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 effects. 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.

Has any new information been developed since the Draft EIS?

No new noise-related issues were introduced, and WSDOT did not conduct any new analysis beyond that which was done for the Draft EIS.

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 also often place additional restrictions on noise levels for 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 proposed 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.

What is the Noise Technical Memorandum?

This section was derived from the Noise Technical Memorandum, Appendix L, 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

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 Leq 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.

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 of frequencies, the A-weighted decibel scale was 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 how noise is measured can be found in Appendix L, Noise Technical Memorandum.

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 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.

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.

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 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}).

Aberdeen Log Yard Alternative (Preferred Alternative)

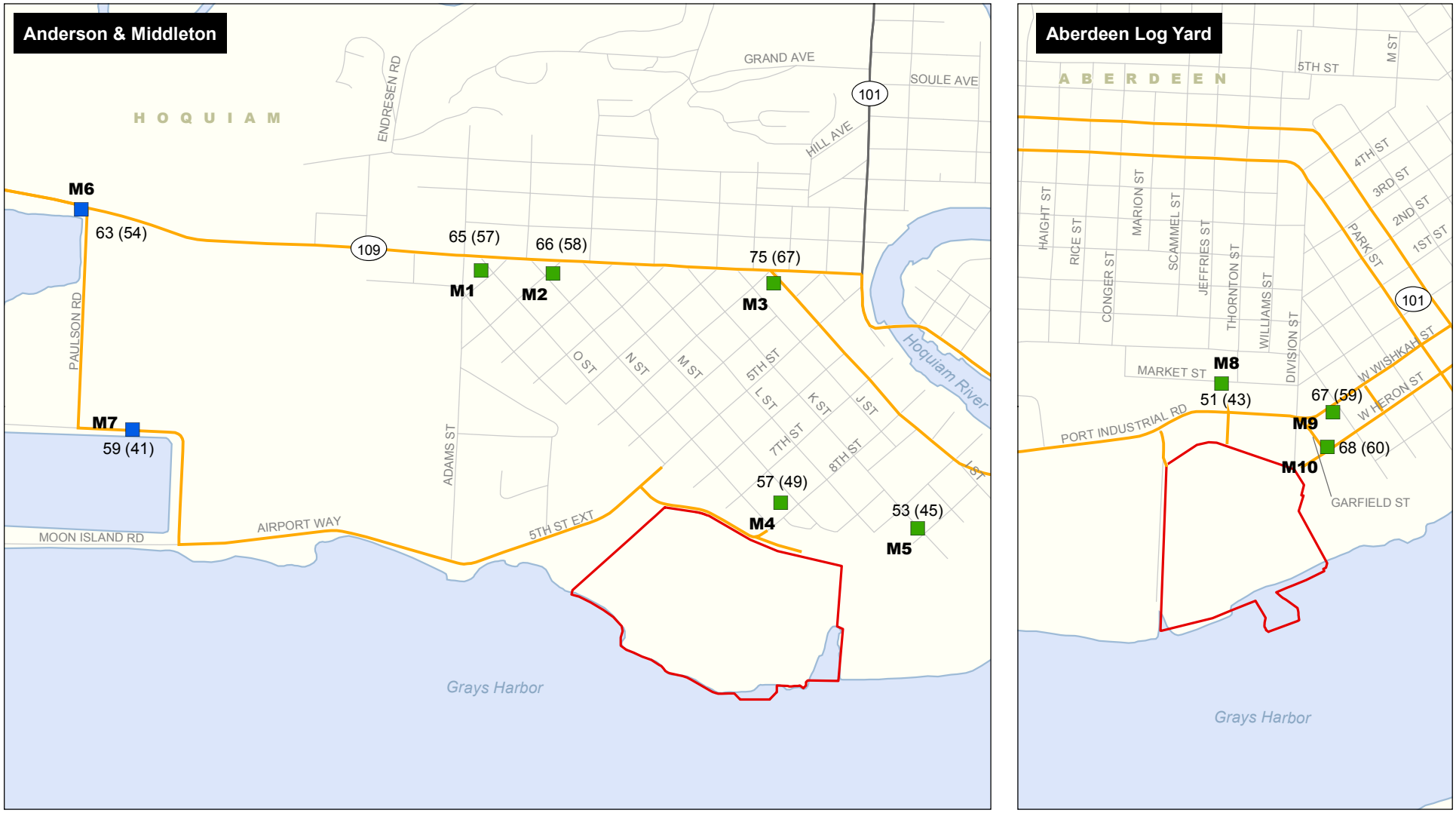
The closest noise-sensitive properties to the Aberdeen Log Yard Alternative site are single-family residences located on Garfield Street approximately 470 feet northeast of the site. Existing commercial structures shield these residences from the site. Some single-family residences are 500 feet north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

