 3.10-8

Predicted Maximum Cumulative Project Construction Noise Levels for the Aberdeen Log Yard Alternative

Modeling Location	Noise Level (L_{eq})		
	Cumulative Worst Case	Change over Modeled Traffic Noise Levels	Change over Measured Ambient Noise Levels
ALYR-1	62	7	11
ALYR-2	56	7	5
ALYR-3	61	8	10
ALYR-4	65	7	14
ALYR-5	62	8	--
ALYR-6	67	7	0
ALYR-7	72	6	5
ALYR-8	70	6	2
ALYR-9	75	6	7
ALYR-10	70	6	2
ALYR-11	72	5	4

Anderson & Middleton Alternative

WSDOT projected noise levels from pontoon-building operations at the Anderson & Middleton site using the same methods as for construction. The noise modeling predicts that general pontoon-building noise levels would range from 40 to 64 dBA L_{eq} (Exhibit 3.10-9). During peak pontoon-building operational hours, noise levels at several residences near the site (AMR-10 through AMR-12 and AMR-14) are predicted to equal or exceed the state noise control ordinance levels between 7 a.m. and 9 p.m. Site operations are not predicted to alter noise levels in the Grays Harbor National Wildlife Refuge. Worst-case noise levels along the proposed haul routes during these hours would likely increase by 1 to 6 dBA L_{eq} during periods of peak truck haul traffic (Exhibit 3.10-10). The predicted increase at the Hoquiam High School athletic field and Emerson Elementary would be 1 dBA L_{eq} , with noise levels increasing to about 64 dBA. WSDOT predicts no noise increases for Hoquiam Middle School and that all sites along the haul route would have noise levels below WSDOT traffic noise criteria. At the Grays Harbor National Wildlife Refuge, truck noise levels would likely increase by 1 to 2 dBA over current levels.

As presented in Exhibit 3.10-11, the maximum cumulative project noise levels from truck traffic and pontoon-building operations with the Anderson & Middleton Alternative could increase noise levels by 13 to 22 dBA over existing noise levels at residences near the site (AMR-1

through AMR-17). The concrete batch plant and associated equipment would be the primary source of noise causing the increase. Haul route noise levels would likely increase by 1 to 2 dBA along Emerson Street and up to 6 dBA along Adams Street during peak haul truck traffic.

Aberdeen Log Yard Alternative

Based on the noise modeling, general pontoon-building activities noise levels from the Aberdeen Log Yard Alternative are predicted to range from 46 to 59 dBA L_{eq} (see Exhibit 3.10-12). Although the modeling predicts that three sites would have increases of 5 to 7 dBA, noise levels at all sites would be below the state noise control ordinance.

EXHIBIT 3.10-9

Predicted Maximum Project Operations Noise Levels for the Anderson & Middleton Alternative

Modeling Location	Noise Level (L_{eq})				
	Existing Measured Noise Levels	Existing Data Source	Project Site Operation	Potential Noise Impact	Increase over Existing
AMR-1	63	M6	42	No	--
AMR-2	59	M7	42	No	--
AMR-3	59	M7	43	No	--
AMR-4	59	M7	45	No	--
AMR-5	59	M7	54	No	--
AMR-6	63	M6	40	No	--
AMR-7	57	M4	57	No	0
AMR-8	57	M4	56	No	--
AMR-9	57	M4	59	No	2
AMR-10	57	M4	63	Yes	6
AMR-11	57	M4	64	Yes	7
AMR-12	57	M4	62	Yes	5
AMR-13	57	M4	59	No	2
AMR-14	57	M4	62	Yes	5
AMR-15	53	M5	54	No	--
AMR-16	53	M5	56	No	--
AMR-17	53	M5	57	No	--

EXHIBIT 3.10-10

Predicted Maximum Haul Route Noise Levels during Project Operations for the Anderson & Middleton Alternative

Modeling Location	Noise Level (L_{eq})				
	Existing Modeled (Traffic Noise)	Operational Traffic	WSDOT Traffic Criteria	Exceed WSDOT Criteria	Amount over Existing
AMR-1	61	63	66	No	2
AMR-2	43	45	66	No	2
AMR-3	50	51	66	No	1
AMR-4	51	57	66	No	6
AMR-5	41	46	66	No	5
AMR-6	63	64	66	No	1
AMR-7	42	44	66	No	2
AMR-8	42	44	66	No	2
AMR-9	42	45	66	No	3
AMR-10	42	46	66	No	4
AMR-11	42	46	66	No	4
AMR-12	42	47	66	No	5
AMR-13	41	45	66	No	4
AMR-14	41	44	66	No	3
AMR-15	41	43	66	No	2
AMR-16	41	42	66	No	1
AMR-17	40	42	66	No	2

