MILLENNIUM BULK TERMINALS—LONGVIEW SEPA ENVIRONMENTAL IMPACT STATEMENT SEPA NOISE AND VIBRATION TECHNICAL REPORT

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Acronyms and Abbreviations

Applicant	Millennium Bulk Terminal—Longview, LLC
ADT	average daily traffic
BNSF	BNSF Railway Company
Cadna/A®	Computer-Aided Noise Abatement Noise Prediction Model
CCC	Cowlitz County Code
CFR	Code of Federal Regulations
CNEL	community noise equivalent
dBA	A-weighted decibels
FRA	Federal Railroad Administration
FRP	fiberglass reinforced plastic
FTA	Federal Transit Administration
HP	horsepower
Hz	Hertz
L_{dn}	day-night average noise level
L_{eq}	equivalent sound level
L_{max}	maximum sound level
L_v	vibration velocity level
LVSW	Longview Switching Company
mph	miles per hour
NEPA	National Environmental Policy Act
RCW	Revised Code of Washington
RMS	root mean square
SEL	sound exposure level
SEPA	Washington State Environmental Policy Act
SPL	sound pressure level
UP	Union Pacific Railroad
USC	United States Code
VdB	vibration velocity level expressed in decibels
WAC	Washington Administrative Code

Chapter 1
Introduction

This technical report assesses the potential noise and vibration impacts of the proposed Millennium Bulk Terminals—Longview project (Proposed Action) and No-Action Alternative. This report describes the regulatory setting, establishes the methods for assessing potential noise and vibration impacts, presents the historical and current noise and vibration conditions in the study area, and assesses potential noise and vibration impacts.

This technical analysis is supported by the data and results provided in Appendix A, *Existing Ambient Sound Pressure Level Survey Data*; and Appendix B, *Construction Noise Impact Analysis*.

1.1 Project Description

Millennium Bulk Terminals—Longview, LLC (Applicant) is proposing to construct and operate a coal export terminal (Proposed Action) in Cowlitz County, Washington along the Columbia River (Figure 1). The coal export terminal would receive coal from the Powder River Basin in Montana and Wyoming, and the Uinta Basin in Utah and Colorado via rail shipment. The coal export terminal would receive, stockpile, and load coal onto vessels and transport the coal via the Columbia River and Pacific Ocean to overseas markets in Asia.

1.1.1 Proposed Action

Under the Proposed Action, the Applicant would develop the coal export terminal on 190 acres (project area) primarily within an existing 540-acre site that is currently leased by the Applicant (Applicant's leased area). The project area is adjacent to the Columbia River in unincorporated Cowlitz County, Washington near Longview, Washington (Figure 2). The Applicant currently operates and would continue to operate a bulk product terminal within the Applicant's leased area.

BNSF Railway Company (BNSF) or Union Pacific Railroad (UP) trains would transport coal on BNSF main line routes in Washington State, and the BNSF Spur and Reynolds Lead in Cowlitz County to the project area. Coal would be unloaded from rail cars, stockpiled, and loaded by conveyor onto ocean-going vessels for export at two new docks (Docks 2 and 3) located in the Columbia River.

Once construction is complete, the Proposed Action could have a maximum annual throughput capacity of up to 44 million metric tons of coal per year. The coal export terminal would consist of one operating rail track, eight rail tracks for storing up to eight unit trains, rail car unloading facilities, a stockpile area for coal storage, conveyor and reclaiming facilities, two new docks in the Columbia River (Docks 2 and 3), and shiploading facilities on the two docks. Dredging of the Columbia River would be required to provide access to and from the Columbia River navigation channel and for berthing at the two new docks.

Vehicles would access the project area from Industrial Way (State Route 432), and vessels would access the project area via the Columbia River. The Reynolds Lead and BNSF Spur track—both jointly owned by BNSF and UP and operated by Longview Switching Company (LVSW)—provide rail access to the project area from a point on the BNSF main line (Longview Junction) located to the east in Kelso, Washington. Coal export terminal operations would occur 24 hours per day, 7 days per week. The coal export terminal would be designed for a minimum 30-year period of operation.

At full terminal operations, approximately 8 loaded unit trains each day would carry coal to the export terminal, 8 empty unit trains each day would leave the export terminal, and an average of 70 vessels per month or 840 vessels per year would be loaded, which would equate to 1,680 vessel transits in the Columbia River annually.

Figure 1. Project Vicinity

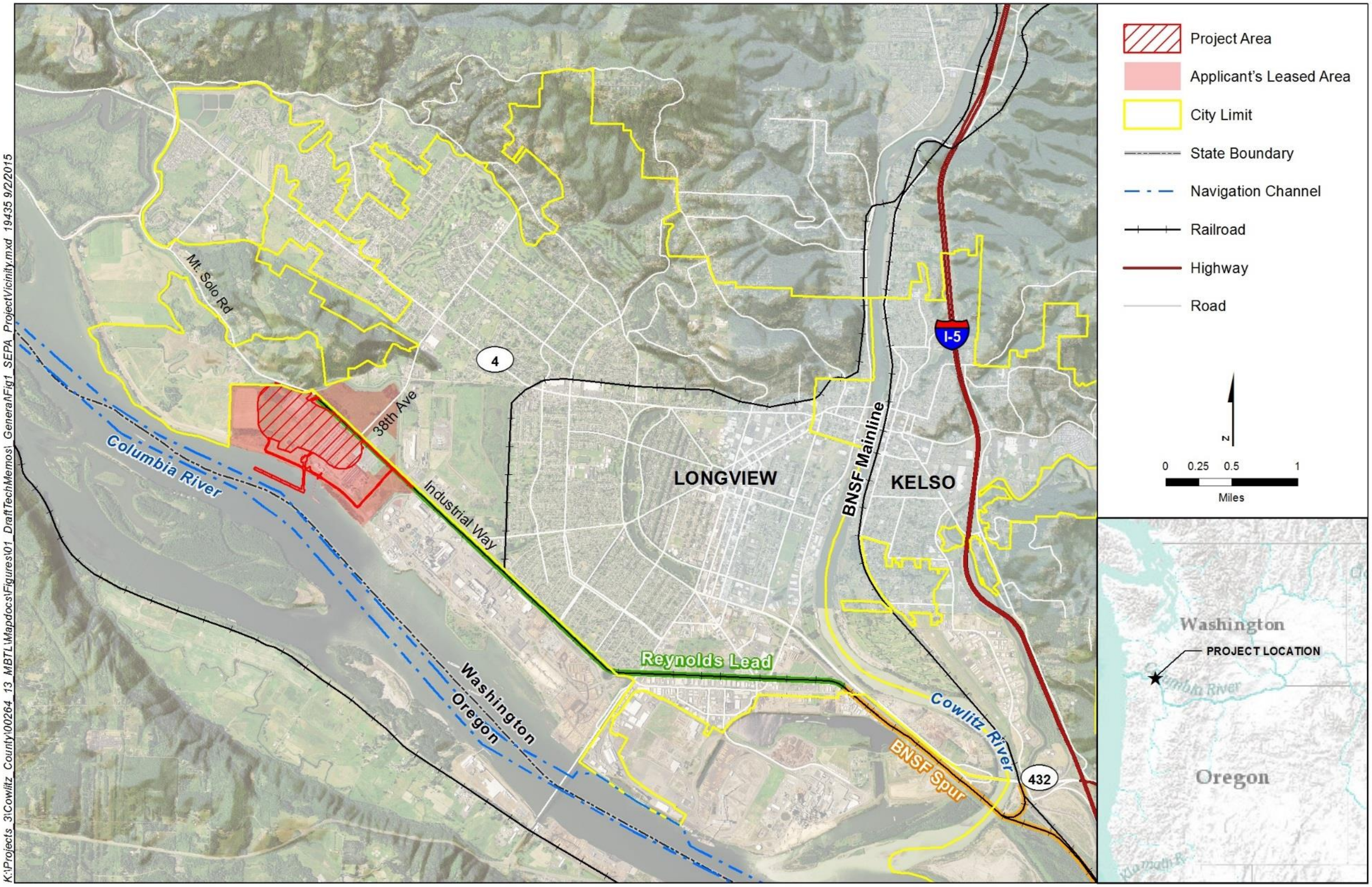
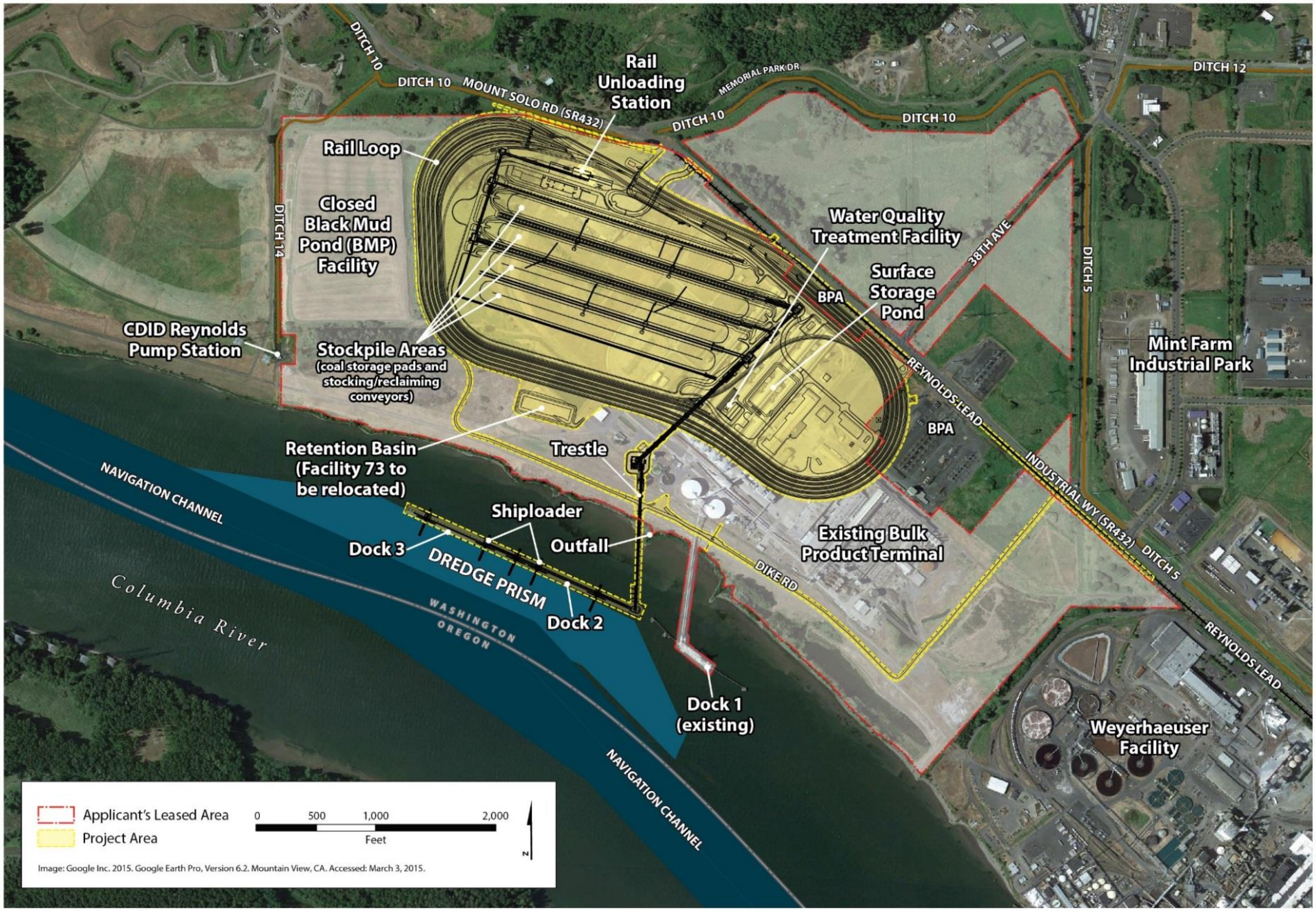


Figure 2. Proposed Action



1.1.2 No-Action Alternative

The Applicant plans to continue operating its existing bulk product terminal located adjacent to the project area. Ongoing operations would include storing and transporting alumina and small quantities of coal, and continued use of Dock 1. Maintenance of the existing bulk product terminal would continue, including maintenance dredging at the existing dock every 2 to 3 years. The Applicant plans to expand operations at the existing bulk product terminal, which could include increased storage and upland transfer of bulk products utilizing new and existing buildings. The Applicant would likely need to undertake demolition, construction, and other related activities to develop expanded bulk product terminal facilities.

If the coal export terminal is not constructed, the Applicant would likely propose expansion of the bulk product terminal onto areas that would have been subject to construction and operation of the proposed coal export terminal. Additional bulk product transfer activities could involve products such as a calcined pet coke, coal tar pitch, cement, fly ash, and sand or gravel. Any new operations would be evaluated under applicable regulations. Upland areas of the project area are zoned Heavy Industrial and it is assumed future proposed industrial uses in these upland areas could be permitted. Any new construction would be limited to uses allowed under existing Cowlitz County development regulations.

1.2 Regulatory Setting

The jurisdictional authorities and corresponding regulations, statutes, and guidelines for determining potential impacts related to noise and vibration are summarized in Table 1.

Table 1. Regulations, Statutes, and Guidelines for Noise and Vibration

Regulation, Statute, Guideline	Description
Federal	
National Environmental Policy Act (42 USC 4321 *et seq*.)	Requires the consideration of potential environmental effects. NEPA implementation procedures are set forth in the President's Council on Environmental Quality's Regulations for Implementing NEPA (49 CFR 1105).
Noise Control Act of 1972 (42 USC 4910)	Protects the health and welfare of U.S. citizens from the growing risk of noise pollution, primarily from transportation vehicles, machinery, and other commerce products. Increased coordination between federal researchers and noise control activities; established noise emission standards; and presented noise emission and reduction information to the public.
Federal Transit Administration Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06, May 2006)	Provides procedures and guidance for analyzing the level of noise and vibration, assessing the resulting impacts, and determining possible mitigation for most federally funded transit projects.
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Regulation, Statute, Guideline	Description
Federal Railroad Administration High-Speed Ground Transportation Noise and Vibration Impact Assessment (October 2012)	Provides guidance and methods for the assessment of potential noise and vibration impacts resulting from proposed high-speed ground transportation projects. (Federal Railroad Administration 2012).
U.S. Environmental Protection Agency Railroad Noise Emission Standards (40 CFR 201)	Establishes final noise emission standards for surface carriers engaged in interstate commerce by railroad. This rulemaking is pursuant to Section 17 of the Noise Control Act of 1972.
FRA Railroad Noise Emission Compliance Regulations (49 CFR 210)	These regulations indicate the minimum compliance regulations necessary to enforce EPA's Railroad Noise Emission Standards.
FRA Final Rule on the Use of Locomotive Horns at Highway-Rail Grade Crossings (49 CFR 222 and 229)	Requires the sounding of locomotive horns at public highway rail grade crossings. Considers the allowance of quiet zones when the increase risk is mitigated with supplementary grade crossing safety measures.
State	
Washington State Environmental Policy Act (197-11 WAC, RCW 43.21C)	Requires state and local agencies in Washington to identify potential environmental impacts that could result from governmental decisions.
Maximum Environmental Noise Levels (WAC 173-60)	Establishes maximum environmental noise levels. However, noise from surface carriers engaged in interstate commerce by railroad is exempt from these regulations.
Local	
Cowlitz County SEPA Regulations (CCC 19.11)	Provide for the implementation of SEPA in Cowlitz County.
Cowlitz County Nuisance Noises (CCC 10.25)	Regulates excessive intermittent noise that interfere with the use, value and enjoyment of property and which pose a hazard to the public health, safety and welfare.

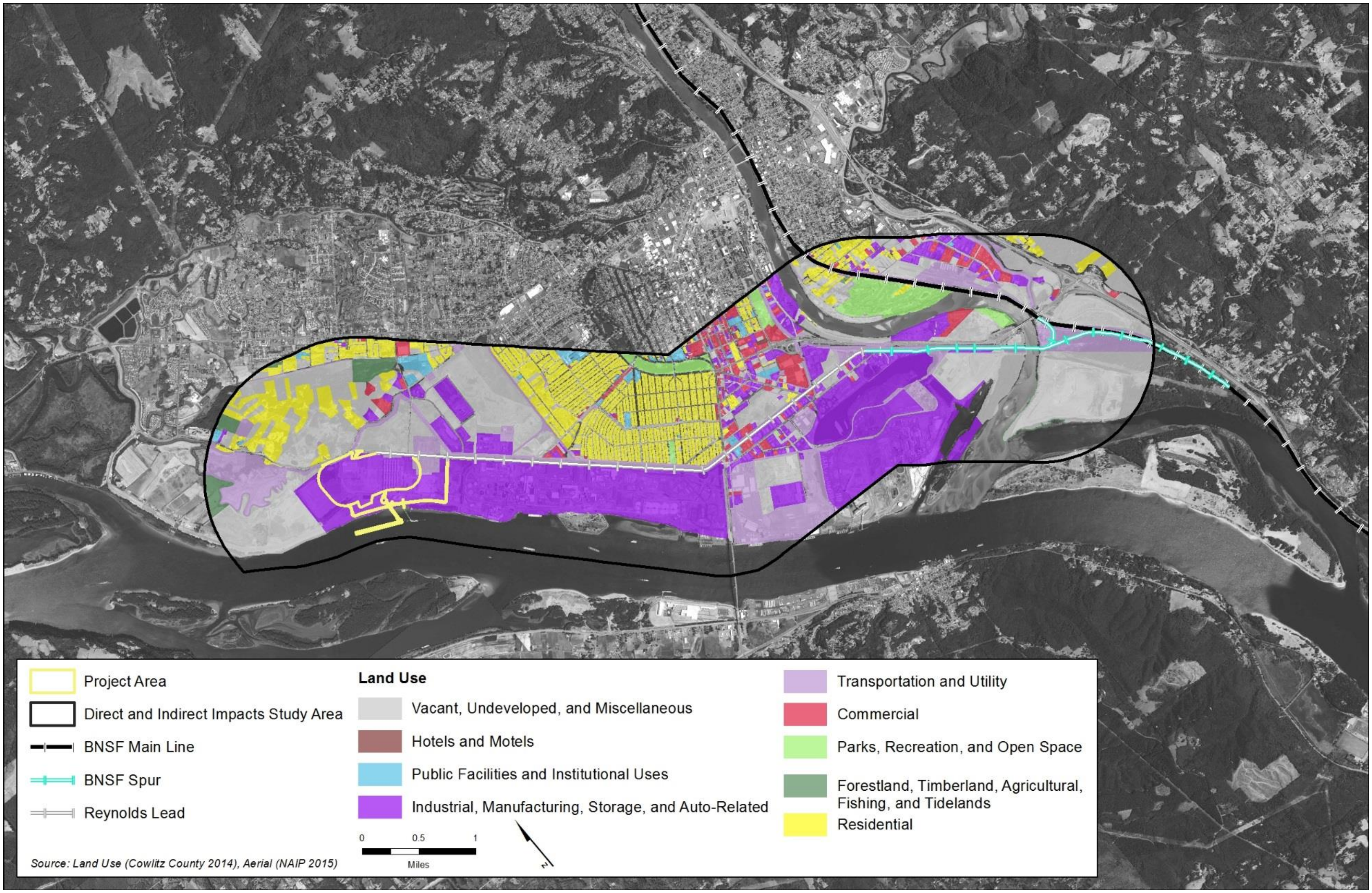
Notes:
USC = United States Code;, NEPA = National Environmental Policy Act;, CFR = Code of Federal Regulations;
FTA = Federal Transit Administration; FRA = Federal Railroad Administration;
RCW = Revised Code of Washington; SEPA = Washington State Environmental Policy Act ; WAC = Washington Administrative Code; CCC = Cowlitz County Code

1.3 Study Area

The study area for noise and vibration direct impacts is within 1 mile of the project area. The study area for noise and vibration indirect impacts is the area within 1 mile (from centerline) of the Reynolds Lead and BNSF Spur. Figure 3 illustrates the combined study area.

An assessment of potential noise and vibration indirect impacts is also included for the rail routes in Washington State for Proposed Action-Related trains and Proposed Action-Related vessel traffic along the Columbia River between the project area and 3 nautical miles offshore.

Figure 3. Study Area



Chapter 2
Existing Conditions

This chapter explains the methods for assessing the existing conditions and determining impacts, and describes the existing conditions in the study area as they pertain to noise and vibration.

2.1 Methods

This section describes the sources of information and methods used to characterize the existing conditions and assess the potential impacts of the Proposed Action and No-Action Alternative on noise and vibration.

2.1.1 Data Sources

The following sources of information were used to evaluate the noise and vibration characteristics of the study area. Citations are provided in the methods discussion where appropriate.

- Information provided by the Applicant, including project design features and a list of typical construction and operation equipment.
- Lists of typical construction and operation equipment provided from reference projects and typical corresponding sound pressure and vibration levels.
- Data on locomotive and train noise levels.
- Existing and future rail traffic estimates for the BNSF Spur and the Reynolds Lead provided by LVSW and the Applicant.
- Reference sound level for rail equipment.
- Ambient noise monitoring data collected during field surveys in the study area.

2.1.1.1 Field Surveys of Ambient Sound Pressure Levels

Field surveys were performed from October 28 through November 10, 2014, and from January 11 through January 16, 2015, to measure existing outdoor ambient sound levels at representative noise-sensitive receptors (ambient noise levels). Noise-sensitive receptors include residential and industrial land uses such as schools and churches (Figure 4). The surveys focused on locations in the study areas where noise-sensitive receptors (mostly residential properties) could be exposed to noise from project activities and where receptors are close to railroad grade crossings. Institutional noise-sensitive receptors, such as schools and churches, were also considered during the selection of the ambient survey locations.

Prior to the field survey, the project team coordinated with the City of Longview and the Cowlitz County Public Utilities District to identify and access representative noise-sensitive receptors where short-term (10-minute) and long-term (24-hour) sound level meters could be set up for sound pressure level (SPL) measurements. The project team also obtained contact information from the Applicant for owners of private property where the Applicant's contractors had previously measured noise. The project team worked directly with the property owners to obtain rights of entry to private property. Selected locations appear in Figure 5.