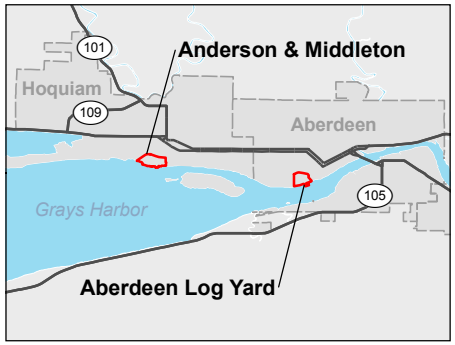
The land uses along the proposed truck haul routes are mostly commercial, but there are several single-family homes along West Wishkah and West Heron streets between Garfield and Park streets, as well as some additional residences past Park Street. Schools near the project area include Harbor High School, 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 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 are 6 to 8 dBA lower than daytime levels because of reduced 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.

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).





Long-term noise-monitoring location

Short-term noise-monitoring location

54(45) Daytime (nighttime) sound level (dBA L_{eq})

Potential haul route

Build Alternative Site

City limits

N

0 500 1,000 2,000 Feet

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

Washington State Department of Transportation

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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.

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.

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. 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.

Noise increases at the Grays Harbor National Wildlife Refuge were also considered. More information on potential effects of noise on wildlife can be found in the proposed SR 520 Pontoon Construction Project Biological Assessment (WSDOT 2010d) and in Appendix C, Ecosystems Discipline Report.

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. 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.

Aberdeen Log Yard Alternative (Preferred 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 the 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 WSDOT noise 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 3.10-3 through 3.10-5 provide a comprehensive look at the potential maximum noise levels during casting basin facility construction. Exhibit 3.10-3 focuses on maximum construction noise directly related to site construction. 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.

Exhibit 3.10-4 details the maximum noise levels related to haul route activity. 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 eleven 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.

Exhibit 3.10-5 provides a cumulative noise analysis that predicts 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. 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 s, actual increases would likely be less because this analysis assumes the worst-case construction and hauling activities.

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

Washington State Department of Transportation

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EXHIBIT 3.10-3
Predicted Maximum Project Construction Noise Levels for the Aberdeen Log Yard Alternative (Preferred Alternative)

	Noise Level (L_{eq})				
Modeling Location	**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 10 p.m. because construction noise is exempt from the state noise control ordinance from 7 a.m. to 10 p.m. Maximum allowable sound levels are 60 dBA during the day and 50 dBA at night.

-- noise level change 0 or less than existing noise levels
dBA A-weighted decibels
L_{eq} energy average noise equivalent sound level

EXHIBIT 3.10-4
Predicted Maximum Haul Route Noise Levels during Project Construction for the Aberdeen Log Yard Alternative (Preferred Alternative)

	Noise Level (L_{eq})				
Modeling Location	**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 (--)

-- noise level change 0 or less than existing noise levels
L_{eq} energy average noise equivalent sound level

EXHIBIT 3.10-5
Predicted Maximum Cumulative Project Construction Noise Levels for the Aberdeen Log Yard Alternative (Preferred 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	--
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

-- noise level change 0 or less than existing noise levels
L_{eq} energy average noise equivalent sound level

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. WSDOT noise 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. 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 3.10-6, -7, and -8 provide a comprehensive look at the potential maximum noise levels during site construction. Exhibit 3.10-6 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 3.10-6
Predicted Maximum Project Construction Noise Levels for the Anderson & Middleton Alternative

	Noise Level (L_{eq})				
Modeling Location	**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 10 p.m., because construction noise is exempt from the state noise control ordinance from 7 a.m. to 10 p.m. Maximum allowable sound levels are 60 dBA during the day and 50 dBA at nighttime.

-- noise level change 0 or less than existing noise levels
dBA A-weighted decibels
L_{eq} energy average noise equivalent sound level

Exhibit 3.10-7 presents maximum noise levels related to haul route activity. WSDOT 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 3.10-7
Predicted Maximum Haul Route Noise Levels during Project Construction for the Anderson & Middleton Alternative

	Noise Level (L_{eq})				
Modeling Location	**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 (--)

-- noise level change 0 or less than existing noise levels
L_{eq} energy average noise equivalent sound level

WSDOT noise 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 3.10-8, 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.

EXHIBIT 3.10-8
Predicted Maximum Cumulative Project Construction Noise Levels for the Anderson & Middleton Alternative

	Noise Level (L_{eq})		
Modeling Location	**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

L_{eq} energy average noise equivalent sound level

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.