EXHIBIT 3.10-11

Predicted Maximum Cumulative Project Operational Noise Levels for the Anderson & Middleton Alternative

Modeling Location	Noise Level (L _{eq})						Change Over Traffic	Change Over Measured
	Existing Traffic Only	Existing Measured	Construction Traffic	Site Construction	Cumulative Worst Case			
AMR-1	61	63	63	42	63	2	0	
AMR-2	43	59	45	42	47	4	--	
AMR-3	50	59	51	43	52	2	--	
AMR-4	51	59	57	45	57	6	--	
AMR-5	41	59	46	54	55	14	--	
AMR-6	63	63	64	40	64	1	1	
AMR-7	42	57	44	57	57	15	0	
AMR-8	42	57	44	56	56	14	--	
AMR-9	42	57	45	59	59	17	2	
AMR-10	42	57	46	63	63	21	6	
AMR-11	42	57	46	64	64	22	7	
AMR-12	42	57	47	62	62	20	5	
AMR-13	41	57	45	59	59	18	2	
AMR-14	41	57	44	62	62	21	5	
AMR-15	41	53	43	54	54	13	1	
AMR-16	41	53	42	56	56	15	3	
AMR-17	40	53	42	57	57	17	4	

EXHIBIT 3.10-12

Predicted Maximum Project Operations Noise Levels, Aberdeen Log Yard Alternative

Modeling Location	Noise Level (L_{eq})				
	Existing Measured Noise Levels	Existing Data Source	Project Site Operation	Potential Noise Impact	Increase over Existing
ALYR-1	51	M8	58	No	7
ALYR-2	51	M8	50	No	--
ALYR-3	51	M8	56	No	5
ALYR-4	51	M8	58	No	7
ALYR-5	67	M9	56	No	--
ALYR-6	67	M9	59	No	--
ALYR-7	67	M9	58	No	--
ALYR-8	68	M10	57	No	--
ALYR-9	68	M10	57	No	--
ALYR-10	68	M10	56	No	--
ALYR-11	68	M10	46	No	--

Worst-case noise levels along the proposed haul routes would likely increase by 1 to 2 dBA L_{eq} during peak noise periods (see Exhibit 3.10-13). The noise modeling predicts that four locations, ALYR-7 and ALYR-9 through ALYR-11, would have traffic noise levels above the WSDOT criteria during pontoon-building operations. However, all four sites already exceed the criteria, and the predicted increase of 1 to 2 dBA is not normally perceptible to an average person.

As indicated in Exhibit 3.10-14, the maximum cumulative project noise levels from truck traffic and pontoon-building operations for the Aberdeen Log Yard Alternative could increase by 5 to 11 dBA over existing noise levels at the residences near the site (ALYR-1 through ALYR-5). The concrete batch plant and associated equipment along with haul trucks would be the primary source of noise causing the increase.

EXHIBIT 3.10-13

Predicted Maximum Haul Route Noise Levels during Project Operations, Aberdeen Log Yard Alternative

Modeling Location	Noise Level (L_{eq})				
	Existing Modeled (Traffic Noise)	Project Operational Traffic	WSDOT Traffic Criteria	Exceed WSDOT Criteria	Amount over Existing (over criteria)
ALYR-1	55	56	66	No	1 (--)
ALYR-2	49	50	66	No	1 (--)
ALYR-3	53	54	66	No	1 (--)
ALYR-4	58	59	66	No	1 (--)
ALYR-5	54	55	66	No	1 (--)
ALYR-6	60	61	66	No	1 (--)
ALYR-7	66	67	66	Yes	1 (1)
ALYR-8	64	65	66	No	1 (--)
ALYR-9	69	71	66	Yes	1 (4)
ALYR-10	64	66	66	Yes	2 (0)
ALYR-11	67	68	66	Yes	1 (2)

EXHIBIT 3.10-14

Predicted Maximum Cumulative Project Operations Noise Levels, Aberdeen Log Yard Alternative Site

Modeling Location	Noise Level (L_{eq})						Change Over Measured
	Existing Traffic Only	Existing Measured	Operational Traffic	Site Operation	Cumulative Worst Case	Change Over Traffic	
ALYR-1	55	51	56	58	60	5	9
ALYR-2	49	51	50	50	53	4	2
ALYR-3	53	51	54	56	58	5	7
ALYR-4	58	51	59	58	62	4	11
ALYR-5	54	67	55	56	59	5	--
ALYR-6	60	67	61	59	63	3	--
ALYR-7	66	67	67	58	67	1	0
ALYR-8	64	68	65	57	66	2	--
ALYR-9	69	68	71	57	71	2	3
ALYR-10	64	68	66	56	66	2	--
ALYR-11	67	68	68	46	68	1	0

How would pontoon moorage directly affect noise levels?