Figure 4. Sensitive Receptors in the Study Area

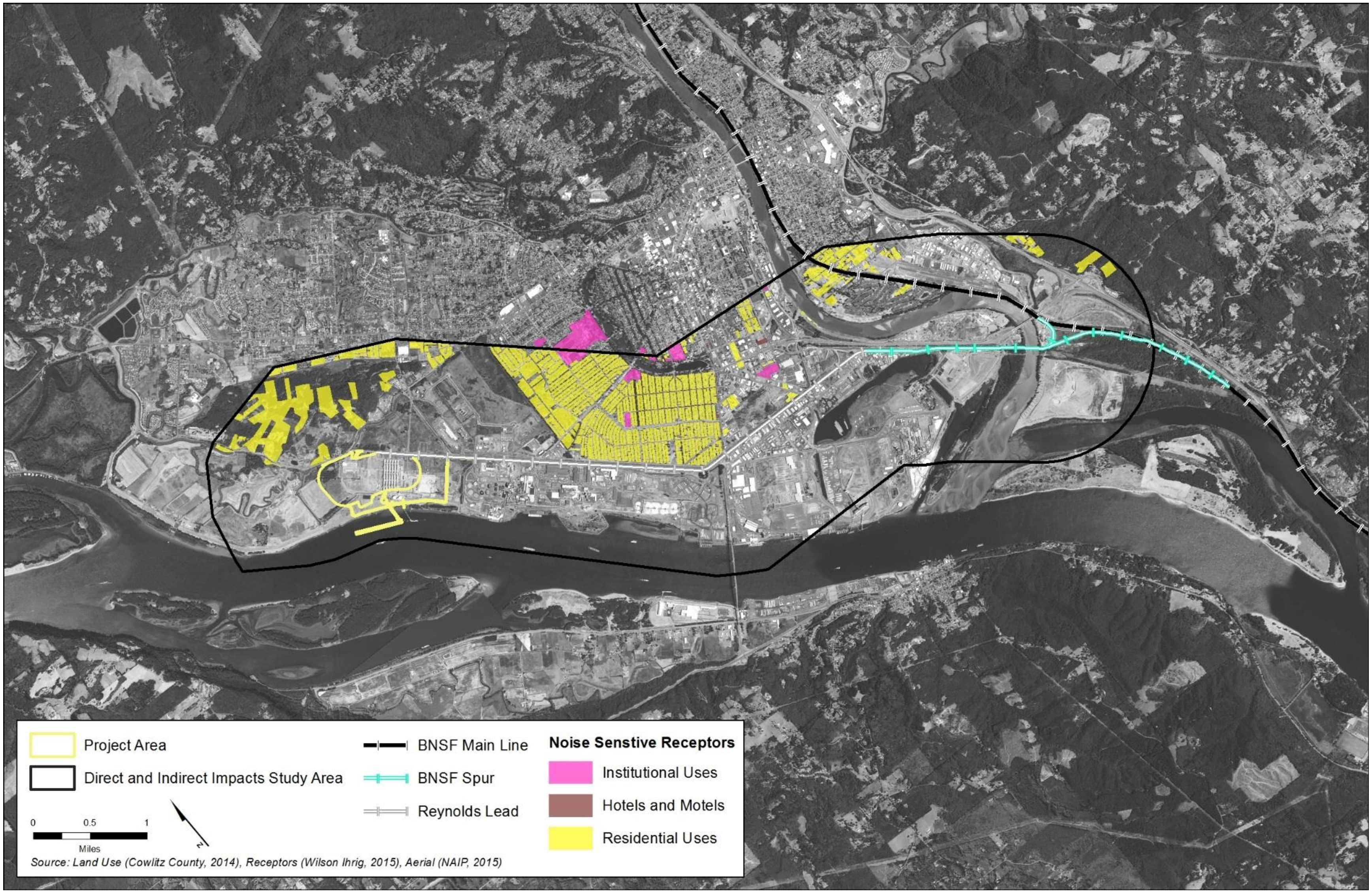
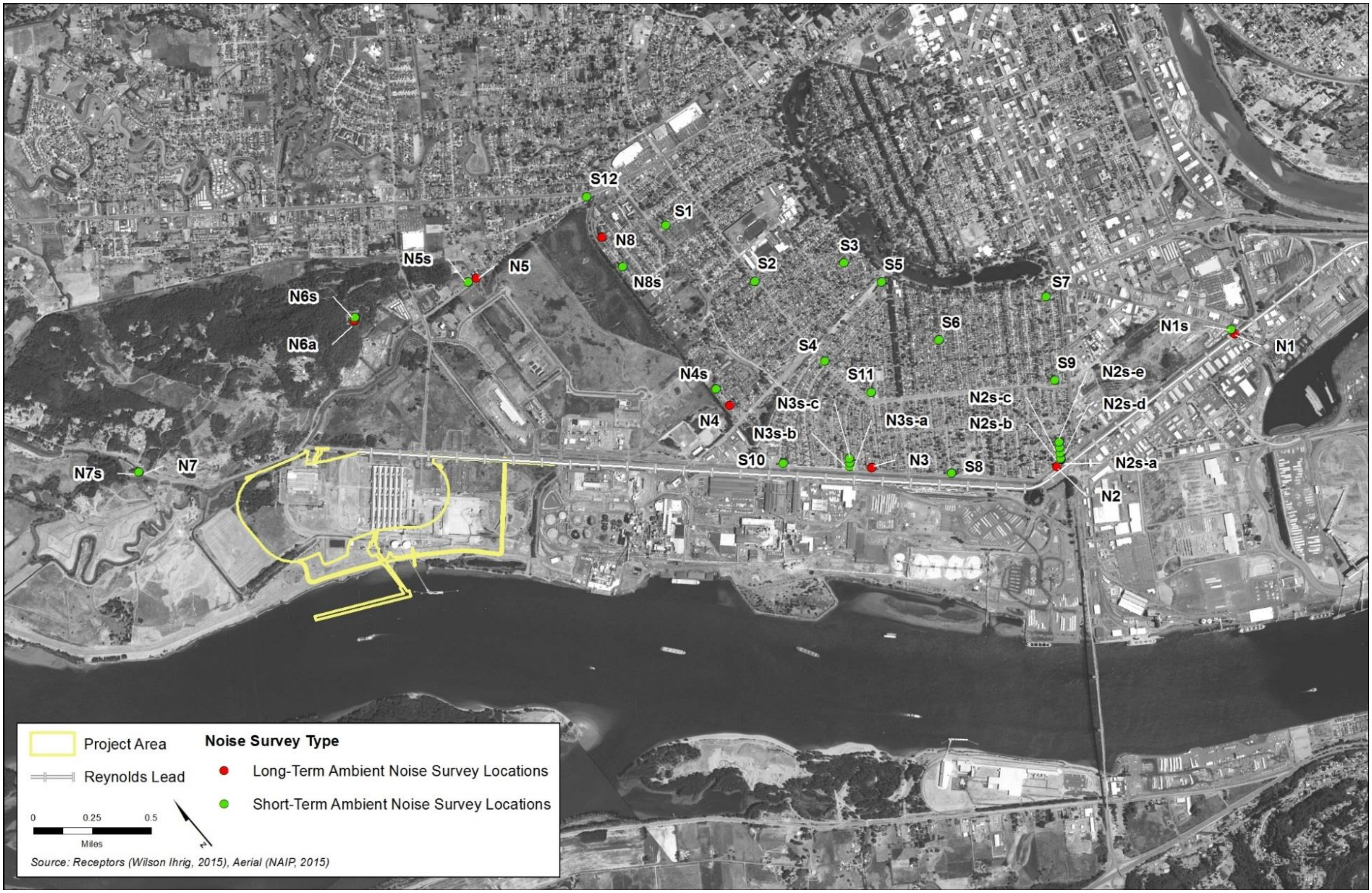


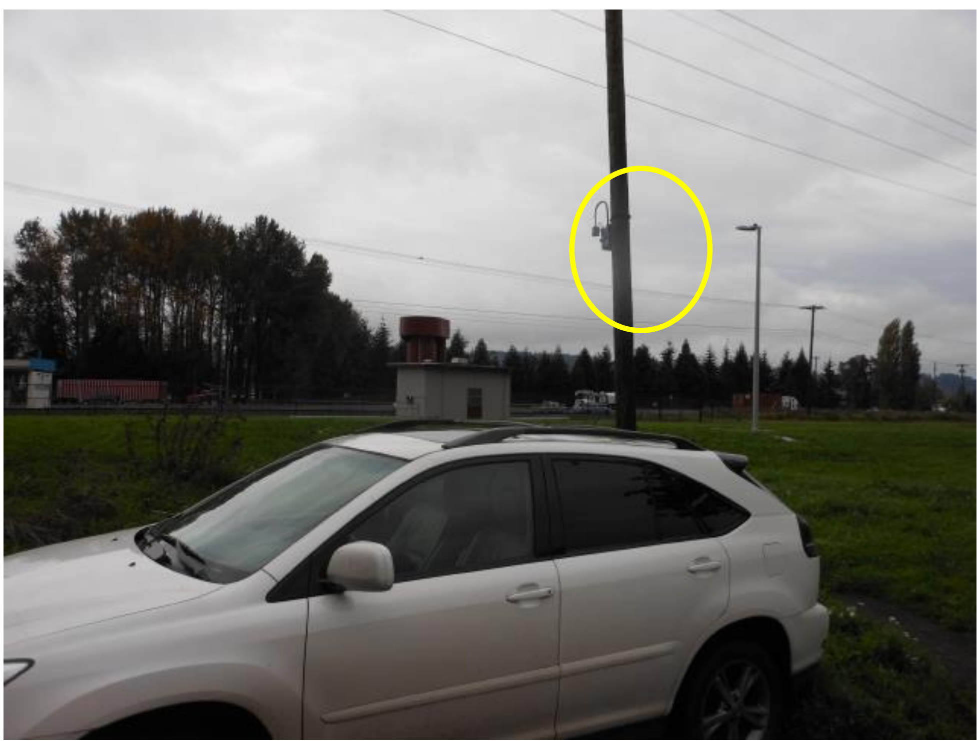
Figure 5. Ambient Sound Pressure Level Survey Locations



Photographs of the long-term survey locations are provided in Photographs 1 through 7.

Photograph 1. Location N1, 602 California Way, Longview, WA

Photograph 2. Location N2, 111-15th Avenue, Longview, WA



Photograph 3. Location N3, 221 Beech Street, Longview, WA

Photograph 4. Location N4, 875 34th Avenue, Longview, WA (survey equipment not shown)

Photograph 5. Location N5, 3600 Memorial Park Drive, Longview, WA

Photograph 6. Location N6, 420 Rutherglen Drive, Longview, WA

Photograph 7. Location N7, 4723 Mount Solo Road, Longview, WA

Photograph 8. Location N8, 1719 Dorothy Avenue, Longview, WA

Four calibrated, precision, digitally logging sound-level meters were installed on the afternoon of October 27, 2014, then relocated on the evening of November 2, 2014, providing at least 6 full days of data collected at each of eight locations, N1 through N8 (Photographs 1 through 8). All noise monitors included Larson Davis Model 812 logging sound level meters and were mounted on safely accessible wood utility poles or metal light poles with the microphone at a height of approximately 10 feet above the ground surface. The one exception to this installation was location N6, where the monitor was strapped to a patio railing because no poles were available (Photograph 6).

The meters were programmed to store data at 1-hour intervals including statistical levels of L_2, L_8, L_{25}, and L_{90}, where L_n is the SPL that is exceeded n% of the time within the 1-hour interval. The L_2, L_8 and L_{25} metrics were selected to correspond with allowable noise limit exceedance durations of 1.5, 5, and 15 minutes specified in Washington Administrative Code (WAC) 173-60-040. The meters were calibrated with a Brüel & Kjær Type 4230 Sound Level Calibrator prior to each deployment and the calibration was checked at the completion of each measurement period. All calibration checks were within 0.5 decibels of the premeasurement calibration level. The measurements were deemed sufficiently accurate and no data were discarded.

Short-term measurements were conducted during the same period as the long-term survey, typically while deploying, relocating, or recovering the long-term survey equipment. The short-term measurements were conducted using a Brüel & Kjær Type 2230 Precision Integrating Sound Level Meter with the electrical signal from the microphone recorded on a digital recorder for data analysis upon return to the office. The sound level meter and digital recording were calibrated at the start and end of each day the short-term measurements were conducted using the same calibrator used for the long-term survey. For all short-term measurements, the calibration checks were within 0.1 decibel of the initial calibration. The microphone of the short-term equipment was located 5 feet above ground surface and the SPL was measured and recorded for a period of 10 minutes at each short-term survey location, providing the 10-minute equivalent sound level for (L_{eq})[1] at each short-term location.

2.1.2 Impact Analysis

The following methods were used to evaluate the potential impacts of the Proposed Action and No-Action Alternative on noise and vibration. For the purposes of this analysis, construction impacts are based on the peak construction period and operations impacts are based on maximum throughput capacity (up to 44 million metric tons of coal per year), which is assumed to be in 2028.

2.1.2.1 Construction—Project Area

The Applicant has identified three construction scenarios.

- **Truck.** If material is delivered by truck, it is assumed approximately 88,000 truck trips would be required over the construction period. Approximately 56,000 loaded truck trips would be needed during the peak construction year.
- **Rail.** If material is delivered by rail, it is assumed approximately 700 train trips (35,000 loaded rail cars) would be required over the construction period. Approximately two-thirds of the rail trips would occur during the peak construction year.

[1] Equivalent sound level (L_{eq}) is generally referenced to 1 hour unless otherwise indicated.

- **Barge.** If material is delivered by barge, it is assumed approximately 1,130 barge trips would be required over the construction period. Approximately two-thirds of the barge trips would occur during the peak construction year. Because the project area does not have an existing barge dock, the material would be off-loaded at an existing dock elsewhere on the Columbia River.

The methods for analyzing noise and vibration impacts related to construction on the project area are described in this subsection.

Noise

Daytime construction is exempt from Washington State noise limits (WAC 173-60-040) and the Applicant is not proposing nighttime construction. However, to establish a reasonable benchmark for evaluating potential impacts and provide context, construction noise in the project area was evaluated on an average aggregate daytime L_{eq} basis over an 8-hour shift per guidelines established by the Federal Transit Administration (FTA) (2006) and the Federal Railroad Administration (FRA) (2012) (referred to as the FTA/FRA guidance). The 8-hour L_{eq} was estimated at the noise-sensitive receptors in the study area using detailed information about the anticipated roster of construction equipment to be used, based on the construction of a similar terminal project (URS Corporation 2014a) and the assumptions described in this section of this report.

Because a monthly schedule of construction activities was not available, the construction noise analysis conservatively assumed that the maximum amount of equipment would be operating concurrently for three areas of construction activity (Table 2).

- Rail infrastructure and rotary car dumper
- Conveyors, transfer towers, and surge bins
- Shiploader, dock, and trestles

Table 2. Anticipated Roster of Construction Equipment

			Rail Infrastructure & Rotary Car, Dumper		Conveyors, Transfer Towers, & Surge Bins		Shiploader, Dock, & Trestles	
Construction Equipment Type	Util. Factor[a] (%)	L_{max} at 50 feet[b] (dBA)	Max. Qty. per Month	Months	Max. Qty. per Month	Months	Max. Qty. per Month	Months
Mobile crane[c]	16	83	5	18	5	18	5	18
Elevated work platform	20	85[a]	2	3	4	18	2	12
Water truck[d]	40	88	1	12	1	12	NA	NA
Dump truck	40	88	3	12	1	12	NA	NA
Dozer	40	85	1	5	NA	NA	NA	NA
Excavator[c]	40	85[a]	1	9	2	12	1	3
Roller	20	85	2	9	2	12	1	3
Grader	40	85	2	9	NA	NA	1	3
Compactor	20	82	2	9	2	12	1	3
Track laying machine	50	85	1	6	NA	NA	NA	NA
Drill rig	20	84[a]	1	2	2	6	NA	NA

Impact pile driver	20	101	2	6	2	6	2	6
Loader[c]	40	85	1	12	1	12	1	9
River barge	50	85[e]	NA	NA	NA	NA	2	18
Generator	50	81	2	18	2	18	2	18
Air compressor	40	81	2	18	2	18	2	18
Construction labor (e.g., misc. Pneumatic tools)	50	85[a]	6	18	6	18	6	18

Notes:
[a] Source: Federal Highway Administration 2006
[b] Source: Federal Transit Administration 2006, except where noted
[c] Shared between all three areas of construction activity
[d] Shared between the two areas of land construction
[e] Source: Federal Highway Administration 2006 for "All other equipment >5 HP"
L_{max} = maximum sound level; dBA = A=weighted decibels

For purposes of this analysis, and because the exact locations of these activities (or the involved equipment and processes) are either unknown at this time or could vary during the course of construction, noise was treated as originating from the acoustic center of the geographic locations described in Table 3.

Table 3. Equipment Quantities and Acoustic Centers for Each Phase of Construction

Equipment[a]	Geographic Acoustic Center of Activity
Rail Infrastructure & rotary car dumper with two mobile cranes, no pile driver	Centerline of perimeter track loop closest to receptors
Conveyors, transfer towers, & surge bins with two mobile cranes, one excavator, no water truck, no loader, no pile driver	Midpoint of Stage 1 reclaim travel path
Shiploader, Dock & Trestles w/ 1 mobile crane, no excavator, no loader, no pile driver	Transfer tower TT-08
Pile driver (one)	Closest pile to receptor from rotary car dumper or Stage 1 reclaim travel path

Notes:
[a] Accounting for equipment shared between areas.

The L_{eq} from each piece of equipment, with the exception of the pile driver, was calculated using the following formula from the FTA/FRA guidance.

$$L_{eq}(equip) = E.L. + 10\log_{10}(U.F.) - 20\log_{10}(D/50) - 10G\log_{10}(D/50)$$

Where:

- L_{eq}(equip) is the L_{eq} at a receptor resulting from the operation of a single piece of equipment over a specified period.
- E.L. is the noise emission level of the particular piece of equipment at the reference distance of 50 feet, taken from Table 2 for this analysis.
- U.F. is a usage factor that accounts for the fraction of time that the equipment is in use over the specified period, i.e., 8-hours in this analysis and taken from Table 2.
- D is the distance from the receptor to the piece of equipment.

- G is a constant that accounts for topography and ground effects, assumed to equal zero in this analysis for a conservative estimate of the construction noise at the receptors; i.e., ignoring reduction due to topography or ground effects.

Pile driving is often the dominant source of noise complaints during construction. A conservative approach was taken by calculating the maximum sound level (L_{max}) that would result from driving a single pile at the location closest to the noise-sensitive receptor. The L_{max} is unaffected by the number of pile drivers operating at a given time because the impacts are discrete, short duration events that typically do not overlap in time. However, the 8-hour L_{eq}, calculated for all other equipment as described above, was added to the L_{max} calculated for pile-driving noise to get the total construction noise for comparison to the noise criteria.

Vibration

Impact pile driving would be the dominant source of ground vibration during construction. The vibration velocity level (L_v) during pile driving was calculated using the following formula from the FTA/FRA guidance.

$$L_v(D) = L_v(25\ \text{ft}) - 30 \log_{10}(D/25)$$

Where:

- L_v is the root mean square (RMS) vibration velocity level expressed in decibels (VdB) referenced to 1 micro-inch/second.
- L_v(25 feet) is the reference vibration velocity level for the piece of equipment. In this case, a value of 112 VdB was used, which represents the upper range of vibration level generated by an impact pile driver.
- D is the distance from the receptor to the piece of equipment.

A list of reference vibration velocity levels for typical construction equipment is provided in Table 4.

Table 4. Vibration Source Levels for Construction Equipment

Equipment	Peak Particle Velocity at 25 feet (inches per second)	Approximate L_v[a] at 25 feet
Pile driver (impact)	1.518	112
Vibratory roller	0.210	94
Hoe ram	0.089	87
Large bulldozer	0.089	87
Loaded trucks	0.076	86
Jackhammer	0.035	79
Small bulldozer	0.003	58

Notes:
[a] RMS velocity in decibels (VdB) are 1 micro-inch/second
Source: Federal Railroad Administration 2012
L_v = vibration velocity level;, RMS = root mean square;, VdB = vibration decibel

The FTA/FRA guidance recommends a slightly different formula to assess potential for structural damage due to ground vibration. However, human annoyance occurs at much lower vibration levels than vibration levels that may cause cosmetic damage to structures so this lower threshold was used to assess impacts.

2.1.2.2 Operations—Project Area

The methods for analyzing noise and vibration impacts related to operations on the project area are described in this subsection.

Noise

The Computer-Aided Noise Abatement (Cadna/A®) Noise Prediction Model (Version 4.4.145) was used to estimate the propagation of sound from aggregate project operations at the project area. Cadna/A® is a Windows-based software program that predicts and assesses noise levels near industrial noise sources using standardized algorithms for noise propagation calculations (International Organization for Standardization 1996). The software can accept sound power levels (in dB re: 1 pico-Watt) in octave-band center frequency resolution to describe the multiple sound propagation sources of the site processes or activity to be modeled. The calculations account for classical sound wave divergence plus attenuation factors resulting from air absorption, basic ground effects, and barriers or shielding. The advantage of using Cadna/A® is that it helps handle the three-dimensional sound propagation complexity of considering realistic intervening natural and human-made topographical barrier effects, including those resulting from terrain features (e.g., Mount Solo) and from structures such as major buildings, storage tanks, and large equipment. The model predicted SPLs at all noise-sensitive receptors in the study area and generated noise contours of equal $L_{eq,}$ 50 A-weighted decibels (dBA) and 60 dBA, for comparison to the Washington State regulatory noise criteria.

A detailed Cadna/A® model for the Proposed Action (URS Corporation 2014b) was reviewed and found to be reasonable. Minor modifications included the addition of calculation points at each of the noise-sensitive receptors. Table 5 and Table 6 list the point-type and line-type sound sources, respectively, that were included in the model, and the assumptions for each source are described following the tables. The Applicant has stated that several of the line-type sources would have corrugated fiberglass-reinforced plastic (FRP) panels as exterior cladding material (Table 7) (URS Corporation 2014b). Atmospheric conditions of no wind and no temperature inversions were assumed for all predictions. (Historical information indicates the likelihood of a temperature inversion in the area is approximately 5% [City of Portland 1955].)

Table 5. Modeled Point-Type Sound Sources for Operations

Noise Source	Sound Power Level (dBA)[a]	Attenuation Applied	Height Above Ground (feet)[b]
Idling Train North1	109	—	6.56
Idling Train North2	109	—	6.56
Idling Train North3	109	—	6.56
Idling Train North4	109	—	6.56
Idling Train North5	109	—	6.56
Idling Train North6	109	—	6.56
Idling Train North7	109	—	6.56
Idling Train South1	109	—	6.56

Noise Source	Sound Power Level (dBA)[a]	Attenuation Applied	Height Above Ground (feet)[b]
Idling Train South2	109	—	6.56
Idling Train South3	109	—	6.56
Idling Train South4	109	—	6.56
Idling Train South5	109	—	6.56
Idling Train South6	109	—	6.56
Idling Train South7	109	—	6.56
Surge Bin 15-SB-01	102.7	—	73.08
Tandem Rotary Dumper	103	—	21.25
Stg1 Conv Drv 01	100.2	—	11.97
Stg1 Conv Drv 03	100.2	—	11.97
Stg1 Conv Drv 05	100.2	—	11.97
Stg1 Conv Drv 09	100.2	—	11.97
Stg1 Conv Drv 10	100.2	—	11.97
Stg1 Conv Drv 06	100.2	—	11.97
Stg1 Conv Drv 13	100.2	—	11.97
Stg1 Conv Drv 15	100.2	—	11.97
Stg1 Conv Drv 17	100.2	—	11.97
Stg1 Trnsf Twr 1	98.8	—	41.26
Stg1 Trnsf Twr 2	98.8	—	36.08
Stg1 Trnsf Twr 3	98.8	—	40.97
Stg1 Trnsf Twr 5	98.8	—	31.75
Stg1 Trnsf Twr 6	98.8	—	31.75
Stg1 Trnsf Twr 7	98.8	—	31.75
Stg1 Trnsf Twr 8	98.8	—	47.69
Stg2 Conv Drv A	100.2	—	11.97
Stg2 Conv Drv B	100.2	—	11.97
Stg2 Conv Drv C	100.2	—	11.97
Stg2 Conv Drv D	100.2	—	11.97
Stg2 Conv Drv E	100.2	—	11.97
Stg2 Trnsf Twr 4	98.8	—	36.08
Stg2 Conv Drv F	100.2	—	11.97
Surge Bin 15-SB-02	102.7	—	73.08
Idling Train North1	109	—	6.56

Notes:
[a] Sound Power Level in dB re: 1 pico-Watt
[b] Site ground elevation 10 feet
Source: URS 2014a
dBA = A-weighted decibels; FRP = fiberglass reinforced plastic

Table 6. Modeled Line-Type Sound Sources for Operations

Noise Source	Sound Power Level (dBA)[a]	Attenuation Applied	Height Above Ground (feet)[b]
Rail track	113.4	—	6.56
Tandem Rotary Dumper to TT01	88.5	FRP	87.53
Stage1 15-SB-02 to TT08	90.7	FRP	99.44
Stage1 Dock Conveyor	108.7	—	58.79
Stage1 Reclaim Conveyor to TT05	112.3	—	71.78
Stage1 Reclaim Conveyor to TT05	112.3	—	71.78
Stage1 Reclaim for 14-CV-09	106.5	—	114.83
Stage1 Reclaim for 14-CV-10	106.5	—	114.83
Stage1 Shiploader for Dock2	106.3	—	85.30
Stage1 Stacker for 13-CV-05	106.5	—	98.43
Stage1 Stacker for 13-CV-06	106.5	—	98.43
Stage1 Stacking Conveyor from TT03	112.3	—	71.78
Stage1 TT01 to TT02	83.8	FRP	80.54
Stage1 TT02 to Stacking	111.5	—	35.17
Stage1 TT02 to TT03	86.6	FRP	89.70
Stage1 TT05 to Surge Bin (15-SB-02)	92.4	FRP	149.28
Stage1 TT06 to TT09d	86.3	FRP	49.28
Stage1 TT09 to Surge Bind	87.3	FRP	149.28
Stage2 15-SB-02 to TT08	90.6	FRP	99.44
Stage2 Dock Conveyor	111.2	—	58.79
Stage2 Reclaim Conveyor to TT07	111.8	—	71.78
Stage2 Reclaim Conveyor to TT07	111.9	—	71.78
Stage2 Reclaim for 14-CV-11	106.5	—	114.83
Stage2 Reclaim for 14-CV-12	106.5	—	114.83
Stage2 Shiploader for Dock3	106.3	—	85.30
Stage2 Stacker for 13-CV-08	106.5	—	85.30
Stage2 Stacking Conveyor from TT04	111.7	—	35.17
Stage2 TT03 to TT04	86.9	FRP	89.70
Stage2 TT07 to 15-SB-02	90.9	FRP	149.28
Stage2 TT07 to TT09d	88.3	FRP	49.28
Stage2 TT09 to Surge Bind	87.2	FRP	149.28

Notes:
[a] Sound Power Level in dB re: 1 pico-Watt
[b] Site ground elevation 10 feet
Source: URS 2014a
dBA = A-weighted decibels; FRP = fiberglass reinforced plastic

Parameters and Assumptions—Operations Equipment

The following notes and assumptions relate to the operations-related equipment of the project area.