Aberdeen Log Yard Alternative (Preferred 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 3.10-9). 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 Aberdeen Log Yard Alternative (Preferred Alternative)

	Noise Level (L_{eq})				
Modeling Location	**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	--

-- noise level change 0 or less than existing noise levels
L_{eq} energy average noise equivalent sound level

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 3.10-10). 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 3.10-11, 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 3.10-10
Predicted Maximum Haul Route Noise Levels during Project Operations for the Aberdeen Log Yard Alternative (Preferred Alternative)

	Noise Level (L_{eq})				
Modeling Location	**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)

-- noise levels are 0 or less than existing noise levels
L_{eq} energy average noise equivalent sound level

EXHIBIT 3.10-11
Predicted Maximum Cumulative Project Operations Noise Levels for the Aberdeen Log Yard Alternative Site (Preferred Alternative)

	Noise Level (L_{eq})						
Modeling Location	**Existing Traffic Only**	**Existing Measured**	**Operational Traffic**	**Site Operation**	**Cumulative Worst Case**	**Change Over Traffic**	**Change Over Measured**
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

-- noise levels are 0 or less than existing noise levels
L_{eq} energy average noise equivalent sound level

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 3.10-12). 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 10 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 3.10-13). 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.

EXHIBIT 3.10-12
Predicted Maximum Project Operations Noise Levels for the Anderson & Middleton Alternative

	Noise Level (L_{eq})				
Modeling Location	**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	--

-- noise levels are 0 or less than existing noise levels
L_{eq} energy average noise equivalent sound level

EXHIBIT 3.10-13
Predicted Maximum Haul Route Noise Levels during Project Operations for the Anderson & Middleton Alternative

	Noise Level (L_{eq})				
Modeling Location	**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

L_{eq} energy average noise equivalent sound level

As presented in Exhibit 3.10-14, 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.

How would pontoon moorage directly affect noise levels?

Pontoon moorage would have no effect on noise levels because towing the pontoons to the moorage location in Grays Harbor, which is already active with marine traffic, would not produce noise distinguishable from existing noise, nor would the pontoons produce noise at their moorage location.

EXHIBIT 3.10-14
Predicted Maximum Cumulative Project Operational Noise Levels for the Anderson & Middleton Alternative

	Noise Level (L_{eq})						
Modeling Location	Existing Traffic Only	Existing Measured	Construction Traffic	Site Construction	Cumulative Worst Case	Change Over Traffic	Change Over Measured
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

-- noise levels are 0 or less than existing noise levels
L_{eq} energy average noise equivalent sound level

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.

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. There are no other actions related to project activities at the CTC facility that would result in indirect effects related to noise. Project-related trucks producing noise while traveling

outside the project area would be on state routes, and noise levels would not increase appreciably.

EXHIBIT 3.10-15
Noise Summary of Direct Effects

	Aberdeen Log Yard Alternative (Preferred Alternative)	Anderson & Middleton Alternative
Casting basin construction	Maximum noise levels are predicted to range from 56 to 75 dBA, representing an increase of as much as 14 dBA over existing levels.	Maximum noise levels are predicted to range from 55 to 71 dBA, representing an increase of as much as 24 dBA over existing levels.
Pontoon-building operations	Maximum noise levels are predicted to range from range from 53 to 71dBA L_{eq}, representing an increase of as much as 11 dBA over existing levels. No exceedance of state noise ordinance levels would be expected.	Maximum noise levels are predicted to range from 47 to 64dBA, 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.
Pontoon moorage	None	None

dBA A-weighted decibels
L_{eq} energy average noise equivalent sound level

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 Final 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 because the routes used would depend on which haulers are used, where they are dispatched from, and where specific materials sources and disposal sites are located. 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.

There are no other actions related to project activities at either build alternative site that would result in indirect effects related to noise.

Grass Creek

Constructing the Grass Creek mitigation site could affect noise levels on and near the site; however, WSDOT anticipates only negligible truck traffic during site construction activities, and a relatively small amount of earth-moving equipment would be used to move a limited amount of material around the site. Given this and the proximity of the site to SR 109, the effect on noise levels from this activity is not expected to be significant.

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 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 proposed 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}. 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 and would cease when the project is completed.

Many of the reasonably foreseeable future actions in the Grays Harbor area listed in Exhibit 3-1 are either far removed from the two Grays Harbor build alternative sites, not developed to a sufficient level of detail to allow for noise levels to be projected, or would not occur simultaneous with the proposed SR 520 Pontoon Construction Project. If any of these projects nearby the Grays Harbor build alternative sites were to generate noise simultaneous with the SR 520 Pontoon Construction Project, the cumulative effect on noise may be greater.