Pontoon moorage would have no effect on noise levels.

How would the build alternatives differ in their direct effects on noise levels?

Exhibit 3.10-15 summarizes and compares the direct noise-level effects of the Anderson & Middleton Alternative with the Aberdeen Log Yard Alternative.

EXHIBIT 3.10-15
Noise Summary of Direct Effects

	Anderson & Middleton Alternative	Aberdeen Log Yard Alternative
Casting basin construction	Maximum noise levels are predicted to range from 55 to 71 dBA, representing an increase of as much as 24 dBA over existing levels.	Maximum noise levels are predicted to range from 56 to 75 dBA, representing an increase of as much as 14 dBA over existing levels.
Pontoon-building operation	Maximum noise levels are predicted to range from 47 to 64 dBA L_{eq} , representing an increase of as much as 22 dBA over existing levels. Noise levels at several nearby residences would equal or exceed the state noise ordinance levels.	Maximum noise levels are predicted to range from 53 to 71 dBA, representing an increase of as much as 11 dBA over existing levels. No exceedance of state noise ordinance levels would be expected.
Pontoon moorage	None	None

dBA A-weighted decibels

What indirect noise effects would the project have?

CTC Facility

WSDOT does not predict that using the CTC facility would result in any measureable indirect noise effects. Noise associated with mining or borrow-pit activities to extract materials to produce the concrete for the pontoons could be an indirect effect of the project. The same could be true for project-related trucks producing noise while traveling outside of the project area.

Towing or mooring pontoon in Puget Sound would also not likely have an indirect noise effect. Pontoon towing could result in some changes in boat traffic for short periods, potentially placing a power boat where it might not have gone to avoid the pontoon, which would move the noise generated by that boat to another location. However, as with traffic on roads, it is difficult to quantify any temporary and infrequent change in noise that could occur. Towing and mooring pontoons would occur

infrequently and would not alter the noise environment in a prolonged or substantial way.

Grays Harbor Build Alternatives

Any potential indirect noise effects would cease at the end of the project and would, therefore, be temporary. Indirect noise effects could occur during project construction and operation if project-related truck traffic using established haul routes were to cause a substantial number of drivers of other heavy trucks to use alternate routes. Because a single heavy truck can produce as much acoustical energy as up to 50 passenger vehicles, this could have a noticeable increase in noise levels along alternative routes.

Noise associated with project mining or borrow-pit activities could also cause indirect noise effects. However, when this Draft EIS was prepared, WSDOT did not know whether noise associated with existing mining and aggregate operations would change as a result of supplying source material for this project and where this material would come from. WSDOT also does not know which haul routes outside of the study area would be used. Indirect effects from mining and hauling aggregate to the casting basin facility would be possible but unquantifiable at this time.

Pontoon towing and moorage would occur infrequently and would not alter the noise environment in a prolonged or substantial way.

How would noise levels be affected if the project were not built?

Under the No Build Alternative, noise levels in the study area would continue to be dominated by local vehicle traffic and residential and commercial activities.

What mitigation measures does WSDOT propose to reduce direct effects on noise levels?

CTC Facility

No noise effects are predicted from operation at the CTC site; therefore, no noise mitigation would be necessary.

Grays Harbor Build Alternatives

WSDOT would implement several construction noise abatement methods, including operational methods, equipment choice, and acoustical treatments, to limit the effects of construction noise. Following are some recommended measures that could be implemented to reduce project noise levels:

- Require that all engine-powered equipment have mufflers installed according to the manufacturer's specifications.
- Limit jackhammers, concrete breakers, saws, pile-driving, and other construction activities that would generate similar or greater noise levels to the hours between 7 a.m. and 7 p.m. on weekdays, with more stringent time restrictions on weekends.
- Install temporary or portable acoustic barriers around stationary construction noise sources, such as a concrete batch plant.
- Shut off idling equipment.
- Notify nearby residents whenever extremely noisy work would occur.
- Coat the piles.
- Use of pile pads.
- Use of piston mufflers on pile-driving hammers.