- **Transfer towers.** The 98.8 dBA sound power level was derived from estimated octave band center frequency levels (Edison Electric Institute 1984: Table 4.34), adjusted downward by 17 decibels in each octave band so that the overall dBA was comparable to a transfer tower reference point (Heggies 2006). This adjustment reflects the addition of a cladded enclosure, so the FRP attenuation was not applied. The source height is approximately the top of the cladded structure (Edison Electric Institute 1984). While the transfer tower noise levels may include material falling and conveyor belts, they do not include the conveyor drives, which are considered separately.

- **Conveyor belts.** The stacking, reclaim, and dock conveyors are exposed to the outdoors and hence do not receive the benefit of cladding noise reduction as do the other conveyor segments. The 103 dBA sound power level (per 100 meters of length) was recommended for unenclosed low-noise conveyors based on an exchange of confidential information between URS and SLR Consulting (URS Corporation 2014b) regarding sound levels "generally being achieved in practice" at Kooragong Coal Terminal. For enclosed conveyor galleries, the FRP attenuation adjustment was applied.
- **Conveyor drives.** Conveyor drive locations were identified from available Worley-Parsons plan and elevation drawing sets. Consistent with these drawings, all conveyor drives would be located near grade and exposed to the outdoors. They would not be located inside the cladded transfer towers nor do they feature any substantial noise-reducing enclosure or other means of noise reduction. While project design information indicates that conveyor drives would have up to four 400-horsepower (HP) motors (URS Corporation 2014b), predictive model data (Heggies 2006) suggest that the low-noise specification sound power level is 100 dBA for either a 630-kilowatt motor (845 HP) or an 800-kilowatt motor (1,073 HP) and thus does not depend on the total drive power. Hence, all drives in the model for this technical report, ranging from 400 to 1,600 HP, had the same 100 dBA L_{eq} sound power.
- **Tandem rotary dumper.** The tandem rotary dumper sound level is assumed to include motor noise from indexers (positioners) fore and aft of the dumper building. The 103 dBA sound power level was derived from measured level octave band center frequency levels taken at the exteriors of the entry and exit openings of a similar rotary dumper facility (Pittsburgh Testing Laboratory 1982).
- **Startup rapid unloader.** For purposes of this analysis, the startup rapid unloader was assumed similar to the tandem rotary dumper with respect to noise emission.
- **Shiploader.** The shiploaders move bulk materials along the dock conveyors and are point sources of noise. The 106.3 dBA SPL was derived from a reference terminal (Whitt et al. 2007), adjusted so that the overall dBA was comparable to the value shown for the shiploader in a comparable noise impact assessment (Heggies 2006).
- **Stacker/reclaimer.** The stackers and reclaimers move bulk materials along assigned conveyors and are point sources of noise. The stackers and reclaimers do not emit noise from fixed positions but emit variable noise along a length (i.e., the underlying conveyor position). The model provides an average source position and depicts stacker and reclaimer movement or variable positions. The source heights correspond with the highest point of the boom (stacker) or the wheel axle (reclaimer). The 106.5 dBA SPL was derived from estimated octave band center frequency levels (Edison Electric Institute 1984: Table 4.34) so that the overall dBA was comparable to a stacker and reclaimer reference point (Heggies 2006).
- **Surge bin.** The 102.7 dBA sound power level was derived from octave band center frequency levels in a reference noise assessment (Heggies 2010), adjusted so that the overall dBA was

comparable to the value shown for the buffer bin in a comparable noise impact assessment (Heggies 2006).

- **Train loops.** Trains undergoing active railcar unloading through the rotary car dumper would move slowly during the worst-case hour under consideration. Measurement data from a reference report (U.S. Environmental Protection Agency 1974) provides the basis for an assumed octave-band signature for a comparable sample train of four locomotives and 89 loaded cars. For this operations noise model, a value of 77 dBA per meter generates noise for the moving train (undergoing unloading) that is consistent with recommendations (URS Corporation 2014b) and sound power data from another noise impact assessment (Heggies 2006). Because other trains could be idling, the sound exposure level (SEL) was estimated (Federal Transit Administration 2006: Tables 5-5 and 5-6) and the octave-band profile was approximated data from the reference report (U.S. Environmental Protection Agency 1974). Idling trains were modeled as point sources of noise, with a pair of locomotives at the head of the train, and a single locomotive at the tail.

Parameters and Assumptions—Site Features

- **Structures.** The Cadna/A® 3-D model included path-occluding buildings and structures such as the tandem rotary dumper and the administration office and warehouse.
- **Coal storage.** The Cadna/A® model approximates the tall heaps of stored coal as sloped 15-meter-tall embankments having a size and geometry similar to what appears in available 3-D project layout rendering images.
- **Surface acoustical absorption.** On a recognized scale of zero to one, with zero representing a fully acoustically reflective surface and one representing a fully absorptive surface, the ground surface, on average, was considered 0.5. However, the Columbia River area was locally set to zero.
- **Foliage.** Consistent with what is shown on available aerial photography and observations from the ambient sound survey.
- **Temperature and relative humidity.** The Cadna/A® model assumes at least 70% relative humidity and 20 degrees Celsius—standard values in the model configuration. Available weather data for the project area indicates that seasonal average relative humidity ranges from 72 to 80% (Golden Gate Weather Services 2015), and high temperatures range from about 7 to 26 degrees Celsius (Western Regional Climate Center 2015). Hence, the selected relative humidity value is within the annual relative humidity range and would be considered representative; and, the selected temperature value is near the high value of the region's recorded range and would be considered both representative and conservative, because (all else being equal) sound travels farther in an atmosphere with higher temperatures. The relative humidity affects the degree to which sound is absorbed by the atmosphere over large distances and the effect is more pronounced at higher frequencies. At 20 degrees Celsius and at a fixed distance from a noise source, a change in humidity from 70 to 80%, would be expected to produce a reduction in noise level (from a continuous source) of approximately 1 decibel.
- **Cladding noise reduction.** Based on the Applicant's response to a data request, this analysis assumes that the three major types (roof, opaque wall, translucent window) of exterior surface material are corrugated FRP having a surface weight of 8 ounces per square foot. Because actual sound transmission loss data were not included in the material specifications and engineering data nor were such data found after a reasonable online search, an approximation was used for

this analysis. Assuming its thickness and fluted structure was functionally similar to FRP material, the transmission loss data for a corrugated asbestos sheet of 2 pounds per square foot (Bies and Hansen 1996) was reduced by 12 decibel in each octave band to account for the mass law (a reduction of 6 decibel for each halving of material mass). Then, to account for expected differences between laboratory test and actual field conditions, another reduction of 3 decibels was conservatively applied. The resulting octave band center frequency transmission loss data are shown in Table 7.

Table 7. Estimated Transmission Loss for Fiberglass-Reinforced Plastic Cladding Material

Octave Band (Hz)	63	125	250	500	1000	2000	4000	8000
Transmission Loss (decibels)	5	10	15	18	18	23	24	27

Hz = Hertz

Vibration

There would be no substantial sources of ground vibration on site during operations with the possible exception of trains moving on the rail loop. Using generalized ground surface vibration curves (Federal Transit Administration 2006) and correcting for speed (a maximum of 10 miles per hour on the rail loop), vibration impact from train operations is unlikely at distances more than 40 feet from a railroad track for infrequent events (less than 30 passbys per day). The closest vibration-sensitive receptor (a residence) is approximately 275 feet from the outer track of the rail loop. Therefore, no analysis was conducted to estimate vibration generated during project area operations.

2.1.2.3 Operations—Rail Traffic

The methods for analyzing noise and vibration impacts related to rail traffic to and from the project area are described in this subsection.

Noise

Operations-related rail traffic was estimated for four rail segments.

- BNSF Spur to the Reynolds Lead.
- Reynolds Lead from BNSF Spur to 3rd Avenue and California Way.
- Reynolds Lead from 3rd Avenue and California Way to midway between Industrial Way (State Route 432) and the Weyerhaeuser entrance.
- Reynolds Lead from midway between Industrial Way and Weyerhaeuser entrance to the project area.

The assumptions related to estimates of rail traffic are summarized in Tables 8 through 11.

Table 8. Average Freight Rail Traffic, Consists, and Speed—BNSF Spur to Reynolds Lead

	Number of Locomotives per Train	Number of Railcars per Train	Total Train Length (feet)[a]	Daily Average Train Traffic	Daily Total Train Passbys along BNSF Spur in Both Directions	Speed (mph)
Existing Traffic 2015	2.6	78	4,919	3.6	7.1	10
No-Action 2018	2.6	78	4,919	3.6	7.1	10
No-Action 2028[b]	2.6	78	4,919	3.6	7.1	10
Proposed Terminal Operation 2028[b]	4	125	6,844	8	16	10
Proposed Terminal Operation 2028[c]	4	125	6,844	8	16	20

Notes:

[a] Existing and No-Action Alternative locomotive length = 68.7 feet average; railcar length = 60.8 feet average; project locomotive length = 73 feet; project length = 53 feet

[b] Without track improvements

[c] With track improvements

mph = miles per hour

Table 9. Average Freight Schedule, Consists, and Speed—Reynolds Lead from BNSF Spur to 3rd Avenue and California Way

	Number of Locomotives per Train	Number of Railcars per Train	Total Train Length (feet)	Daily Averag e Trains	Daily Total Train Passbys along Reynolds Lead in Both Directions	Speed (mph)
Existing Traffic 2015	2	20.6	1,459	1.1	2.3	10
No-Action 2018	2	29.6	2,041	1.1	2.3	10
No-Action 2028[b]	2	29.8	2,052	2.0	4.0	10
No Action 2028[c]	2	29.8	2,052	2.0	4.0	20
Proposed Terminal Operation 2028[b]	4	125	6,844	8	16	10
Proposed Terminal Operation 2028[c]	4	125	6,844	8	16	20

Notes:

[a] Existing and No-Action Alternative locomotive length = 68.7 feet average; railcar length = 60.8 feet average; project locomotive length = 73 feet; project length = 53 feet

[b] Without track improvements

[c] With track improvements

mph = miles per hour

Table 10. Average Freight Schedule, Consists, and Speed—Reynolds Lead from Oregon Way and Industrial Way to Project Area

	Number of Locomotives per Train	Number of Railcars per Train	Total Train Length (feet)[a]	Daily Average Trains	Daily Total Train Passbys along Reynolds Lead in Both Directions	Speed (mph)
Existing Traffic 2015	2	20.6	1,441	1.1	2.3	10
No-Action 2018	2	29.6	2,024	1.1	2.3	10
No-Action 2028[e]	2	29.8	2,035	2.0	4.0	10
Proposed Terminal Operation 2028[b]	4	125	6,844	8	16	10
Proposed Terminal Operation 2028[c]	4	125	6,844	8	16	20

Notes:

[a] Existing and No-Action Alternative locomotive length = 68.7 feet average; railcar length = 60.8 feet average; project locomotive length = 73 feet; project length = 53 feet

[b] Without track improvements

[c] With track improvements

mph = miles per hour

Table 11. Freight Schedule, Consists, and Speed—Reynolds Lead from Midway between Industrial Way and Weyerhaeuser Entrance to Project Area

	Number of Locomotives per Train	Number of Railcars per Train	Total Train Length (feet)[a]	Daily Average Trains	Daily Total Train Passbys along Reynolds Lead in Both Directions	Speed (mph)
Existing Traffic 2015	2	20.6	1,441	1.14	2.3	10
No-Action 2018	2	29.6	2,024	1.14	2.3	10
No-Action 2028[b]	2	29.8	2,035	1.995	4.0	10
Proposed Terminal Operation 2028[b]	4	125	6,844	8	16	10
Proposed Terminal Operation 2028[c]	4	125	6,844	8	16	10

Notes:

[a] Existing and No-Action Alternative locomotive length = 68.7 feet average; railcar length = 60.8 feet average; project locomotive length = 73 feet; project length = 53 feet

[b] Without track improvements

[c] With track improvements

mph = miles per hour

For the 2028 Proposed Action and No-Action Alternative analysis, proposed track improvements would include additional track around the yard and a new power switch. These improvements would allow an increase in train speed across some of the crossings from 10 to 20 miles per hour. The analysis also considered without track improvements. For this study, a conservative analysis incorporated the maximum allowable train speed into the noise model for the full length of each segment.

Reference SELs (Federal Railroad Administration 2012) for trains are 97 dBA SEL for freight locomotives (90 feet long) and 100 dBA SEL for freight cars (2,000 feet long). These reference SELs are normalized to 1-second duration at 50 feet for a train traveling 40 miles per hour. These reference SELs represent at-grade ballast and tie track with continuously welded rail conditions, similar to the Reynolds Lead track construction.

There are five public at-grade crossings along the Reynolds Lead and BNSF Spur from the main line to the project area.

- Dike Road
- 3rd Avenue
- California Way
- Oregon Way
- Industrial Way

At Industrial Way, the rail line crosses from the north side to the south side of Industrial Way, approximately 1000 feet west of the crossing at Oregon Way. The crossings at 3rd Avenue and California Way are within approximately 500 feet of each other. In addition to these public crossings, there are three private at-grade crossings.

- Weyerhaeuser entrance west of Douglas Street
- Weyerhaeuser entrance at Washington Way
- 38th Avenue entrance to the Applicant's existing bulk product terminal

The noise model included the FRA provision that horns be sounded not fewer than 15 seconds or more than 20 seconds before the locomotive reaches a crossing. To be conservative, the analysis assumes locomotive horn sounding would begin 20 seconds before the locomotive reaches a crossing (or 600 feet at 20 miles per hour) with a source reference level of 113 dBA SEL, per the FRA guidelines (2012) for assessing train horn noise impacts in the vicinity of grade crossings.

Day-night sound level (L_{dn}) is the A-weighted L_{eq} for a 24-hour period with a 10-decibel penalty applied to noise levels between 10 p.m. and 7 a.m. To calculate the L_{dn} metric, it is necessary to define the number of trains that pass during daytime hours (7 a.m. to 10 p.m.) and nighttime hours (10 p.m. to 7 a.m.). The proposed coal export terminal would operate 24 hours a day and 7 days a week. For the L_{dn} calculations, it was assumed rail traffic would be evenly distributed; therefore, 62.5% of the daily train traffic was assumed to pass in the day and the remaining 37.5% was assumed to pass in the night.

The Cadna/A® model was used to predict noise levels generated by rail traffic along the BNSF Spur and Reynolds Line for existing conditions (2015), the No-Action Alternative in 2018 (No Action 2018), the No-Action Alternative in 2028 (No Action 2028), and operation of the Proposed Action in 2028 (Operations 2028). A summary of the model input is provided in Tables 12 through 15. The noise levels were predicted for trains running without sounding horns at crossings and for trains running with horns sounding at crossings.

Table 12. Cadna/A® Freight Train Noise Model Input—BNSF Spur to Reynolds Lead

		Existing 2015	No Action 2018	No Action 2028[c]	No Action 2028[d]	Terminal Operation 2028[c]	Terminal Operation 2028[d]	Peak Hour, 1 Roundtrip Train
Locomotives	Reference SEL, dBA[a]	97	97	97	97	97	97	97
	Reference length, feet	90	90	90	90	90	90	90
	Reference speed, mph	40	40	40	40	40	40	40
	Speed coefficient, K	10	10	10	10	10	10	10
	Length per unit, feet	69	69	69	69	72	72	72
	Total number of daytime passbys[b]	12	12	12	12	40	40	8
	Total number of nighttime passbys[b]	7	7	7	7	24	24	n/a
Railcars	Reference SEL, dBA[a]	100	100	100	100	100	100	100
	Reference length, feet	2,000	2,000	2,000	2,000	2,000	2,000	2,000
	Reference speed, mph	40	40	40	40	40	40	40
	Speed coefficient, K	20	20	20	20	20	20	20
	Length per unit, feet	62	66	66	66	52	52	52
	Total number of daytime passbys[b]	347	347	347	347	1,250	1,250	250
	Total number of nighttime passbys[b]	208	208	208	208	750	750	n/a
Horns	Reference SEL, dBA1	113	113	113	113	113	113	113
	Number of daytime passbys[b]	4	4	4	4	10	10	2
	Number of nighttime passbys[b]	3	3	3	3	6	6	-
	Train speed, mph	10	10	10	20	10	20	20

Notes:
[a] Reference SEL at distance of 50 feet
[b] Daytime: 7 a.m. to 10 p.m., Nighttime: 10 p.m. to 7 a.m.
[c] Without track improvements
[d] With track improvements
SEL = sound exposure level; dBA = A-weighted decibel; mph = miles per hour; K = speed coefficient; n/a = not applicable

Table 13. Cadna/A® Freight Train Noise Model Input—Reynolds Lead from BNSF Spur to 3rd Avenue and California Way

		Existing 2015	No Action 2018	No Action 2028[c]	No Action 2028[d]	Terminal Operation 2028[c]	Terminal Operation 2028[d]	Peak Hour, 1 Roundtrip Train
Locomotives	Reference SEL, dBA[a]	97	97	97	97	97	97	97
	Reference length, feet	90	90	90	90	90	90	90
	Reference speed, mph	40	40	40	40	40	40	40
	Speed coefficient, K	10	10	10	10	10	10	10
	Length per unit, feet	59	59	59	59	72	72	72
	Total number of daytime passbys[b]	3	3	5	5	40	40	8
	Total number of nighttime passbys[b]	2	2	3	3	24	24	n/a
Railcars	Reference SEL, dBA[a]	100	100	100	100	100	100	100
	Reference length, feet	2,000	2,000	2,000	2,000	2,000	2,000	2,000
	Reference speed, mph	40	40	40	40	40	40	40
	Speed coefficient, K	20	20	20	20	20	20	20
	Length per unit, feet	66	66	66	66	52	52	52
	Total number of daytime passbys[b]	29	42	74	74	1,250	1,250	250
	Total number of nighttime passbys[b]	18	25	45	45	750	750	n/a
Horns	Reference SEL, dBA1	113	113	113	113	113	113	113
	Number of daytime passbys[b]	1	1	2	2	10	10	2
	Number of nighttime passbys[b]	1	1	1	1	6	6	-
	Train speed, mph	10	10	10	20	10	20	20

Notes:

[a] Reference SEL at distance of 50 feet

[b] Daytime: 7 a.m. to 10 p.m., Nighttime: 10 p.m. to 7 a.m.

[c] Without track improvements

[d] With track improvements

SEL = sound exposure level; dBA = A-weighted decibel; mph = miles per hour; K = speed coefficient; n/a = not applicable

Table 14. Cadna/A® Freight Train Noise Model Input—Reynolds Lead from Oregon Way and Industrial to the Project Area

		Existing 2015	No Action 2018	No Action 2028[c]	No Action 2028[d]	Terminal Operation 2028[c]	Terminal Operation 2028[d]	Peak Hour, 1 Roundtrip Train
Locomotives	Reference SEL, dBA[a]	97	97	97	97	97	97	97
	Reference length, feet	90	90	90	90	90	90	90
	Reference speed, mph	40	40	40	40	40	40	40
	Speed coefficient, K	10	10	10	10	10	10	10
	Length per unit, feet	49	49	49	49	72	72	72
	Total number of daytime passbys[b]	3	3	5	5	40	40	8
	Total number of nighttime passbys[b]	2	2	3	3	24	24	n/a
Railcars	Reference SEL, dBA[a]	100	100	100	100	100	100	100
	Reference length, feet	2,000	2,000	2,000	2,000	2,000	2,000	2,000
	Reference speed, mph	40	40	40	40	40	40	40
	Speed coefficient, K	20	20	20	20	20	20	20
	Length per unit, feet	66	66	66	66	52	52	52
	Total number of daytime passbys[b]	29	42	74	74	1,250	1,250	250
	Total number of nighttime passbys[b]	18	25	45	45	750	750	n/a
Horns	Reference SEL, dBA1	113	113	113	113	113	113	113
	Number of daytime passbys[b]	1	1	2	2	10	10	2
	Number of nighttime passbys[b]	1	1	1	1	6	6	-
	Train speed, mph	10	10	10	20	10	20	20

Notes:

[a] Reference SEL at distance of 50 feet

[b] Daytime: 7 a.m. to 10 p.m., Nighttime: 10 p.m. to 7 a.m.

[c] Without track improvements

[d] With track improvements

SEL = sound exposure level; dBA = A-weighted decibel; mph = miles per hour; K = speed coefficient; n/a = not applicable

Table 15. Cadna/A® Freight Train Noise Model Input—Reynolds Lead from Midway between Industrial Way and Weyerhaeuser Entrance to Project Area

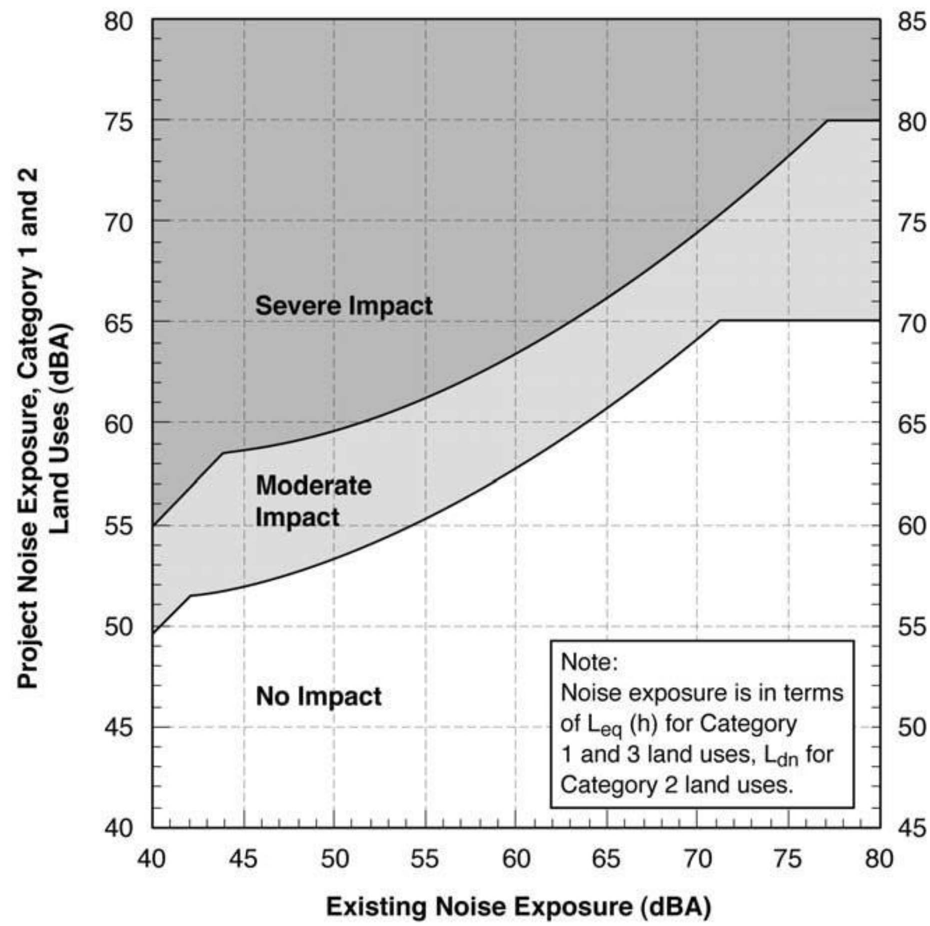
		Existing / Baseline	No Action 2018	No Action 2028[c]	No Action 2028[d]	Terminal Operation 2028[c]	Terminal Operation 2028[d]	Peak Hour, 1 Roundtrip Train
Locomotives	Reference SEL, dBA[a]	97	97	97	97	97	97	97
	Reference length, feet	90	90	90	90	90	90	90
	Reference speed, mph	40	40	40	40	40	40	40
	Speed coefficient, K	10	10	10	10	10	10	10
	Length per unit, feet	49	49	49	49	72	72	72
	Total number of daytime passbys[b]	3	3	5	5	40	40	8
	Total number of nighttime passbys[b]	2	2	3	3	24	24	n/a
Railcars	Reference SEL, dBA[a]	100	100	100	100	100	100	100
	Reference length, feet	2,000	2,000	2,000	2,000	2,000	2,000	2,000
	Reference speed, mph	40	40	40	40	40	40	40
	Speed coefficient, K	20	20	20	20	20	20	20
	Length per unit, feet	66	66	66	66	52	52	52
	Total number of daytime passbys[b]	29	42	74	74	1,250	1,250	250
	Total number of nighttime passbys[b]	18	25	45	45	750	750	n/a
Horns	Reference SEL, dBA1	113	113	113	113	113	113	113
	Number of daytime passbys[b]	1	1	2	2	10	10	2
	Number of nighttime passbys[b]	1	1	1	1	6	6	-
	Train speed, mph	10	10	10	10	10	10	10

Notes:
[a] Reference SEL at distance of 50 feet
[b] Daytime: 7 a.m. to 10 p.m., Nighttime: 10 p.m. to 7 a.m.
[c] Without track improvements
[d] With track improvements
SEL = sound exposure level; dBA = A-weighted decibel; mph = miles per hour; K = speed coefficient; n/a not applicable

Railroad noise is exempt from Washington State noise limits. There are no criteria or guidelines for assessing noise impacts specifically from freight trains. However, the guidelines provided for assessing noise impacts from high-speed rail projects (Federal Railroad Administration 2012) and from transit projects (Federal Transit Administration 2006) are appropriate for assessing potential noise impacts from rail traffic for the Proposed Action. Per these guidelines, noise impacts are determined by the increase in ambient noise level (L_{dn} or peak hour L_{eq}, depending on the type of receptor) after the project is completed. The amount of increase that is acceptable depends on the existing ambient noise level.