Detailed information on noise effects on fish and wildlife can be found in Appendix C, Ecosystems Discipline Report.

If construction-related complaints are received, WSDOT could require that a construction log be kept for each construction area. The log would contain general construction information such as the time activities occurred, the type of equipment used, and other information that might help with potential noise effects. A complaint hot-line could be established to investigate noise complaints and compare them to the construction logs. A construction monitoring and complaint program could help to ensure that all equipment meets state, local, and manufacturers' specifications for noise emissions. Equipment that does not meet the standards could be removed from service until proper repairs were made, and the equipment was retested for compliance. This procedure could apply to all major contributors to potential noise, such as haul trucks, excavators, and other equipment used extensively at the construction sites.

If project construction or operations activities were to continue at nighttime (after 8 p.m. in Hoquiam or 9 p.m. in Aberdeen and before 7 a.m. at either site), WSDOT would meet with the appropriate city officials to obtain an exemption from the local jurisdiction's noise control ordinance. The exemption, typically referred to as a noise variance, would set alternate maximum noise limits, which are based on a variety of factors such as the proximity of noise-sensitive properties and the existing noise levels in the immediate area.

Anderson & Middleton Alternative

In addition to the common mitigation measures listed above, WSDOT would construct a berm or sound wall between the proposed Anderson & Middleton Alternative truck haul route along the 5th Street extension and affected residences. This wall or berm would protect the noise modeling receiver locations AMR-10 through -12 and AMR-14 (see Exhibit 3.10-2) and be designed to reduce noise to within WAC 173-60 criteria during project operations. The berm or wall would be approximately 1,200 feet long, extend from the 5th Street extension to 8th Street, and be 12 to 14 feet high. WSDOT will review the berm or wall design when all equipment locations are finalized and optimized to provide a 6 to 8 dB noise reduction, which would result in project noise levels below the state noise control ordinance.

Aberdeen Log Yard Alternative

Noise levels are not predicted to exceed the WAC noise control ordinance at the Aberdeen Log Yard site due to the added distance between noise-sensitive properties and major noise-producing sources. Therefore, no noise mitigation is proposed for the Aberdeen Log Yard Alternative.

How could WSDOT mitigate for indirect effects on noise?

CTC Facility

Because WSDOT does not expect any indirect noise effects, no noise mitigation is recommended for the CTC facility.

Grays Harbor Build Alternatives

WSDOT does not recommend noise mitigation for the types of indirect effects that could be associated with casting basin construction and operation at either Grays Harbor build alternative site. Under the WAC, traffic on public roadways is not considered a noise-generating source that requires mitigation, and the types of indirect effects that could occur on area streets (discussed previously under *How would construction of the casting basin directly affect noise levels?*) would be infrequent and temporary.

What would the cumulative noise effects likely be?

CTC Facility

No changes to existing noise levels would be expected at the CTC facility as a result of the SR 520 Pontoon Construction Project. Therefore, there would be no contribution to cumulative effects on noise levels associated with pontoon-building or towing activities at this site.

Grays Harbor Build Alternatives

As discussed previously under *What are the noise levels in the study area now?*, ambient noise levels were high at both Grays Harbor build alternative sites during the decades of logging and milling operations in the late nineteenth and early twentieth centuries. As these industries have diminished at Grays Harbor, ambient noise levels at the build alternative sites have likely trended downward to the levels reported in the preceding discussions, ranging from 37 to 75 dBA L_{eq} with transient peaks up to 93 dBA L_{max} from passing trucks or aircraft. As additional industrial development (Exhibits 3-1 and 3-3) occurs near the build alternative sites, each development will add an increment of noise to the ambient level, and operating the casting basin facility would contribute to this cumulative effect.

During casting basin operation, the project's contribution to ambient noise in and around the study area would be from onsite equipment, the concrete batch plant, haul trucks delivering materials to the site, and vehicles used by employees traveling to and from the site. These noise-generating activities would occur throughout the duration of the project and would be mitigated if necessary to ensure compliance with WAC noise regulations. Because pontoon construction would not occur indefinitely into the future, the project's contribution to the cumulative noise effect is considered temporary.

How could cumulative effects on noise be mitigated?

All noise effects related to the SR 520 Pontoon Construction Project would be temporary; therefore, this project would not contribute to regional cumulative noise effects and a discussion on how to mitigate for these types of effects is not necessary.