The FTA/FRA guidance defines two levels of potential impact, *moderate impact* or *severe impact*. The level of impact is determined by the existing level of noise exposure and the change in noise exposure that would result from the Proposed Action using a sliding scale according to the land uses affected. Noise impacts are assessed by comparing the existing outdoor noise exposure with Proposed Action-related outdoor noise levels, as illustrated in Figure 6. The criterion for each degree of impact is based on a sliding scale that is dependent on the existing noise exposure and noise exposure with project-related trains. As the existing level of noise exposure increases, the additional noise exposure causing a moderate or severe impact decreases.

Figure 6. Noise Impact Criteria



Source: Federal Transit Administration 2006.

FTA/FRA guidance noise impact criteria are based on the land-use category of the receiving properties. The FTA/FRA guidance identifies three land-use categories for assessing potential noise impacts.[2]

- **Category 1.** Land where quiet is an essential element of intended purpose, such as outdoor amphitheaters, concert pavilions, and national historic landmarks with significant outdoor use.

[2] Noise exposure values are reported as hourly equivalent sound level ($L_{eq[h]}$) for Category 1 and 3 land uses, and L_{dn} for residential land uses (Category 2).

- **Category 2.** Residences and buildings where people normally sleep, including homes, hospitals, and hotels.
- **Category 3.** Institutional land uses (schools, places of worship, libraries) that are typically available during daytime and evening hours. Other uses in this category can include medical offices, conference rooms, recording studios, concert halls, cemeteries, monuments, museums, historical sites, parks, and recreational facilities.

The analysis considered two types of rail noise.

- *Wayside* noise refers to the combined effect of locomotive noise and car/wheel noise.
- *Horn* noise refers to the sound of locomotive warning horns, which are sounded at public at-grade road/rail crossings. Because horn sounding is intentionally loud to warn motorists of oncoming trains, the horn noise footprint is often larger than the wayside noise footprint.

To determine noise impact for the No-Action Alternative, the L_{dn} predicted for existing trains was decibel subtracted from the measured L_{dn} at each ambient survey location. This provided L_{dn} levels representative of sources other than trains. The L_{dn} predicted for the No-Action Alternative was then added to the result to provide the No-Action Alternative L_{dn} including all sources of noise. Any increases between the No-Action Alternative L_{dn} and the measured L_{dn} (which included noise from the existing trains) were compared to the FTA/FRA guidance to determine impact.

To determine noise impacts for the operation of the Proposed Action in 2028, the calculated L_{dn} for associated train traffic was added to the No Action 2028 L_{dn} calculated at each ambient survey location as described above. Any relative increases between the above summation and the No Action 2028 levels were compared to the FTA/FRA guidance. The above approach accounted for increases, if any, in rail traffic noise not associated with the Proposed Action by 2028.

At locations where potential noise impacts were indicated, additional nearby calculation points were added to the Cadna/A® model to determine the potential extent of the impacts. The model results and online satellite photography were then used to determine the number of potentially affected properties.

For noise-sensitive receptors that have predominantly daytime use only (e.g., churches, schools), noise impacts are determined from the peak hour L_{eq} per the FTA/FRA guidance. The existing L_{eq} was determined at each ambient survey location from the long-term survey data. The ambient survey data and the calculated L_{eq} were used to determine impacts in a similar fashion as for the L_{dn} at residences described above.

Statewide Analysis of Train Noise

Assessment of the potential noise impact from increased train traffic on BNSF and UP routes in Washington State to and from the project area was based on a potential increase in L_{dn}, which was calculated using the following equation.

$$L_{dn}\text{ increase} = 10\log\left(\frac{V_{total}}{V_{non\text{-}project}}\right)$$

Where:

- V_{total} is the total volume of train traffic, i.e., the average total number of trains per day, including Proposed Action-related trains and all other trains.

- $V_{non\text{-}project}$ is the number of trains per day that are not related to the Proposed Action.

The above equation is similar to the method used to calculate noise exposure based on train traffic volume per the FTA guidance manual for detailed noise analysis (Federal Transit Administration 2006). The above assumes that the distribution of the number of trains between daytime and nighttime does not change.

Vibration

Using generalized ground surface vibration curves (Federal Transit Administration 2006) and correcting for speed (a maximum 20 miles per hour with proposed track improvements), a vibration impact from Proposed Action-related train operations is unlikely at distances more than 60 feet from a railroad track for infrequent events (fewer than 30 passbys per day). The closest vibration-sensitive receptor (a residence) is approximately 180 feet away from the Reynolds Lead. There are no vibration sensitive receptors along the BNSF Spur. Therefore, no analysis was conducted to estimate vibration generated during rail operations.

2.1.2.4 Operations—Vessel Traffic

The methods for analyzing noise and vibration impacts related to vessel traffic to and from the project area are described in this subsection.

Noise

There are numerous sources of noise from stationary and moving vessels, summarized as follows.

- **Stationary vessels.** Vessels may be considered stationary noise sources while moored at the docks for loading or unloading. The primary sources of airborne noise from large commercial cargo vessels are the ventilation systems for the engine room and cargo hold. Localized noise may also emit from exhaust stacks or ventilation ducts on the sides of a ship. Noise levels produced by a large moored bulk container ship have been measured at about 65 dBA at a distance of 19 meters (62 feet) at both the engine room ventilation fans and the cargo hold fans (Badino et al. 2014). Using the above information as a reference, the L_{eq} at any distance from a stationary vessel was calculated using the following equation.

$$L_{eq_{(\text{stationary vessel})}} = 65 - 20\log\left(\frac{d}{62}\right)$$

Where d is the distance in feet between the receiver and the vessel. The above equation is based on the basic concept of spherical spreading from a point source of noise (i.e., 6 dB reduction per doubling of distance). A similar term is used in the FTA guidance manual for projecting noise during construction (Federal Transit Administration 2006).

- **Vessels under way.** Vessels may be considered slow moving, single sources of noise while under way in the river. For these vessels, the dominant noise source is engine noise transmitted through intake air vents and exhaust stacks. An analysis of noise from vessels under way estimated the L_{dn} from a moving ship, assuming existing self-propelled vessel traffic on the Columbia River with an average of 6.46 ships per day (U.S. Army Corps of Engineers 2011), half during daytime hours and half at night, passing the Port of Longview, Washington. At a perpendicular distance of 400 feet from the moving ship, the L_{dn} was estimated to be 45 dBA, well under the European Union Directive noise limit of 75 dBA at 25 meters for vessels under way (URS Corporation 2014a). Using the above information as a reference, the L_{dn} at any perpendicular distance from the shipping lane with a specific volume of ship traffic was calculated using the following equation.

$$L_{dn_{(\text{vessels under way})}} = 45 - 20\log\left(\frac{d}{400}\right) + 10\log\left(\frac{V}{6.46}\right)$$

Where:

- d is the perpendicular distance between the lane of ship traffic and the noise sensitive receiver.
- V is the volume of ship traffic, i.e., average total number of vessels per day.

The second term on the right-hand side of the above equation accounts for spherical spreading from a point source of noise as described for stationary vehicles above. The third term is similar to the method used to calculate noise exposure based on train traffic volume per FTA guidance for detailed noise analysis (Federal Transit Administration 2006).

- **Foghorns.** Vessels may sound their foghorns while under way in heavy fog. One such horn was heard and monitored during a site visit. The foghorn reached a maximum noise level of 60 dBA at the ship's point of closest approach to the measurement location (approximately 1,800 feet). This represents the highest foghorn sound level to which noise-sensitive receptors would be exposed. The L_{max} from foghorns at any perpendicular distance from the shipping lane was calculated using the following equation.

$$L_{max_{(\text{foghorn})}} = 60 - 20\log\left(\frac{d}{1800}\right)$$

Where d is the perpendicular distance in feet between the receiver and the shipping lane. The above equation accounts for spherical spreading from a point source of noise as described for stationary vehicles above.

Vibration

The vessels that would be used are similar to those which are already traveling on the Columbia River. There have been no documented cases of perceptible vibration on shore generated by ship traffic on the river. Therefore, no analysis was conducted to estimate vibration generated during vessel operations.

2.2 Existing Conditions

This section describes the existing noise conditions in the study area.

Figure 3 in Section 1.3, *Study Area*, illustrates the land uses in the study area. Figure 4 in Section 2.1, *Methods*, illustrates the sensitive receptors in the study area, including residential land uses. As shown in Figure 4, the closest noise-sensitive receptors to the project area and Reynolds Lead and BNSF Spur are residential land uses. These land uses are located north of the Reynolds Lead and Industrial Way (SR 432) between Oregon Way and Washington Way (a distance of approximately 1.5 miles along the Reynolds Lead). Residential land uses are also located across Mount Solo Road (SR 432) from the project area. Figures 7 through 10 are plots of the equal L_{dn} estimated for existing rail traffic along the Reynolds Lead and BNSF Spur based on the existing rail traffic provided in the SEPA Rail Transportation Technical Report (ICF and Hellerworx 2017). The following subsections describe existing noise contours for all noise sources including train horns. The existing ambient noise levels formed the baseline against which the effects of the Proposed Action and No-Action Alternative were measured.

Figure 7. Existing Rail Noise Contours, BNSF Spur to Reynolds Lead, Including Train Horns

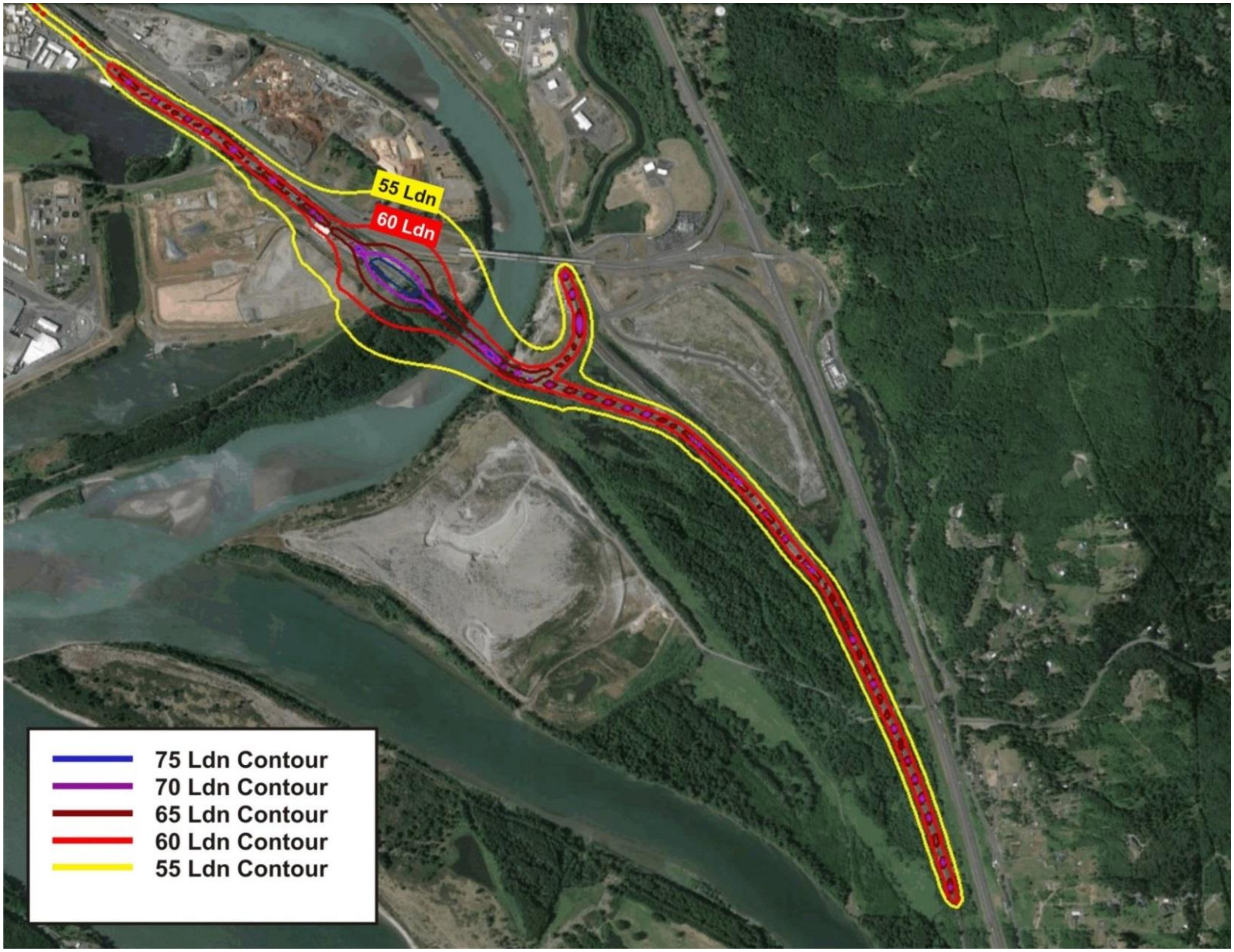


Figure 8. Existing Rail Noise Contours, Beginning of Reynolds Lead, Including Train Horns

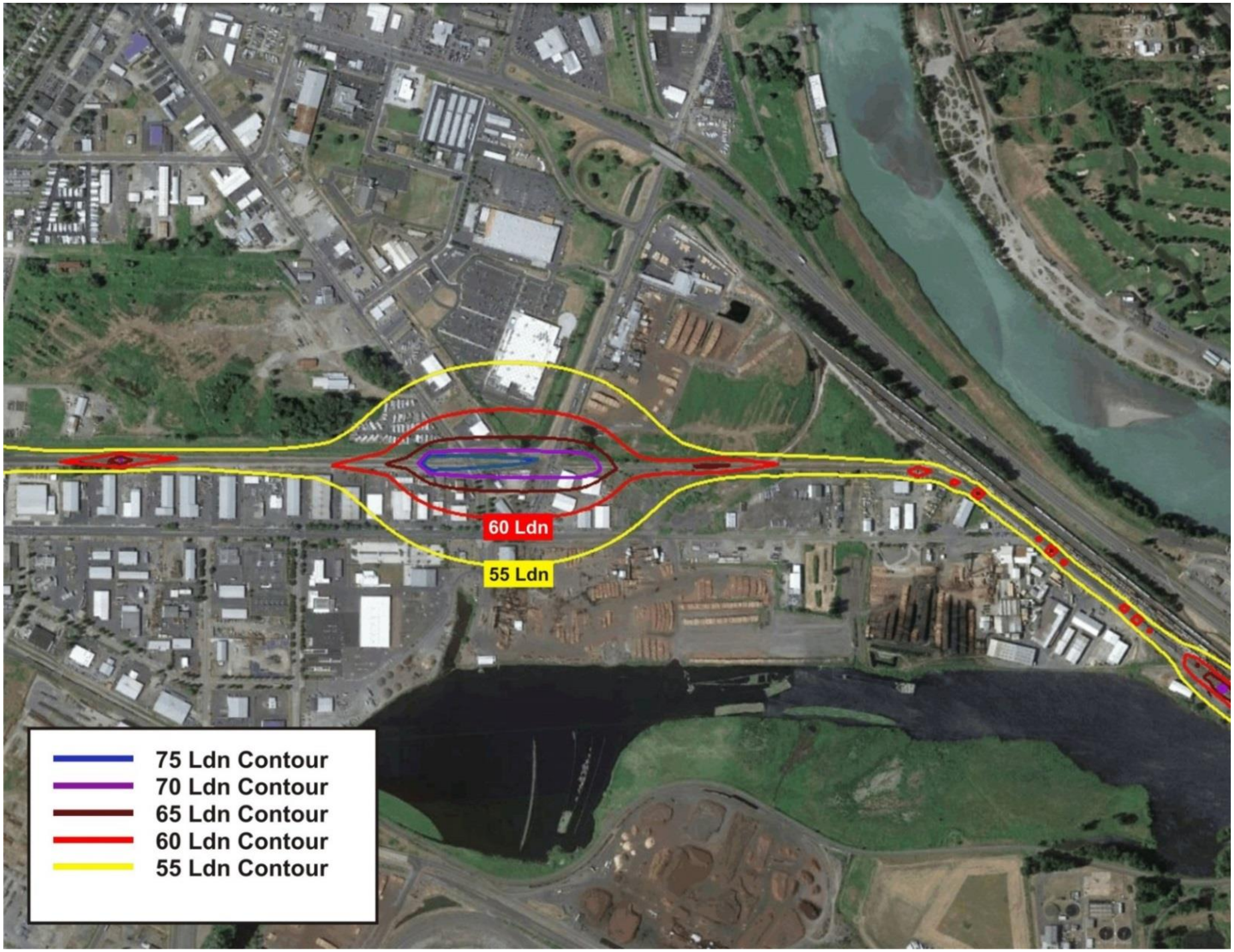
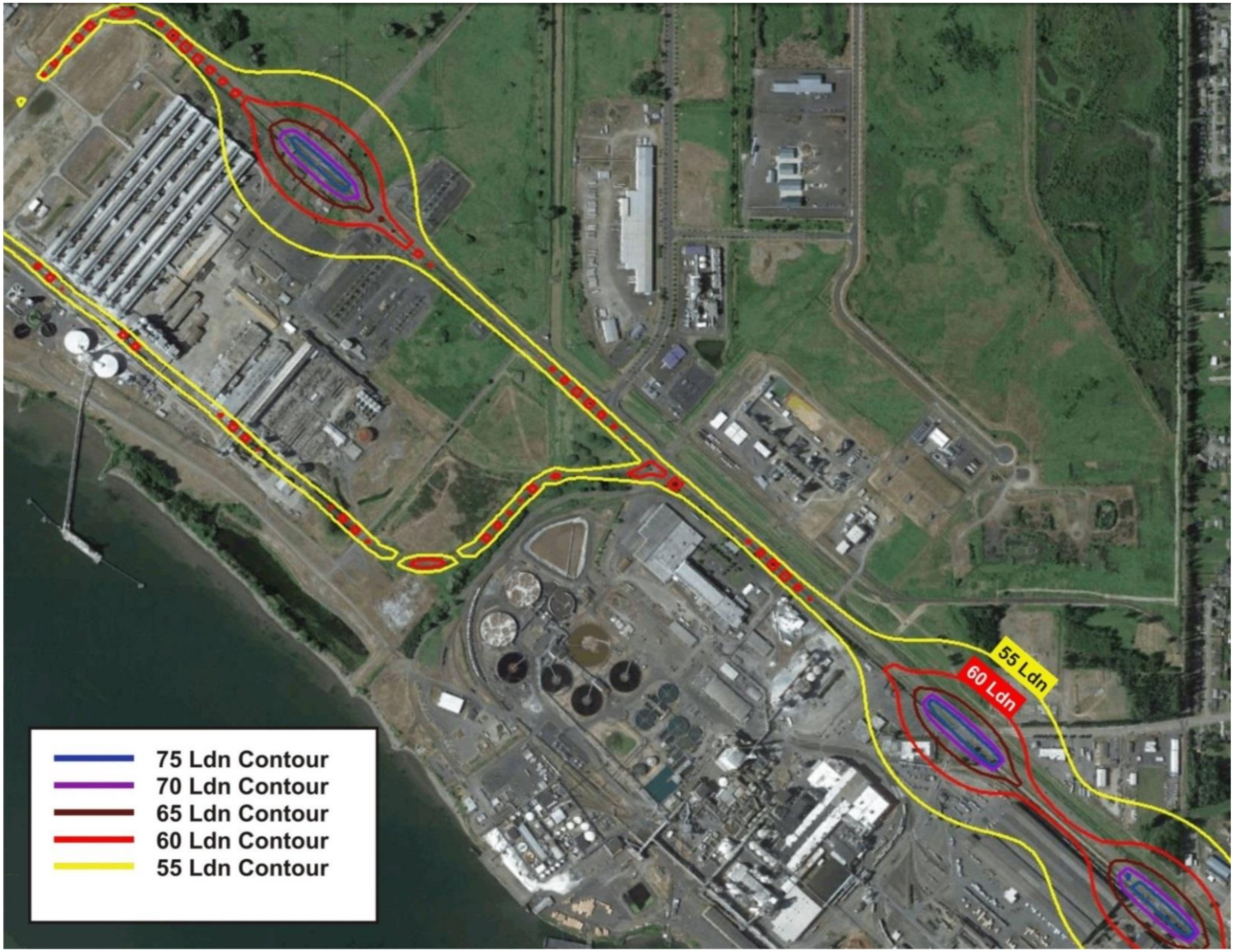


Figure 9. Existing Rail Noise Contours, Mid-Reynolds Lead, Including Train Horns

Figure 10. Existing Rail Noise Contours, End of Reynolds Lead, Including Train Horns



2.2.1 Proposed Action

A summary of primary noise sources at each long-term survey location is included in Table 16.

Table 16. Existing Environmental Noise Sources near the Project Area[a]

Location	Noise Sources
N1: 602 California Way	California Way and Industrial Way traffic Trains on Reynolds Lead Horizon Metals recycling center on California Way
N2: 111 15th Avenue	Industrial Way cars and trucks Trains on Reynolds Lead
N3: 221 Beech Street	Local traffic Industrial Way traffic Weyerhaeuser mill Trains on Reynolds Lead
N4: 875 34th Avenue	Local traffic and residential activity PNW Metal Recycling at Mint Farm
N5: 3600 Memorial Park	Local traffic PNW Metal Recycling at Mint Farm
N6: 420 Rutherglen Drive	Distant industrial at Mint Farm, Weyerhaeuser mill Port of Longview
N7: 4723 Mount Solo Road	Traffic on Mount Solo Road (mostly cars)
N8: 1719 Dorothy Avenue	Local traffic and residential activity PMW Metal Recycling at Mint Farm

Notes:
[a] As observed at long-term ambient noise survey locations.

A summary of daily noise descriptors (L_{dn}, community noise equivalent [CNEL], daytime L_{eq} and nighttime L_{eq}) for each day of measurements at all long-term locations is included in Table 17. The data in Table 17 indicate that the L_{dn} and CNEL values are generally within 1 decibel of each other, which is typical of environmental noise dominated by daytime human activity. The hourly L_{eq} for 6 or 7 days of measurement at locations N1 through N8 are plotted in Appendix A, *Existing Ambient Sound Pressure Level Survey Data*. The hourly statistical SPL for each 24-hour period of measurement and at all eight locations are also plotted in Appendix A.

Table 17. Daily Noise Measurements at Sources near the Project Area

Location	Date	L_{dn} (dBA)	CNEL (dBA)	Daytime L_{eq} (dBA)	Nighttime L_{eq} (dBA)
N1 602 California Way	Tue, Oct 28, 2014	75	75	72	68
	Wed, Oct 29, 2014	76	76	67	70
	Thu, Oct 30, 2014	78	78	68	71
	Fri, Oct 31, 2014	77	77	70	70
	Sat, Nov 1, 2014	72	72	64	66
	Sun, Nov 2, 2014	69	73	67	56
N2 111 15th Avenue	Tue, Nov 4, 2014	77	77	63	71
	Wed, Nov 5, 2014	72	72	60	66
	Thu, Nov 6, 2014	72	73	64	66
	Fri, Nov 7, 2014	67	67	60	61
	Sat, Nov 8, 2014	60	60	60	51
	Sun, Nov 9, 2014	63	63	64	53
	Mon, Nov 10, 2014	74	74	61	68
N3 221 Beech Street at Alder St.	Tue, Nov 4, 2014	72	72	68	65
	Wed, Nov 5, 2014	71	71	68	64
	Thu, Nov 6, 2014	71	71	68	64
	Fri, Nov 7, 2014	70	70	67	63
	Sat, Nov 8, 2014	67	67	64	59
	Sun, Nov 9, 2014	67	67	66	59
	Mon, Nov 10, 2014	70	71	67	63
N4 875 34th Avenue	Tue, Nov 4, 2014	67	67	56	61
	Wed, Nov 5, 2014	60	60	51	54
	Thu, Nov 6, 2014	63	63	58	57
	Fri, Nov 7, 2014	58	58	49	52
	Sat, Nov 8, 2014	60	60	60	51
	Sun, Nov 9, 2014	61	61	60	53
	Mon, Nov 10, 2014	58	58	49	52
N5 3600 Memorial Park Drive	Tue, Oct 28, 2014	71	71	66	64
	Wed, Oct 29, 2014	62	62	59	55
	Thu, Oct 30, 2014	66	66	61	59
	Fri, Oct 31, 2014	70	70	63	64
	Sat, Nov 1, 2014	59	60	57	52
	Sun, Nov 2, 2014	61	62	61	51
N6 420 Rutherglen Drive	Tue, Oct 28, 2014	65	65	55	59
	Wed, Oct 29, 2014	62	62	63	52
	Thu, Oct 30, 2014	62	62	56	55
	Fri, Oct 31, 2014	65	65	56	59
	Sat, Nov 1, 2014	52	52	49	44
	Sun, Nov 2, 2014	56	57	55	48

Location	Date	L_{dn} (dBA)	CNEL (dBA)	Daytime L_{eq} (dBA)	Nighttime L_{eq} (dBA)
N7 4723 Mount Solo Road	Tue, Oct 28, 2014	69	69	65	62
	Wed, Oct 29, 2014	68	68	65	60
	Thu, Oct 30, 2014	68	68	65	60
	Fri, Oct 31, 2014	69	69	65	62
	Sat, Nov 1, 2014	65	65	63	56
	Sun, Nov 2, 2014	63	64	62	55
N8 1719 Dorothy Avenue	Tue, Nov 4, 2014	64	64	56	57
	Wed, Nov 5, 2014	58	58	52	51
	Thu, Nov 6, 2014	63	64	64	53
	Fri, Nov 7, 2014	90[a]	90[a]	93[a]	49
	Sat, Nov 8, 2014	57	57	55	50
	Sun, Nov 9, 2014	88[a]	89[a]	60	81[a]
	Mon, Nov 10, 2014	86[a]	86[a]	53	81[a]

Notes:
[a] Includes anomalous high-level events, likely due to residential activity near microphone or heavy rainfall.
Ldn = day-night sound level; dBA = A-weighted decibels; CNEL = community noise equivalent; L_{eq} = equivalent sound level

A summary of the short-term ambient survey results (10-minute L_{eq}) is provided in Table 18. For the purpose of assessing potential noise impacts due to increased rail traffic associated with the Proposed Action along the Reynolds Lead, L_{dn} levels were estimated at each of the above short-term locations by comparing the 10-minute L_{eq} to the hourly L_{eq} detected at the nearest long-term measurement during the same time of day as the short-term measurement (the hourly L_{eq}s were averaged over the days included in the long-term measurements). The L_{dn} estimated at each short-term location is included in Table 18.

Table 18. Short-Term Noise Measurements at Sources near the Project Area

Location	Address (Longview, WA)	Date	Time	10-minute L_{eq} (dBA)	L_{dn}[a] (dBA)
N1s	605 California	10/27/14	4:28–4:38 p.m.	66	76
N2s-a	111 15th Avenue	11/3/14	3:06–3:16 p.m.	62	76
N2s-b	End of Sidewalk at 15th Ave at Pole	11/3/14	4:18–4:24 p.m.	59	73
N2s-c	125 feet north of N2s-b	11/3/14	4:27–4:34 p.m.	57	71
N2s-d	250 feet north of N2s-b	11/3/14	4:37–4:43 p.m.	56	70
N2s-e	375 feet north of N2s-b	11/3/14	4:46–4:53 p.m.	56	70
N3s-a	Beech Street & Alder Street	11/3/14	5:55–6:05 p.m.	65	71
N3s-b	100 feet north up Beech from N3s-a	11/3/14	7:15–7:24 p.m.	62	68
N3s-c	200 feet north up Beech from N3s-a	11/3/14	7:25–7:31 p.m.	57	63
N4s	875 34th Avenue	12/8/14	11:10–11:20 a.m.	51	63
N5s	3534 Memorial Park Drive	10/27/14	3:25–3:35 p.m.	55	66

Location	Address (Longview, WA)	Date	Time	10-minute L_{eq} (dBA)	L_{dn}[a] (dBA)
N6s	420 Rutherglen Drive	11/3/14	1:40–1:50 p.m.	50	62
N7s	4723 Mount Solo Road	10/27/14	5:11–5:21 p.m.	62	68
N8s	1719 Dorothy Avenue	12/8/14	10:37–10:47 a.m.	52	61
S1	3128 Louisiana Street	12/8/14	10:52–11:02 a.m.	51	71
S2	3011 Hemlock Street	12/8/14	11:35–11:45 a.m.	59	71
S3	2642 Field Street	12/8/14	11:54 a.m.–12:04 p.m.	56	68
S4	30th Ave median & Colorado Street	12/8/14	12:25–12:35 p.m.	61	73
S5	St Rose	12/8/14	3:32–3:42 p.m.	58	70
S6	540 23rd Avenue	12/8/14	12:58–1:08 p.m.	49	55
S7	645 15th Avenue	12/8/14	2:59–3:09 p.m.	63	77
S8	214 23rd Avenue	12/8/14	1:43–1:53 p.m.	61	67
S9	410 15th Avenue	12/8/14	1:19–1:29 p.m.	57	91
S10	Alder Street & Douglas Street	12/8/14	2:05–2:15 p.m.	63	69
S11	427 28th Avenue	12/8/14	12:40–12:50 p.m.	55	61
S12	Olive Way & Ocean Beach Hwy	12/8/14	2:32–2:42 p.m.	68	77

Notes:

[a] Estimated from the data collected at the nearest long-term survey location

L_{eq} = equivalent sound level; L_{dn} = day-night sound level; dBA = A-weighted decibel

Chapter 3
Impacts

This chapter describes the direct and indirect impacts related to noise and vibration that would result from construction and operation of the Proposed Action and the No-Action Alternative.

3.1 Proposed Action

Potential impacts that could occur in the study area as a result of construction and operation of the Proposed Action are described below.

3.1.1 Construction: Direct Impacts

Construction of the Proposed Action would result in the following direct impacts. These impacts would occur during the construction period in 2018.

Emit Noise during Construction

The maximum noise level the closest noise-sensitive receptor (the residence at 104 Bradford Place) during construction is predicted to be 83 dBA, which would occur during pile driving. While not a regulatory noise standard for construction noise, to provide context, this noise level would exceed FTA/FRA noise level criteria of 80 dBA for construction noise when pile activities occur within approximately 1,500 feet of this residence. Projected noise levels during construction are summarized in Appendix B, *Construction Noise Impact Analysis*, Table B-1.

Emit Pile-Driving Vibration during Construction

The maximum predicted vibration levels would occur during pile driving. The maximum predicted vibration velocity level at the closest vibration-sensitive receptor (the residence at 104 Bradford Place) would be 72 VdB during pile driving. While not a regulatory standard for vibration during construction, to provide context, this vibration level would not exceed FTA/FRA criteria for maximum allowable vibration due to construction at residences. Therefore, while construction of the Proposed Action would emit vibration from pile driving, the vibration would be not be substantive enough to have an adverse impact at the nearest residence.

3.1.2 Construction: Indirect Impacts

Construction of the Proposed Action would result in the following indirect impacts.

Emit Noise from Construction-Related Vehicle Traffic

A potential source of noise impacts related to construction would be automobile and truck traffic traveling to and from the project area, mainly on Industrial Way. As discussed in the SEPA Vehicle Transportation Technical Report (ICF and DKS Associates 2017), the average daily traffic (ADT) on Industrial Way approaches 10,000 trucks per day, of which approximately 7%

(or 700 trucks) are heavy trucks with three or more axles. In general, changes in a noise level of less than 3 dBA are not typically noticed by the human ear. A doubling of traffic volume (a 100% increase) would be required to increase the L_{dn} from road traffic by 3 dBA at the noise-sensitive receptors. Approximately 330 truck trips per day would be required for a 6-month period during the first year to support construction. The increase in truck traffic represents an increase of 3.3% in ADT for all vehicles on Industrial Way. The potential for noise impact would be less if truck traffic distributed off Industrial Way to other roadways in the study area. This increase in vehicular traffic would not result in a substantial change to the existing noise level. In addition, it would be temporary (during the peak year of construction) and would occur only during daytime hours. Therefore, no noise or vibration impact related to construction traffic would be anticipated.

Emit Noise from Construction-Related Rail Traffic

The Proposed Action would add approximately 1.3 train trips during the peak construction year if construction materials are delivered by rail. This level of rail activity would not cause noise levels to increase more than 3 L_{dn} (dBA). Proposed Action-related rail traffic would not result in noise impacts that would meet FTA/FRA criteria for a noise impact.

3.1.3 Operations: Direct Impacts

3.1.3.1 Noise

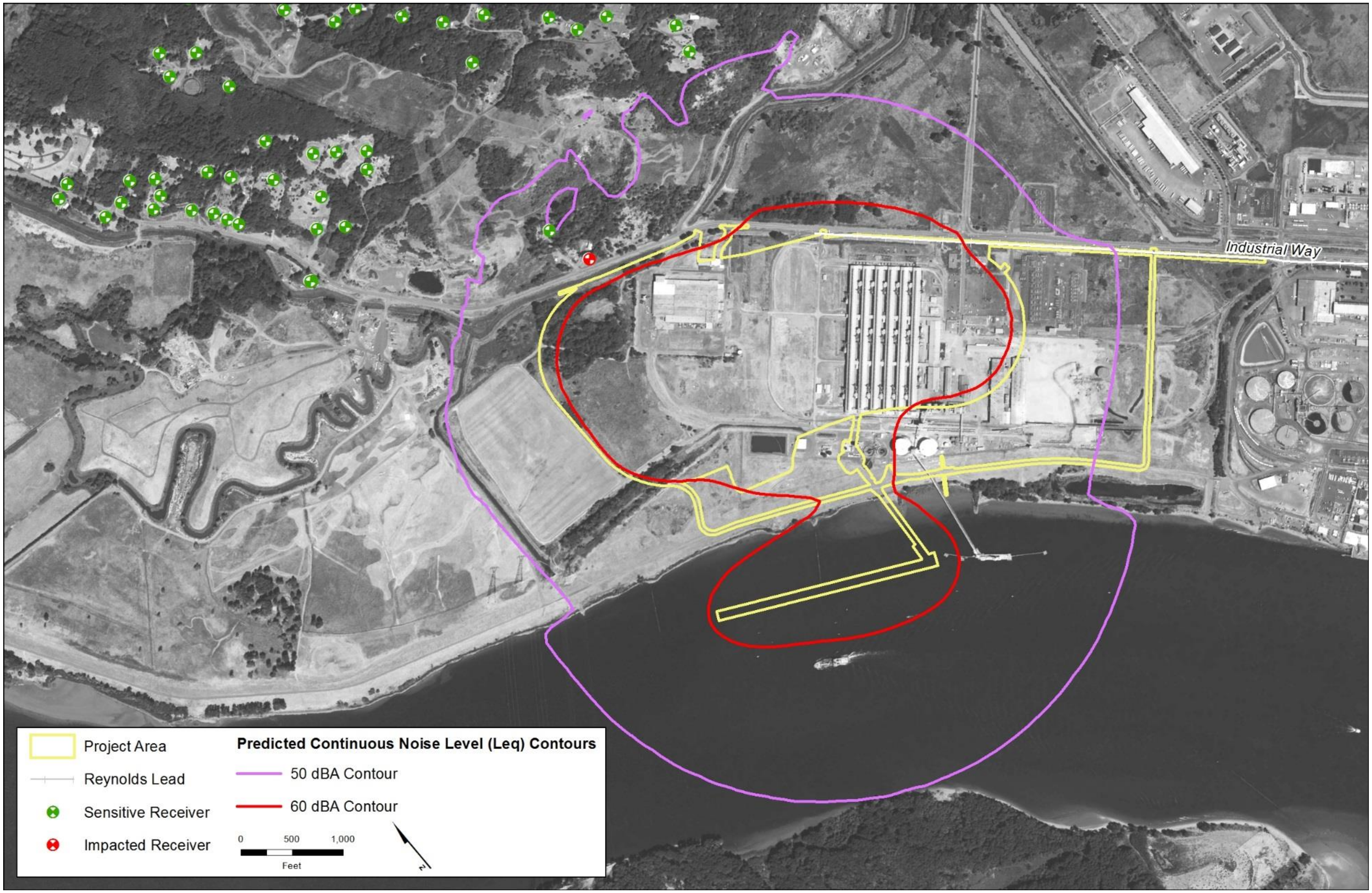
Operation of the Proposed Action would result in the following direct impacts. These impacts are estimated for full-scale operations in 2028.

Exceed Washington Administrative Code Maximum Environmental Noise Levels

Figure 11 indicates the predicted noise contours (L_{eq} of 50 dBA and 60 dBA) for operations at the project area. The analysis indicates noise from operation of the Proposed Action in 2028 would exceed the Washington State noise standard at a single residence (104 Bradford Place). As indicated in Figure 11, this residence is within the 50 dBA L_{eq} contour, which is the applicable Washington State limit for nighttime noise levels in a residential area when the noise is from an industrial source. The predicted L_{eq} at the residence is 55 dBA. This predicted noise level is likely comparable to the current nighttime noise level because the residence has a similar exposure to the Mount Solo Road traffic noise as the N7 noise monitor location. At N7, the nighttime noise levels ranged from 55 dBA on a Sunday night to 62 dBA on weeknights.

Another residence, just north of the Bradford Place residence, would be shielded by the topography of the land (Figure 11). The predicted L_{eq} at the second residence is 50 dBA and would not exceed the Washington State maximum environmental noise level at this location.

Figure 11. Predicted Continuous Noise Level (L_{eq}) Contours during Operations



3.1.3.2 Vibration

No significant sources of ground vibration would occur at the project area during operations and the closest vibration receptor (a residence) is too far away to be affected by vibration from trains on the rail loop. Therefore, no vibration impacts associated with operations at the project area would be anticipated.

3.1.4 Operations: Indirect Impacts

Figures 12 through 15 are plots of the equal L_{dn} noise levels in 2028 with the Proposed Action. All contours include the contribution of noise from train horns. Operation of the Proposed Action would result in the following indirect impacts. These impacts are estimated for full-scale operations in 2028.

Exceed FTA/FRA Guidelines for No Noise Impact

Operation of the Proposed Action would increase rail traffic-related noise along the Reynolds Lead and BNSF Spur. Train engineers are required by FRA rules to begin to sound locomotive horns at least 15 seconds and not more than 20 seconds in advance of public grade crossings.[3] In addition, LVSW operating rules require train engineers to sound locomotive horns at private grade crossings. These noise impacts would occur with or without the incorporation of proposed track improvements that would allow higher train speed through the grade crossings. In either case, train horns sounded near grade crossings would still be required and would be the dominant noise impact.

Noise from surface carriers engaged in interstate commerce by railroad is exempt from Washington state maximum permissible noise level regulations (WAC 173-60-040). As discussed above in Section 2.1.2.3, *Operations—Rail Traffic*, FTA and FRA have defined two levels of potential impact, *moderate impact* or *severe impact*. The level of impact is determined by the existing level of noise exposure and the change in noise exposure that would result from the Proposed Action. As the existing level of noise exposure increases, the additional noise exposure needed to cause a moderate or severe impact decreases. For this analysis, the existing level of noise exposure was determined by the ambient noise study results and the projected No-Action Alternative 2028 noise levels described in Section 2.1.2.4 *Operations—Rail Traffic*.

[3] The FRA horn noise regulations that require locomotive horn sounding at public at-grade crossings also include provisions for establishing quiet zones where horn sounding would not be required if adequate alternative safety measures are provided.

Figure 12. Noise Contours for Proposed Action 2028 Rail Traffic, BNSF Spur to Reynolds Lead, Including Train Horns

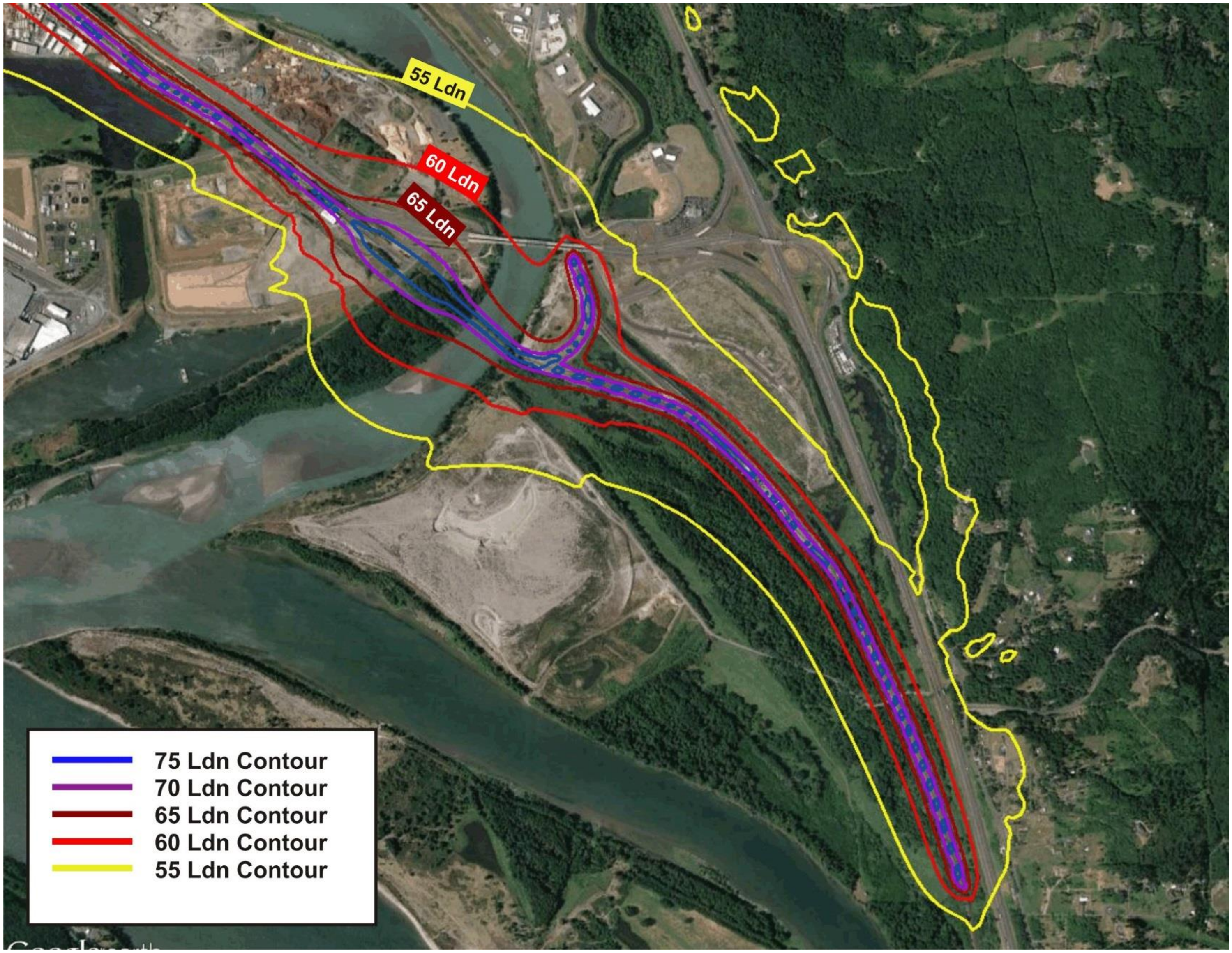


Figure 13. Noise Contours for Proposed Action 2028 Rail Traffic, Beginning of Reynolds Lead, Including Train Horns

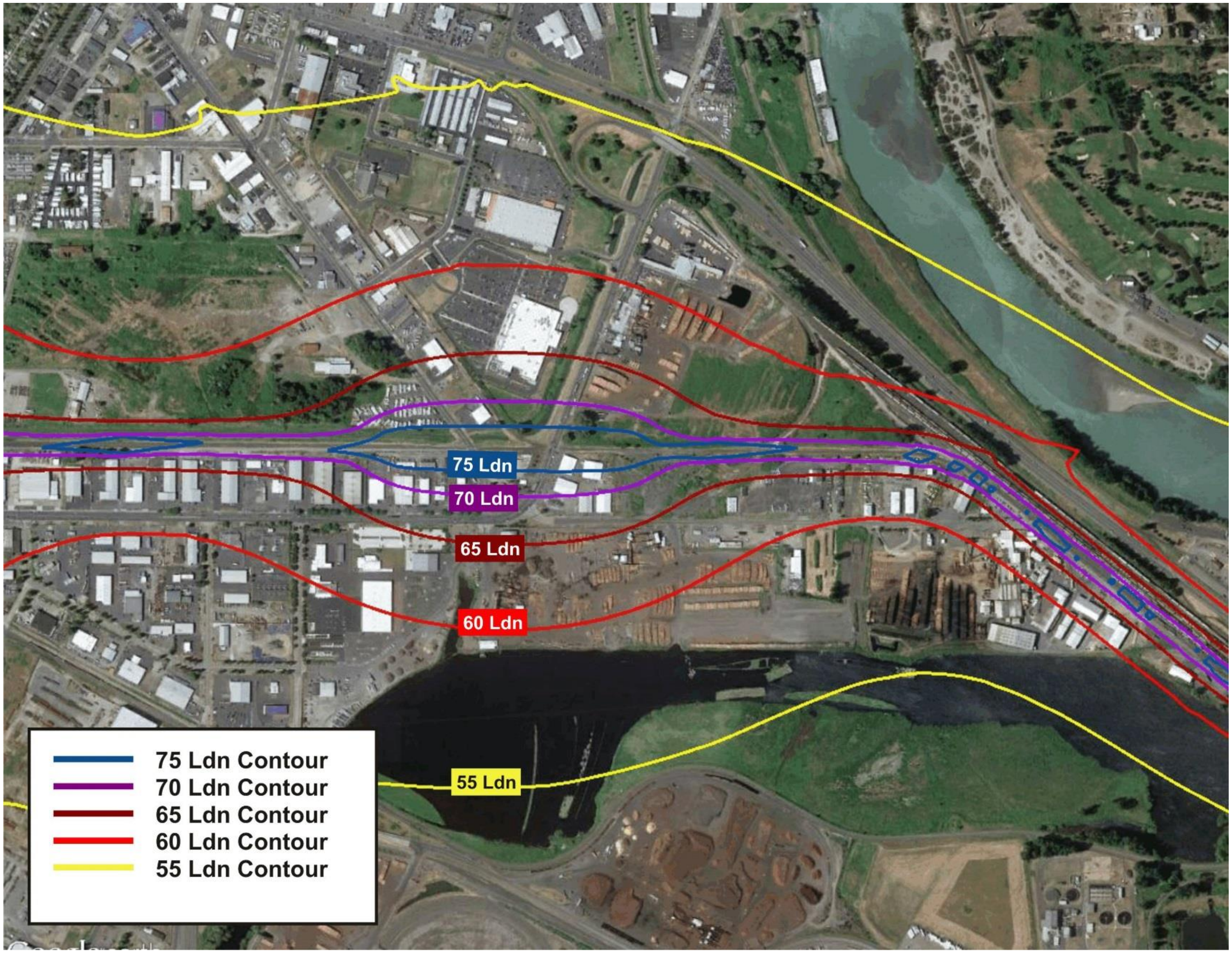


Figure 14. Noise Contours for Proposed Action 2028 Rail Traffic, Mid-Reynolds Lead, Including Train Horns

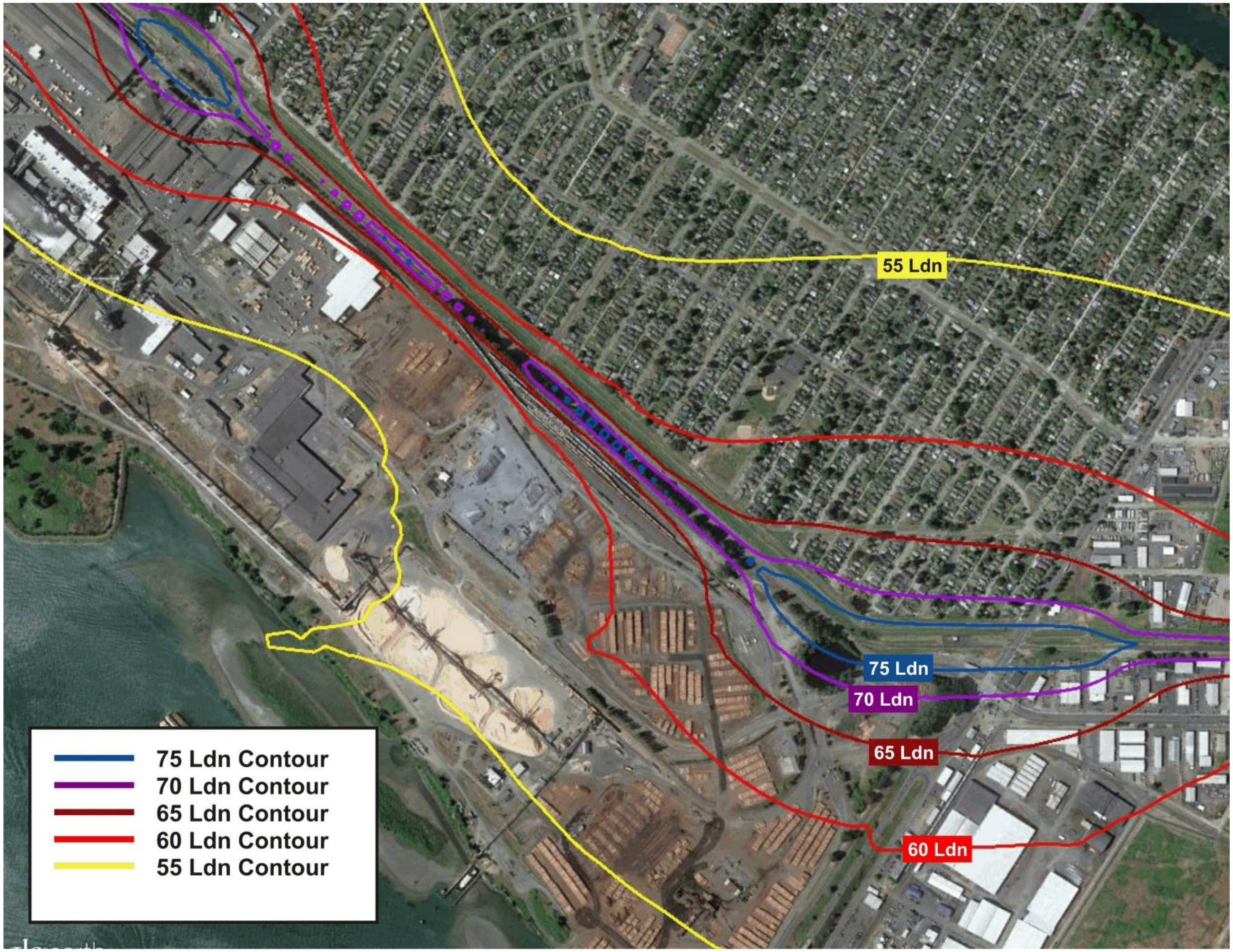


Figure 15. Noise Contours for Proposed Action 2028 Rail Traffic, End of Reynolds Lead, Including Train Horns

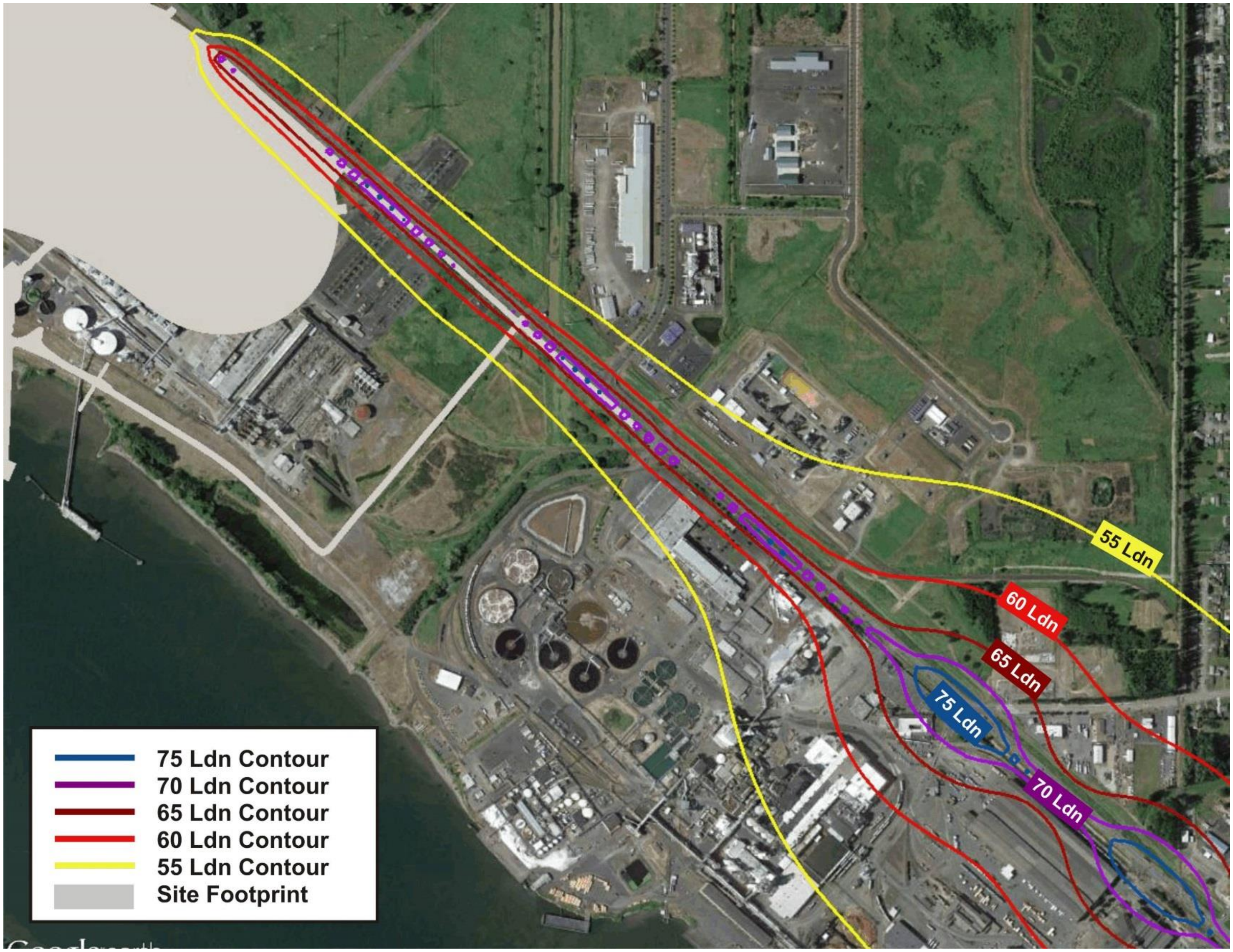


Table 19 lists the results of the noise impact assessment per the guidelines established by the FTA/FRA guidance at each ambient survey location for trains traveling to and from the project area. The table lists the following.

- L_{dn} existing noise exposure (based on the ambient noise study results presented in Chapter 2)
- L_{dn} predicted existing noise exposure
- L_{dn} levels representative of all other sources of noise not related to trains (decibel subtracted)
- L_{dn} predicted for the No-Action Alternative trains alone
- L_{dn} for total noise exposure (Proposed Action-related trains, plus No-Action Alternative trains, plus all other sources of noise not related to trains)
- Net increase in noise exposure
- The thresholds of moderate and severe impact

Impact determination at each survey location per the moderate and severe thresholds established according to FTA/FRA guidance. The net increase is determined relative to the estimated future ambient level (2028 No-Action Alternative trains plus all other sources of noise not related to trains).

Table 19. 2028 Noise Impact Assessment with Proposed Action-Related Rail Traffic

Location	Distance to Track (feet)	Measured Existing Level, L_{dn} (dBA)	Existing Trains, L_{dn} (dBA)	Ambient All Other Sources, L_{dn} (dBA)	No Action Trains, L_{dn} (dBA)	Project Trains, L_{dn} (dBA)	Total Noise, L_{dn} (dBA)	Increase (dBA)	MI Threshold	SI Threshold	Impact Type
N1, 602 California Way	171	76	64	76	65	74	78	2.1	0.3	2.1	**MI**
N1s, 605 California Way	146	76	66	76	66	75	79	2.5	0.3	2.1	**SI**
N2, 111 15th Avenue	212	73	65	72	65	73	76	2.9	0.6	2.4	**SI**
N2s-a, 111 15th Avenue	189	76	65	76	66	74	78	2.0	0.3	2.1	**MI**
N2s-b, 111 15th Avenue	212	73	65	72	65	73	76	2.9	0.6	2.4	**SI**
N2s-c, 139 15th Avenue	313	71	62	70	62	70	74	2.7	1.0	2.6	**SI**
N2s-d, 151 15th Avenue	416	70	60	70	60	69	72	2.3	1.0	2.8	**MI**
N2s-e, 163 15th Avenue	522	70	58	70	58	67	72	1.8	1.0	2.8	**MI**
N3, 221 Beech St at Alder	252	71	48	71	50	59	71	0.2	1.0	2.6	NI
N3s-a, 221-227 Beech St	256	71	49	71	50	59	71	0.3	1.0	2.6	NI
N3s-b, 221-227 Beech St	363	68	48	68	49	58	68	0.4	1.2	3.1	NI
N3s-c, 255 Beech Street	458	63	48	63	49	57	64	1.0	1.6	4.1	NI
N4, 875 34th Avenue	1838	63	46	63	46	54	64	0.5	1.6	4.1	NI
N4s, 875 34th Avenue	1838	63	46	63	46	54	64	0.5	1.6	4.1	NI
N5, 3600 Memorial Park Dr	4018	66	38	66	39	44	66	0.0	1.3	3.4	NI

Location	Distance to Track (feet)	Measured Existing Level, L_{dn} (dBA)	Existing Trains, L_{dn} (dBA)	Ambient All Other Sources, L_{dn} (dBA)	No Action Trains, L_{dn} (dBA)	Project Trains, L_{dn} (dBA)	Total Noise, L_{dn} (dBA)	Increase (dBA)	MI Threshold	SI Threshold	Impact Type
N5s, 3600 Memorial Park Dr	3936	66	38	66	39	44	66	0.0	1.3	3.4	NI
N6, 420 Rutherglen Dr	2933	62	45	62	46	49	62	0.2	1.7	4.4	NI
N6s, 420 Rutherglen Dr	2987	62	45	62	46	49	62	0.2	1.7	4.4	NI
N7, 4723 Mount Solo Road	4490	68	24	68	25	28	68	0.0	1.2	3.1	NI
N7s, 4723 Mount Solo Road	4491	68	24	68	25	28	68	0.0	1.2	3.1	NI
N8, 1719 Dorothy Avenue	4511	61	39	61	39	47	61	0.2	1.9	4.7	NI
N8s, 1715 Dorothy Avenue	4457	61	39	61	39	47	61	0.2	1.9	4.7	NI
S1, 3128 Louisiana Street	5443	71	38	71	38	46	71	0.0	1.0	2.6	NI
S2, 3007 Hemlock Street	4306	71	40	71	40	48	71	0.0	1.0	2.6	NI
S3, 2642 Field Street	4824	68	40	68	40	49	68	0.0	1.2	3.1	NI
S4, 30th Avenue	2595	73	43	73	43	52	73	0.0	0.6	2.4	NI
S5, St Rose de Viterbo	4426	70	40	70	41	49	70	0.0	1.0	2.8	NI
S6, 540 23rd Road	3207	55	43	55	43	52	57	1.8	3.1	7.1	NI
S7, 645 15th Avenue	3281	77	43	77	44	53	77	0.0	0.3	2.1	NI
S8, 23rd Ave/Industrial Way	252	67	50	67	51	61	68	0.9	1.2	3.2	NI
S9, 410 15th Avenue	1669	71	48	71	49	58	71	0.2	1.0	2.6	NI
S10, Alder Street	261	69	59	69	59	67	71	2.1	1.1	2.9	**MI**
S11, 427 28th Avenue	1970	61	44	61	44	53	62	0.6	1.9	4.7	NI
S12, 3297 Ocean Bch Hwy	5988	77	37	77	37	44	77	0.0	0.3	2.1	NI

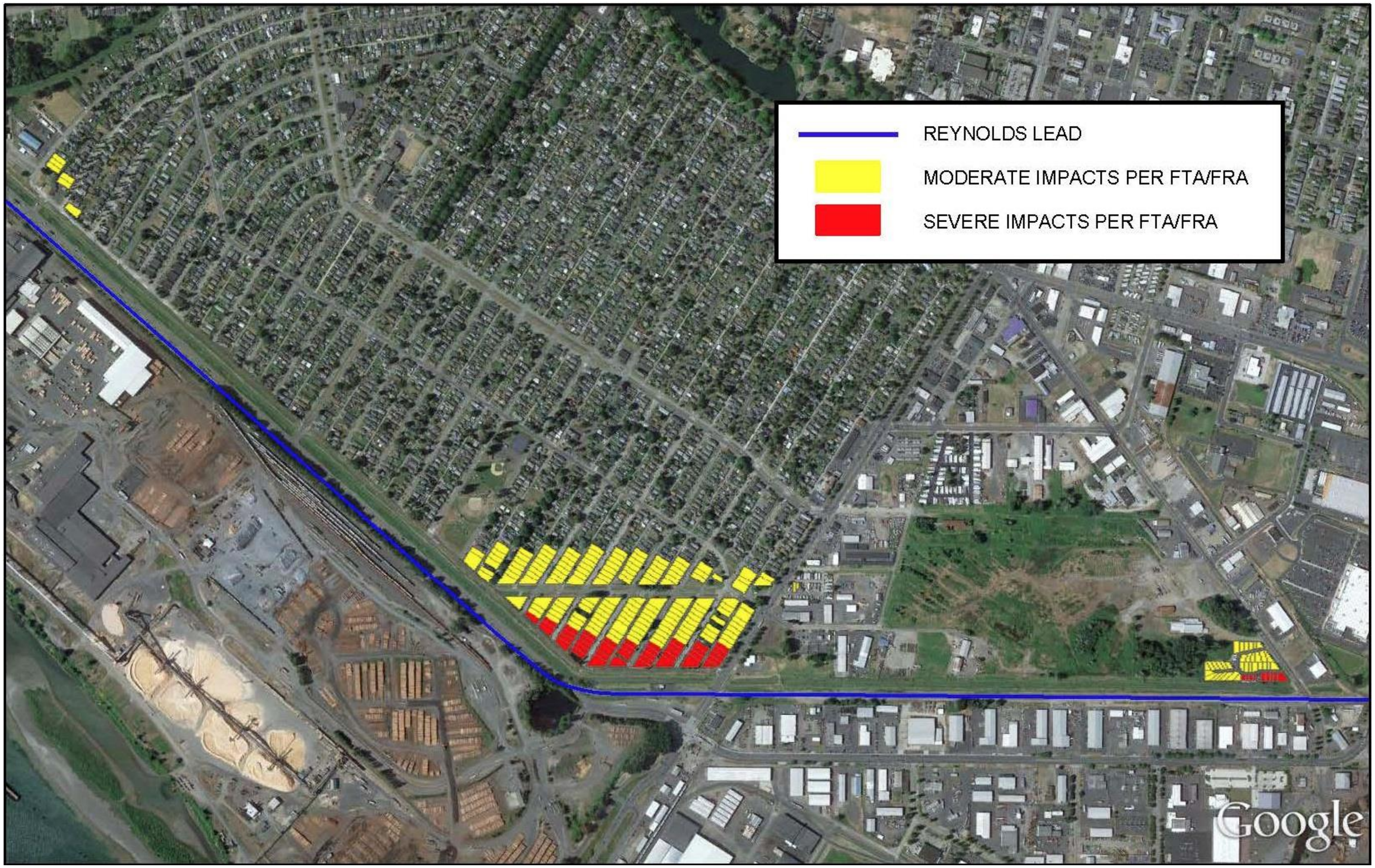
Notes:

[a] Impact determinations of moderate or severe are established per Federal Transit Administration (2006) and Federal Railroad Administration (2012) guidelines

L_{dn} = day-night equivalent; dBA = A-weighted decibel; NI = No Impact; MI = Moderate Impact; SI = Severe Impact

Figure 16 indicates the properties that would be expected to have moderate to severe noise impacts from Proposed Action-related rail traffic. The impacts would be the same with or without the track improvements because the train noise would be dominated by the locomotive horn sounding at the grade crossings. Increased noise from locomotive or car traffic alone (without horn sounding) would not result in noise impacts based on the FTA/FRA guidance. This applies for train speeds of 10 or 20 miles per hour.

Figure 16. Noise Impacts from Proposed Action-Related Rail Traffic



Note: If the Oregon Way/Industrial Way Intersection Project grade-separates the Oregon Way and Industrial Way crossings with the Reynolds Lead, all severe and moderate noise impacts near the Oregon Way and Industrial Way crossings would not occur.

Table 20 summarizes the number of affected noise-sensitive receptors predicted near each grade crossing. Some of the properties that may be affected are multifamily residences. The number of single residential units that could be affected at each multifamily residence was estimated using online satellite and street photography.

Table 20. Estimated Number of Noise-Sensitive Receptors with Noise Impacts from Proposed Action-Related Train Traffic

	Estimated Number of Receptors Impacted	
Reynolds Lead Crossing(s)	**Moderate Impact** [a]	**Severe Impact** [a]
3rd Avenue & California Way	34 single-family residences	10 single-family residences
Oregon Way & Industrial Way [b]	135 single-family residences 18 multi-family residences [c]	34 single-family residences 5 multi-family residences[e]
Private driveway at Weyerhaeuser (near Douglas Street & Washington Way)	4 single-family residences 2 multi-family residences [d]	0
Total Properties	**193**	**49**

Notes:

[a] Per FTA/FRA guidance as described in Section 2.1, *Methods*.

[b] If the Industrial Way/Oregon Way Intersection Project grade-separates the Oregon Way and Industrial Way crossings of the Reynolds Lead by 2028, the moderate and severe noise impacts at the Oregon Way and Industrial Way crossings would not occur because Proposed Action-related trains would not be required to sound horns for public safety at these crossings.

[c] Estimated 52 individual residences affected

[d] Estimated 4 individual residences affected

[e] Estimated 16 individual residences affected

The Industrial Way/Oregon Way Intersection Project led by Cowlitz County Public Works, currently in the preliminary design and NEPA and SEPA environmental compliance phase, is addressing traffic congestion, freight mobility, and safety issues at the Industrial Way/Oregon Way intersection. In January 2017, one of two design options advanced to analysis in the environmental impact statement would grade-separate the Reynolds Lead crossing with Oregon Way and Industrial Way, meaning trains would not be required to sound horns for public safety at the Oregon Way and Industrial Way crossings of the Reynolds Lead. As a result, all projected impacts from Proposed Action–related rail traffic noise near the crossings at Oregon Way and Industrial Way would be eliminated (i.e., those impacts indicated in the center of Figure 16), leaving only the potential impacts projected near the grade crossings at 3rd Avenue and California Way and the driveway near Douglas Street and Washington Way. Therefore, an estimated 40 receptors representing approximately 42 residences would be exposed to a moderate noise impact, and an estimated 10 receptors representing approximately 10 residences would be exposed to a severe noise impact with Proposed Action-related trains traveling on the Reynolds Lead.

Emit Noise and Vibration from Operations-Related Road Traffic

A potential source of noise impacts related to operations would be automobile and truck traffic traveling to and from the project area, mainly on Industrial Way. As discussed in the SEPA Vehicle Transportation Technical Report (ICF and DKS Associates 2017), the annual ADT on Industrial Way is projected be approximately 11,450 without the Proposed Action, and 12,100 with the Proposed Action, representing 5.7% increase in ADT for all vehicles. In general, changes in a noise level of less than 3 dBA are not typically noticed by the human ear. A doubling of traffic volume (i.e., a 100% increase) would be required to increase the L_{dn} from road traffic by 3 dBA at the noise sensitive receptors. The increase in vehicle traffic represents an increase of 5.6% in ADT for all vehicles on Industrial Way. This increase in vehicular traffic would not result in a material significant change in noise levels. Therefore, no noise or vibration impact related to operations traffic would be anticipated.

Emit Noise from Vessel Operations

For ships moored at the project area docks, the noise associated with stationary vessels is estimated to be 29 dBA at the closest noise-sensitive receptors on Mount Solo Road, approximately 3,800 feet away. This accounts only for sound attenuation with distance from the source. The estimated Proposed Action-related ship noise would be comparable to or less than ambient noise levels at this noise-sensitive receptor. Therefore, noise from river vessels associated with the Proposed Action would not cause a noise impact at noise-sensitive receptors.

For vessels under way, ship traffic is expected to be 70 ships per month during full operation in 2028. This corresponds to daily traffic of 4.66 ships per day. The noise-sensitive receptors on Barlow Point Road are all more than 400 feet from the edge of the Columbia River. Online satellite imagery indicates that a typical minimum distance between these receptors and vessels navigating the Columbia River would be about 1,600 feet. The corresponding L_{dn}, corrected to the 1,600-foot distance, would be 32 $L_{dn.}$ Other receptors are at substantially greater distances. The estimated noise exposure from Proposed Action-related ship traffic would be comparable or less than ambient noise levels at the noise sensitive receivers and would, therefore, not result in any noise impacts at the receivers. Table 21 summarizes the potential L_{dn} from Proposed Action 2028 vessel traffic at various perpendicular distances from the Columbia River navigational channel. The estimated noise exposure from Proposed Action-related ship traffic would be comparable to or less than ambient noise levels at noise sensitive receivers and is unlikely to cause noise impacts along the Columbia River.

Table 21. Potential Noise Exposure Levels from Vessel Traffic at Various Perpendicular Distances from the Columbia River Navigational Channel

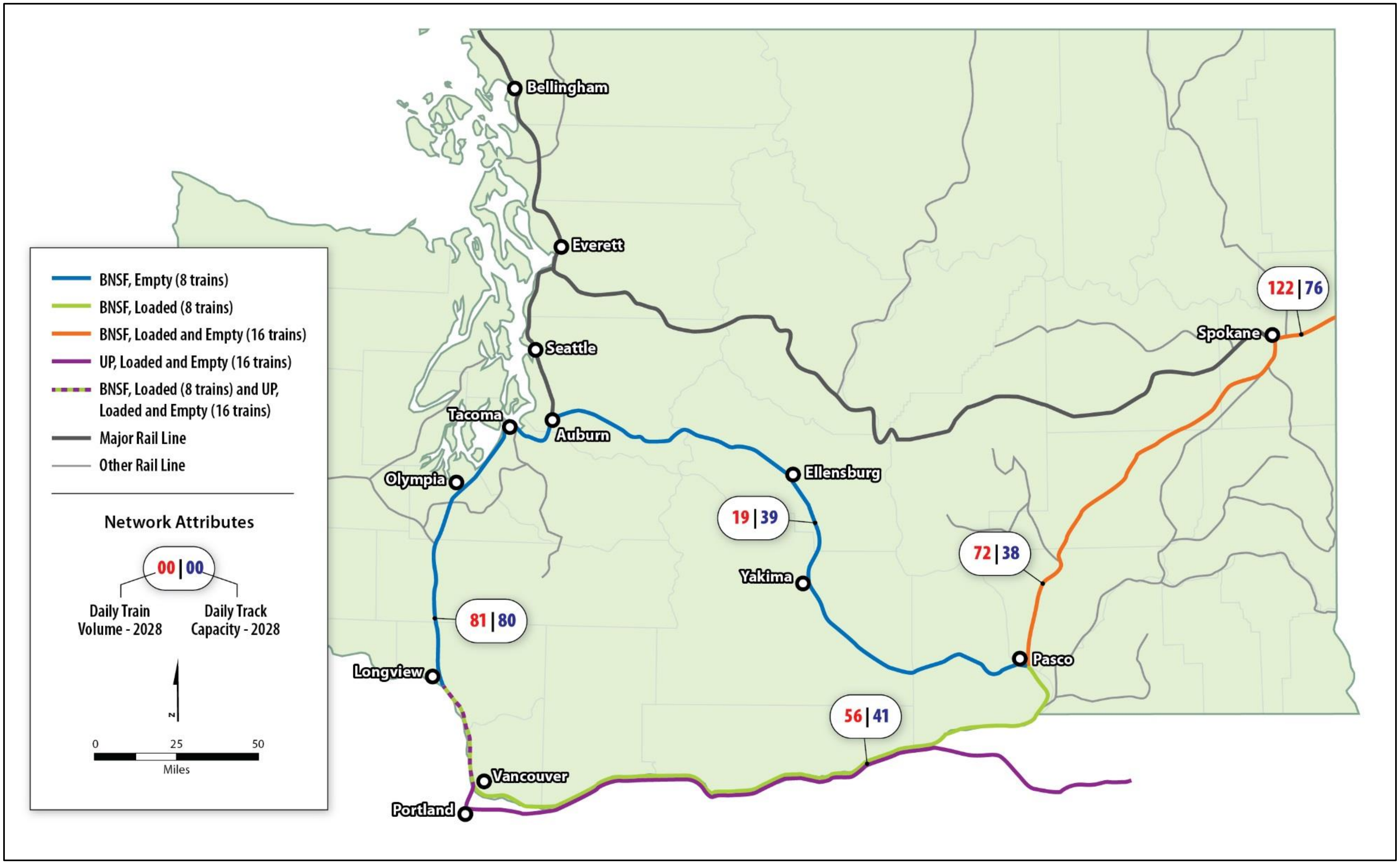
Distance (feet)	L_{dn}
400	44
600	40
800	38
1000	36
1200	34
1400	33
1600	32

With respect to foghorn noise, a foghorn was recorded from Barlow Road. It sounded for approximately 4 seconds every 2 minutes and achieved a maximum noise level of 60 dBA at its point of closest approach to the measurement location (approximately 1,800 feet). These noise levels represent the highest foghorn sound levels to which noise-sensitive receptors on Barlow Point Road are exposed. The levee that runs between the Columbia River and Barlow Point Road interrupts the line of sight between the receptors and vessels under way in the river, and therefore, serves to some extent as a sound barrier. The exception is the noise-sensitive receptor at 274 Barlow Point Road, which sits on top of the dike and has a clear view of the river. The next-closest receptors along Mount Solo Road are at a distance of 4,000 feet or more from the middle of the river. Noise from foghorns is infrequent and is not expected to cause any noise impacts at the noise-sensitive receivers.

Emit Noise from Rail Traffic on Main Line Routes in Washington State

At full operation, the coal export terminal would add 8 loaded and 8 empty trains per day (16 total trains per day) to the rail network in Washington State beyond Longview Junction. As described in the SEPA Rail Transportation Technical Report (ICF and Hellerworx 2017), the rail routes to the Longview area would are assumed the same as current BNSF and UP routes. Loaded trains would be expected to travel through Spokane and Pasco along BNSF's Fallbridge Subdivision to Vancouver, Washington. From there, loaded trains would likely move north on BNSF's Seattle Division main line north to Longview Junction. Empty trains would likely move from Longview Junction north on BNSF's Seattle Division main line to Auburn, Washington. From Auburn, trains would likely move east over BNSF's Stampede and Yakima Valley Subdivisions to Pasco, Washington. From Pasco, empty trains would move over the same route as the loaded trains. Figure 17 illustrates the route of loaded and empty coal trains with estimated 2028 daily track volume, including Proposed Action-related trains, and 2028 daily track capacity.

Figure 17. Washington Rail Network Daily Track Utilization, 2028 with Proposed Action-Related Train Traffic



Trains associated with the Proposed Action would travel at similar speeds as existing trains, and locomotives would sound horns consistent with existing practices. Therefore, the wayside and horn noise levels associated with any individual train trips would not change substantially compared to existing conditions. However, because the Proposed Action would result in more rail traffic, average noise levels would increase. Generally, in areas where existing noise levels are low (particularly at night), there is a greater likelihood that increased train traffic at night would result in more noticeable noise, particularly near grade crossings where trains are required to sound horns.

Table 22 provides a summary of existing train volumes, 2028 baseline train volumes, and 2028 train volumes with the Proposed Action. The table also provides a summary of the potential increase in train-related L_{dn} levels from the addition of Proposed Action-related trains relative to baseline conditions.

In general, changes in a noise level of less than 3 dBA are not typically noticed by the human ear. As indicated in Table 22, the potential increase from Proposed Action-related trains is less than 3 dBA on all routes to and from the project area. In most cases, the potential increase is less than 1 dBA, which is within the level of precision for acoustical measurements. Therefore, noise impacts from Proposed Action-related trains on the routes to and from Longview would not be expected.

Table 22. 2028 Rail Traffic Volumes on BNSF and UP Routes to and from Longview, WA and Potential Increase in Noise Exposure from Proposed Action-Related Trains

	Trains per Day			
Route	**Existing**	**Projected Baseline 2028**	**Projected Baseline 2028 with Proposed Action[a]**	**L_{dn} Increase**
Idaho/Washington State Line-Spokane	70	106	122	0.6
Spokane-Pasco	39	56	72	1.1
Pasco-Vancouver	34	48	56	0.7
Vancouver-Longview Junction	50	73	81	0.5
Longview Junction-Auburn	50	73	81	0.5
Auburn-Pasco	7	11	19	2.4

Notes:

[a] Includes No Action volume plus Operations 2028 volume.

There is the potential that all Proposed Action-related trains could travel through the Columbia River Gorge (16 trains per day). The analysis indicated that the increase in noise that would occur between Pasco and Longview Junction would range between 0.9 and 1.2 L_{dn}. Therefore, no adverse noise impacts from Proposed Action-related trains would be expected if all trains traveled via the Columbia River Gorge and Vancouver.

3.2 No-Action Alternative

Under the No Action Alternative, the Applicant would not construct the coal export terminal and noise and vibration impacts related to construction and operation of the coal export terminal would not occur. The Applicant would continue with current and future increased operations in the project area. The project area could be developed for other industrial uses including an expanded bulk product terminal or other industrial uses. The Applicant has indicated that, over the long term, it would expand the existing bulk product terminal and develop new facilities to handle more products such as calcine petroleum coke, coal tar pitch, and cement. The No-Action Alternative would require approximately 2 train trips per day on the BNSF Spur and Reynolds Lead.

The potential for changes in noise levels for 2 trains trips per day on the BNSF Spur and Reynolds Lead were analyzed for 2028. This assessment concluded that the net increases relative to the existing noise exposure from 2 train trips per day on the BNSF Spur and Reynolds Lead would not result in adverse noise impacts. No-Action Alternative construction-related and operation-related vehicle traffic volumes would be expected to be less than rail traffic under the Proposed Action, which would not result in an adverse noise impact. Therefore, No-Action Alternative-related construction and operations traffic would not result in an adverse noise impact. The No-Action Alternative would not cause vibration impacts because the closest receptors are too far away to experience significant vibration generated by the trains on the Reynolds Lead and BNSF Spur.

Figures 18 through 21 are plots of the equal L_{dn} noise levels from rail traffic related to the No-Action Alternative in 2028.

Figure 18. Noise Contours for No-Action Alternative 2028 Rail Traffic, BNSF Spur to Reynolds Lead, Including Train Horns

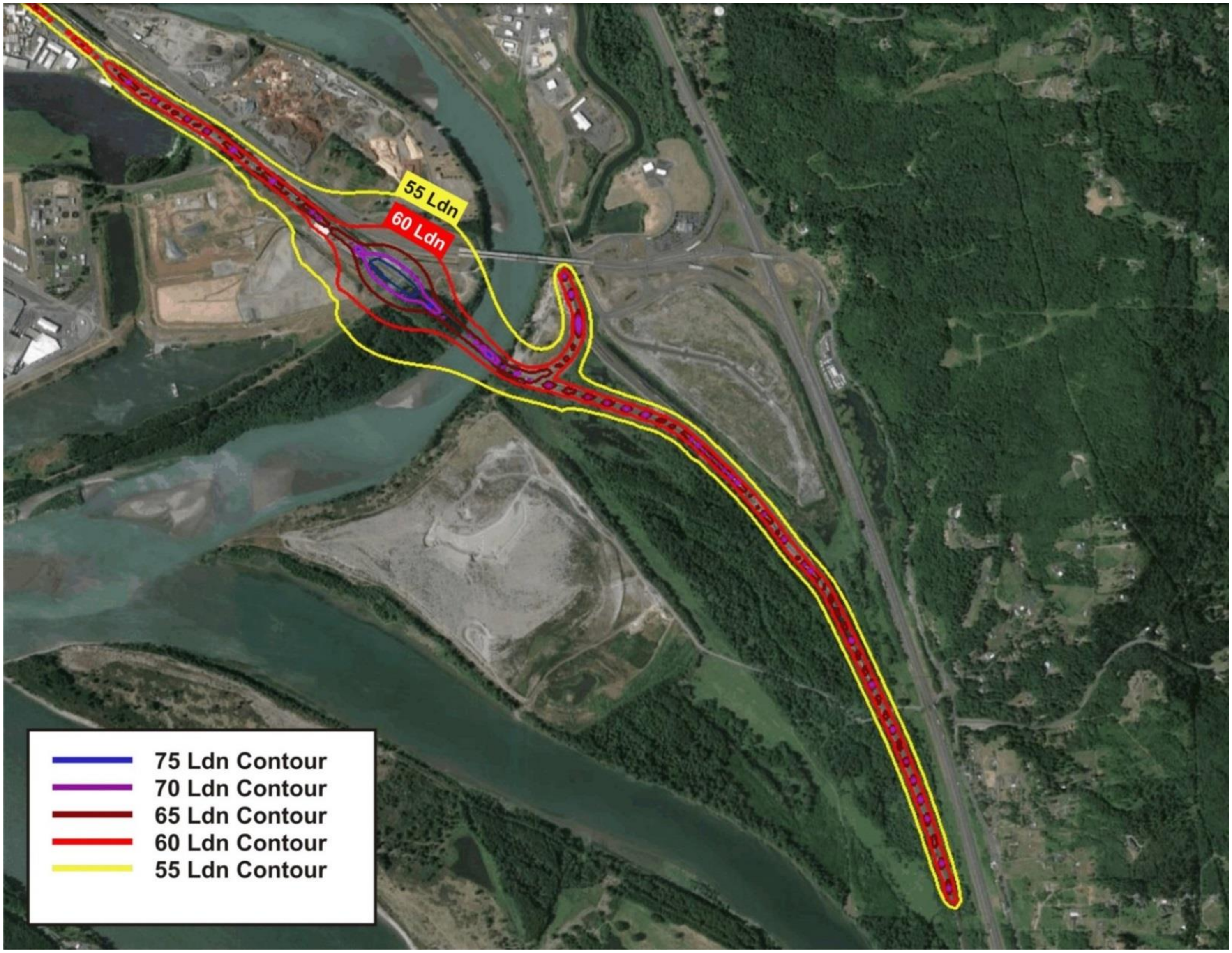


Figure 19. Noise Contours for No-Action Alternative 2028 Rail Traffic, Beginning of Reynolds Lead, Including Train Horns

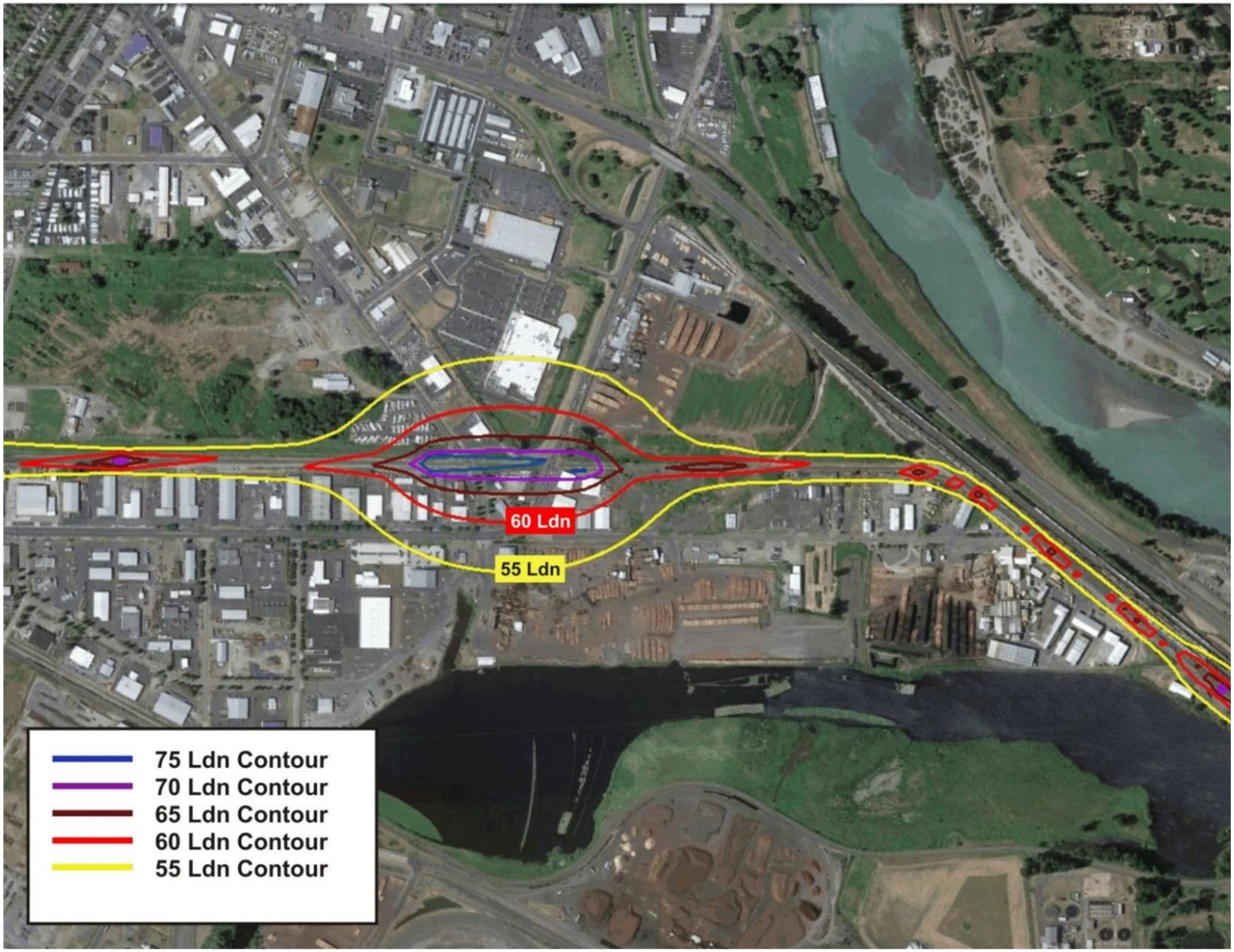


Figure 20. Noise Contours for No-Action Alternative 2028 Rail Traffic, Mid-Reynolds Lead, Including Train Horns

Figure 21. Noise Contours for No-Action Alternative 2028 Rail Traffic, End of Reynolds Lead, Including Train Horns

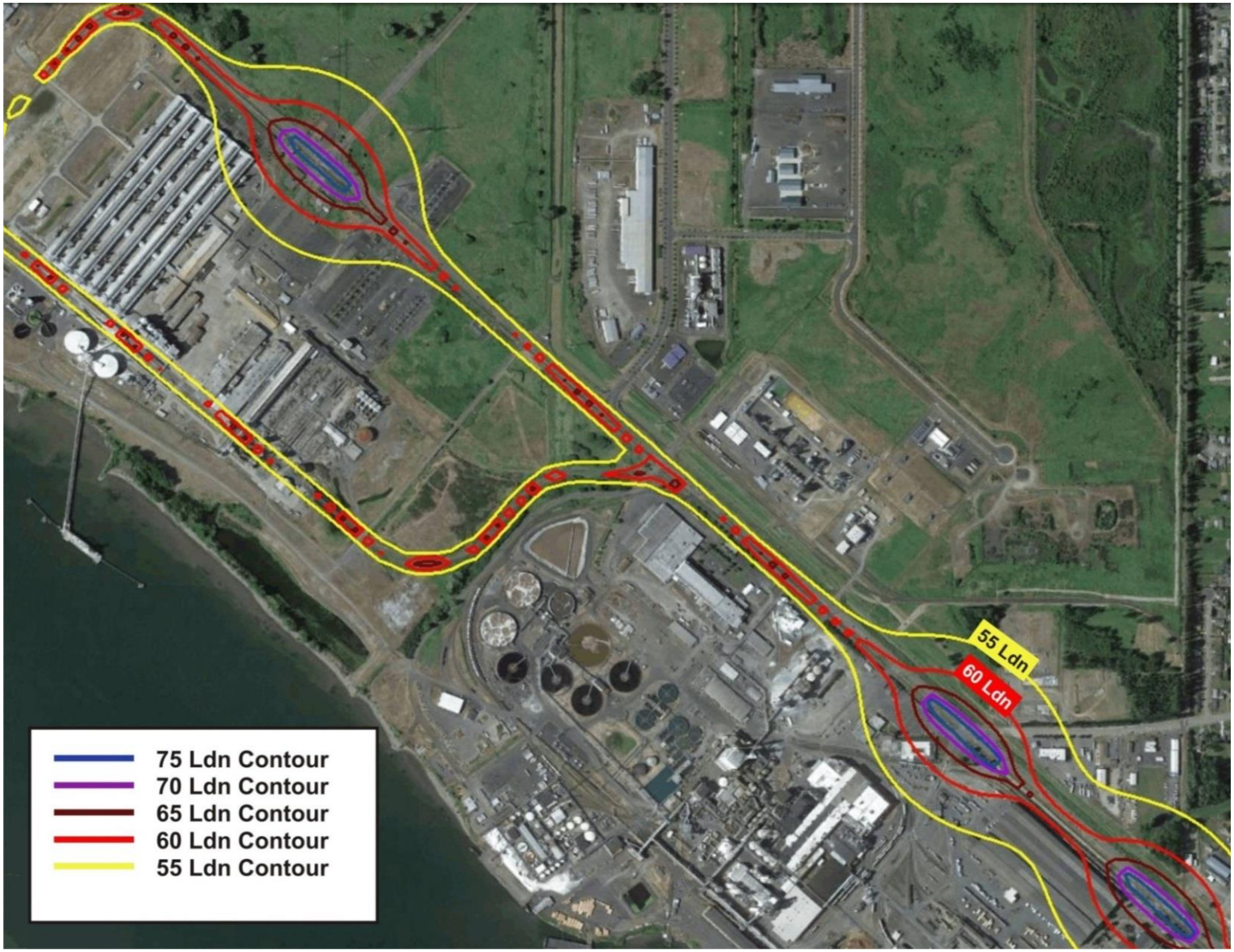


Table 23 lists the results of the noise impact assessment per the guidelines established by the FTA/FRA guidance at each ambient survey location. The table illustrates the net increase relative to the existing noise exposure based on the ambient noise study results.

Table 23. Noise Impact Assessment for No-Action Alternative, 2028 Rail Traffic

Location	Distance to Track (feet)	Measured Existing Level, L_{dn} (dBA)	Existing Trains, L_{dn} (dBA)	Ambient All Other Sources, L_{dn} (dBA)	No Action Trains, L_{dn} (dBA)	Project Trains, L_{dn} (dBA)	Total Noise, L_{dn} (dBA)	Increase (dBA)	MI Threshold[a]	SI Threshold[a]	Impact Type
N1, 602 California Way	171	76	64	76	65	n/a	76	0.0	0.3	2.1	NI
N1s, 605 California Way	146	76	66	76	66	n/a	76	0.0	0.3	2.1	NI
N2, 111 15th Avenue	212	73	65	72	65	n/a	73	0.1	0.6	2.4	NI
N2s-a, 111 15th Avenue	189	76	65	76	66	n/a	76	0.0	0.3	2.1	NI
N2s-b, 111 15th Avenue	212	73	65	72	65	n/a	73	0.1	0.6	2.4	NI
N2s-c, 139 15th Avenue	313	71	62	70	62	n/a	71	0.1	1.0	2.6	NI
N2s-d, 151 15th Avenue	416	70	60	70	60	n/a	70	0.0	1.0	2.8	NI
N2s-e, 163 15th Avenue	522	70	58	70	58	n/a	70	0.0	1.0	2.8	NI
N3, 221 Beech St at Alder	252	71	48	71	50	n/a	71	0.0	1.0	2.6	NI
N3s-a, 221-227 Beech St	256	71	49	71	50	n/a	71	0.0	1.0	2.6	NI
N3s-b, 221-227 Beech St	363	68	48	68	49	n/a	68	0.0	1.2	3.1	NI
N3s-c, 255 Beech Street	458	63	48	63	49	n/a	63	0.0	1.6	4.1	NI
N4, 875 34th Avenue	1838	63	46	63	46	n/a	63	0.0	1.6	4.1	NI
N4s, 875 34th Avenue	1838	63	46	63	46	n/a	63	0.0	1.6	4.1	NI
N5, 3600 Memorial Park Dr	4018	66	38	66	39	n/a	66	0.0	1.3	3.4	NI
N5s, 3600 Memorial Park Dr	3936	66	38	66	39	n/a	66	0.0	1.3	3.4	NI
N6, 420 Rutherglen Dr	2933	62	45	62	46	n/a	62	0.0	1.7	4.4	NI
N6s, 420 Rutherglen Dr	2987	62	45	62	46	n/a	62	0.0	1.7	4.4	NI
N7, 4723 Mount Solo Road	4490	68	24	68	25	n/a	68	0.0	1.2	3.1	NI
N7s, 4723 Mount Solo Road	4491	68	24	68	25	n/a	68	0.0	1.2	3.1	NI
N8, 1719 Dorothy Avenue	4511	61	39	61	39	n/a	61	0.0	1.9	4.7	NI
N8s, 1715 Dorothy Avenue	4457	61	39	61	39	n/a	61	0.0	1.9	4.7	NI
S1, 3128 Louisiana Street	5443	71	38	71	38	n/a	71	0.0	1.0	2.6	NI
S2, 3007 Hemlock Street	4306	71	40	71	40	n/a	71	0.0	1.0	2.6	NI
S3, 2642 Field Street	4824	68	40	68	40	n/a	68	0.0	1.2	3.1	NI

Location	Distance to Track (feet)	Measured Existing Level, L_{dn} (dBA)	Existing Trains, L_{dn} (dBA)	Ambient All Other Sources, L_{dn} (dBA)	No Action Trains, L_{dn} (dBA)	Project Trains, L_{dn} (dBA)	Total Noise, L_{dn} (dBA)	Increase (dBA)	MI Threshold[a]	SI Threshold[a]	Impact Type
S4, 30th Avenue	2595	73	43	73	43	n/a	73	0.0	0.6	2.4	NI
S5, St Rose de Viterbo	4426	70	40	70	41	n/a	70	0.0	1.0	2.8	NI
S6, 540 23rd Road	3207	55	43	55	43	n/a	55	0.0	3.2	7.1	NI
S7, 645 15th Avenue	3281	77	43	77	44	n/a	77	0.0	0.3	2.0	NI
S8, 23rd Ave/Industrial Way	252	67	50	67	51	n/a	67	0.0	1.2	3.2	NI
S9, 410 15th Avenue	1669	71	48	71	49	n/a	71	0.0	1.0	2.6	NI
S10, Alder Street	261	69	59	69	59	n/a	69	0.0	1.1	2.9	NI
S11, 427 28th Avenue	1970	61	44	61	44	n/a	61	0.0	1.9	4.7	NI
S12, 3297 Ocean Bch Hwy	5988	77	37	77	37	n/a	77	0.0	0.3	2.0	NI

Notes:

[a] Impact determinations of moderate or severe are established per Federal Transit Administration (2006) and Federal Railroad Administration (2012) guidelines

L_{dn} = day-night equivalent; dBA = A-weighted decibel; NI = No Impact; MI = Moderate Impact; SI = Severe Impact

Chapter 4
Required Permits

No permits specific to noise or vibration would be required for construction and operation of the Proposed Action.

Chapter 5
References

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Appendix A

Existing Ambient Sound Pressure Level Survey Data

Appendix A
Existing Ambient Sound Pressure Level Survey Data

Figures A-1 through Figure A-8 provide plots of the hourly equivalent sound level (L_{eq}) for each full day of measurements at eight long-term ambient survey locations (N1 through N8). Figures A-9 through Figure A-60 provide plots of the hourly Statistical sound pressure levels (SPL) for each 24-hour period of measurement at all eight locations (N1 through N8).

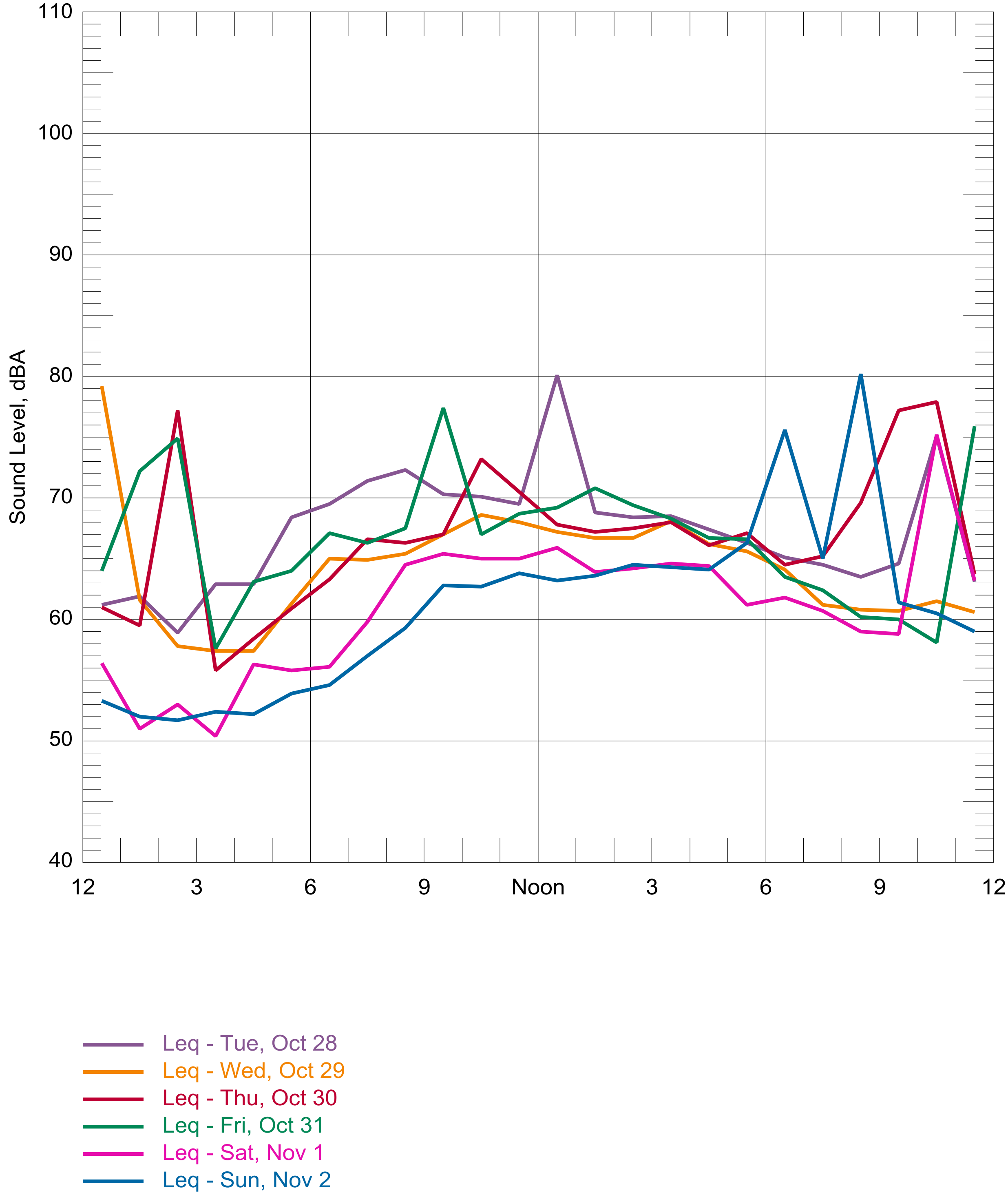

Figure A-1. Location N1, 602 California Way, Longview, WA, hourly L_{eq}

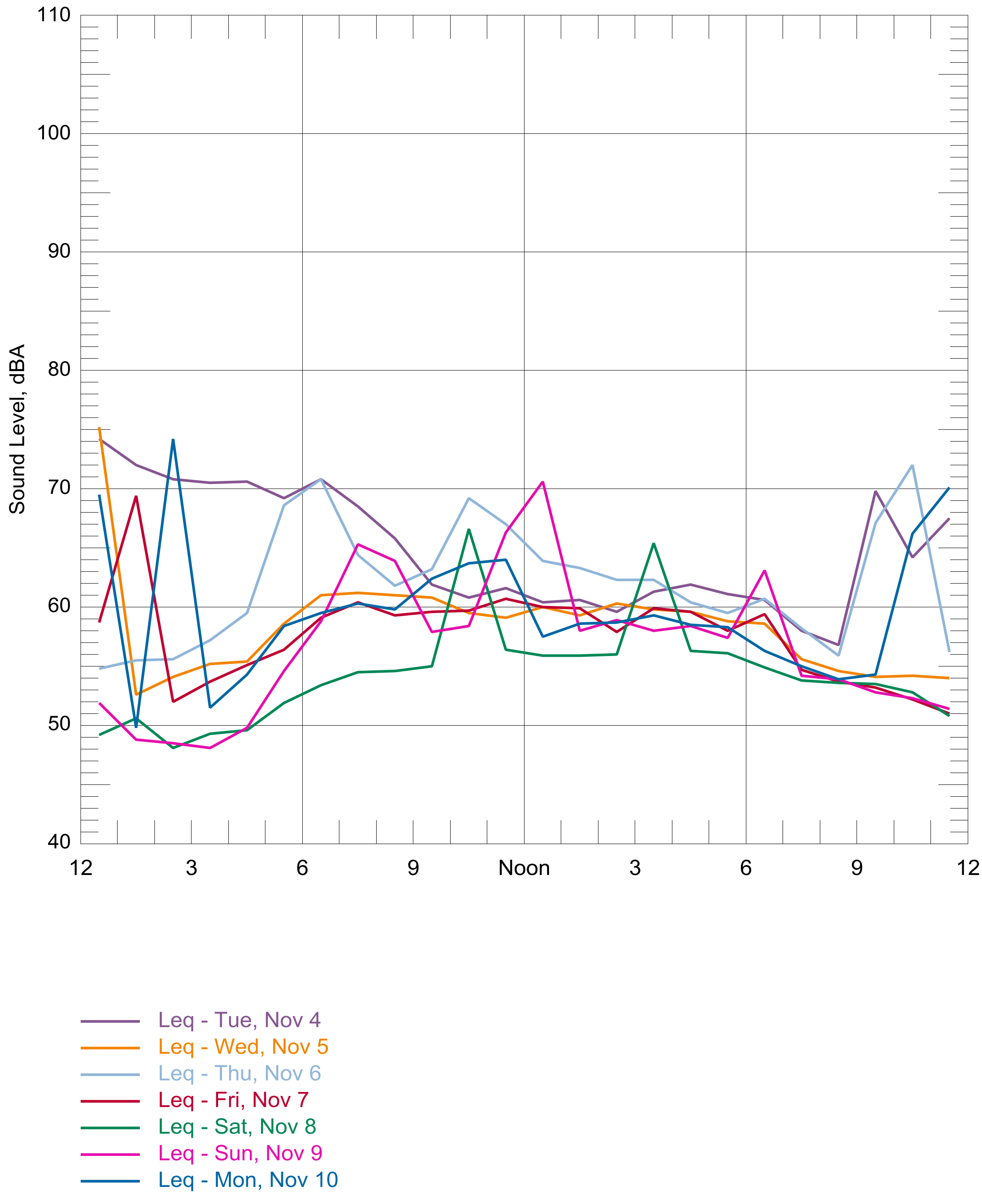

Figure A-2. Location N2, 111-15th Avenue, Longview, WA, hourly L_{eq}

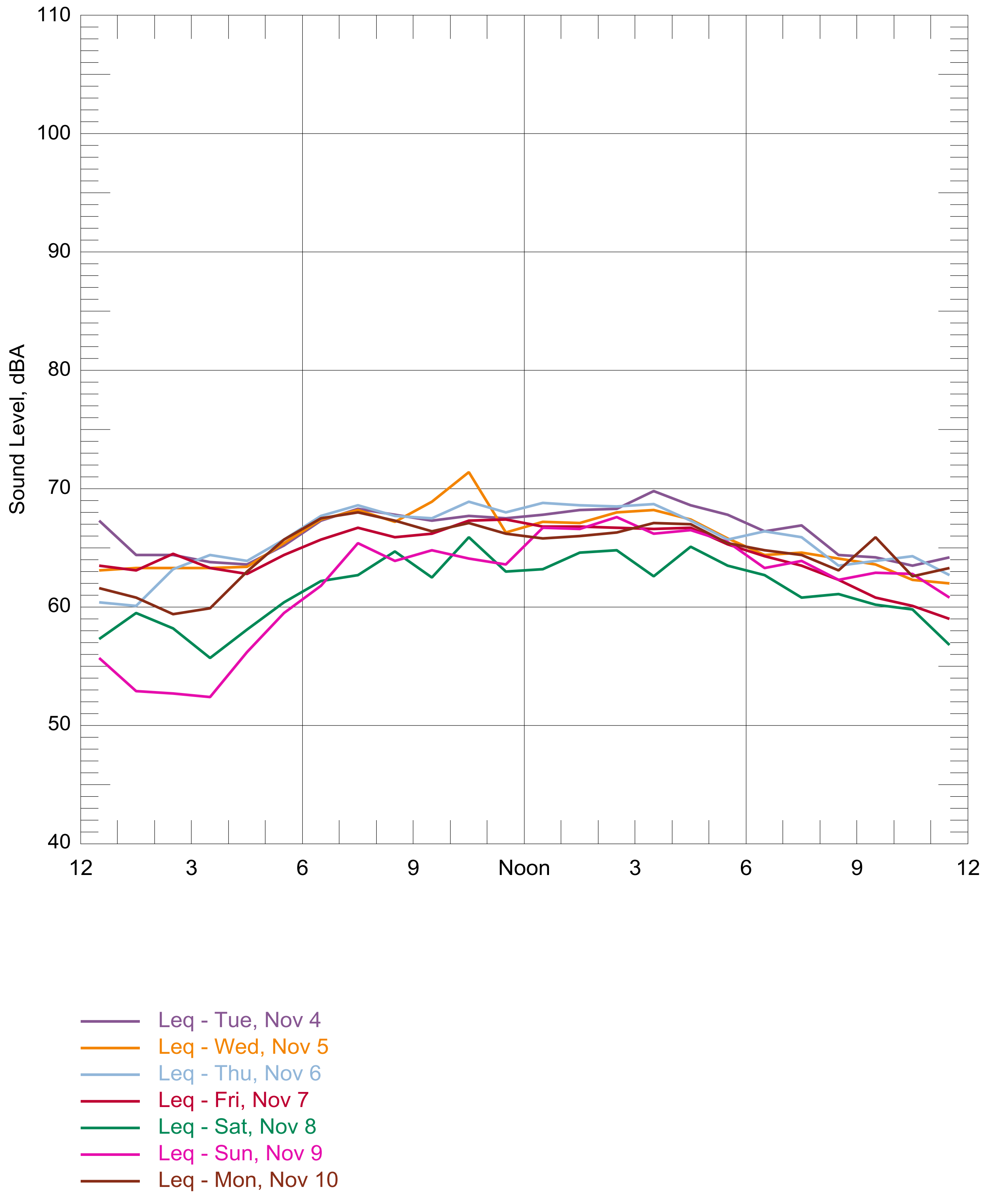

Figure A-3. Location N3, 221 Beech Street, Longview, WA, hourly L_{eq}

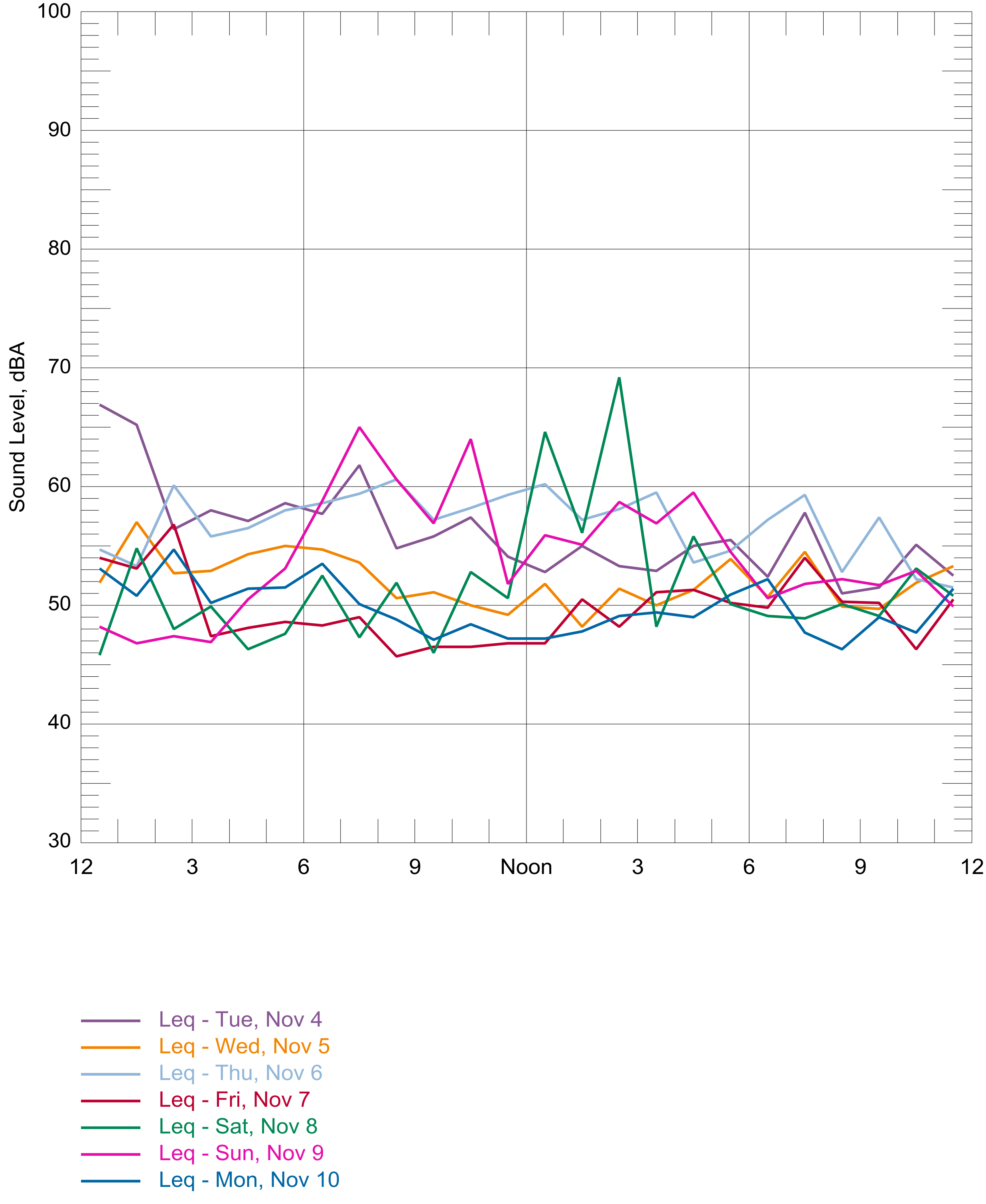

Figure A-4. Location N4, 875-34th Avenue, Longview, WA, hourly L_{eq}

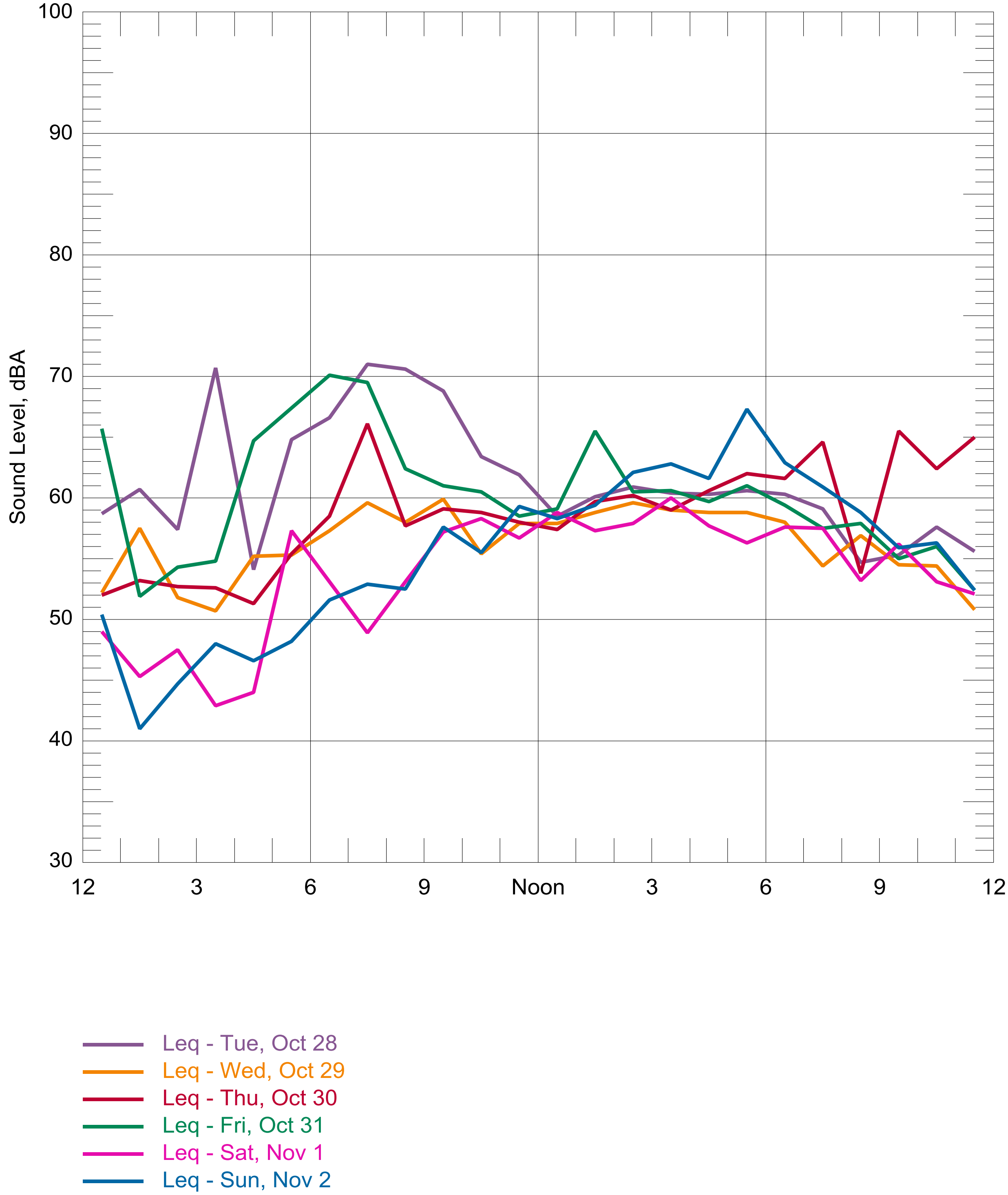

Figure A-5. Location N5, 3600 Memorial Park Drive, Longview, WA, hourly L_{eq}

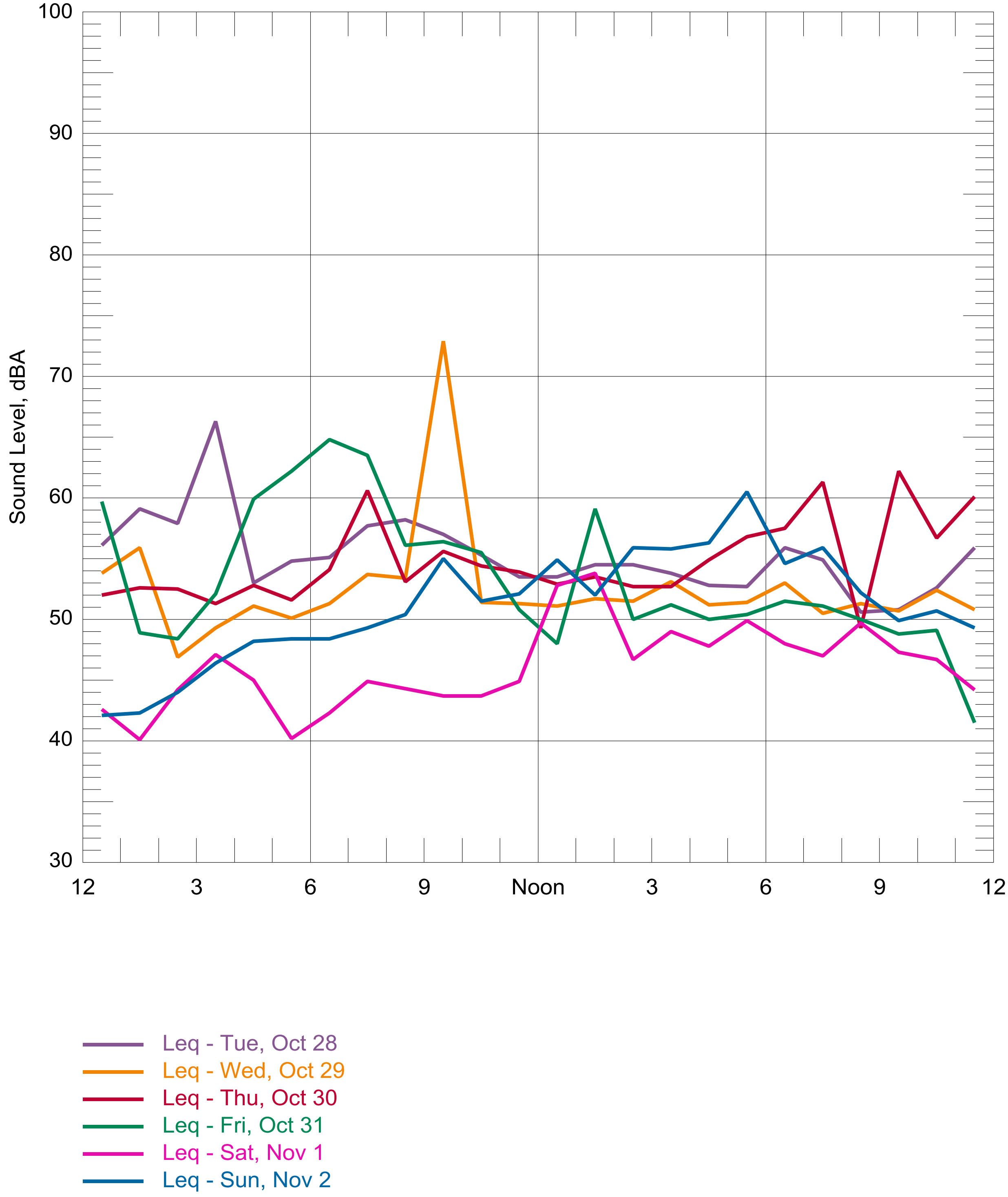

Figure A-6. Location N6, 420 Rutherglen Drive, Longview, WA, hourly L_{eq}

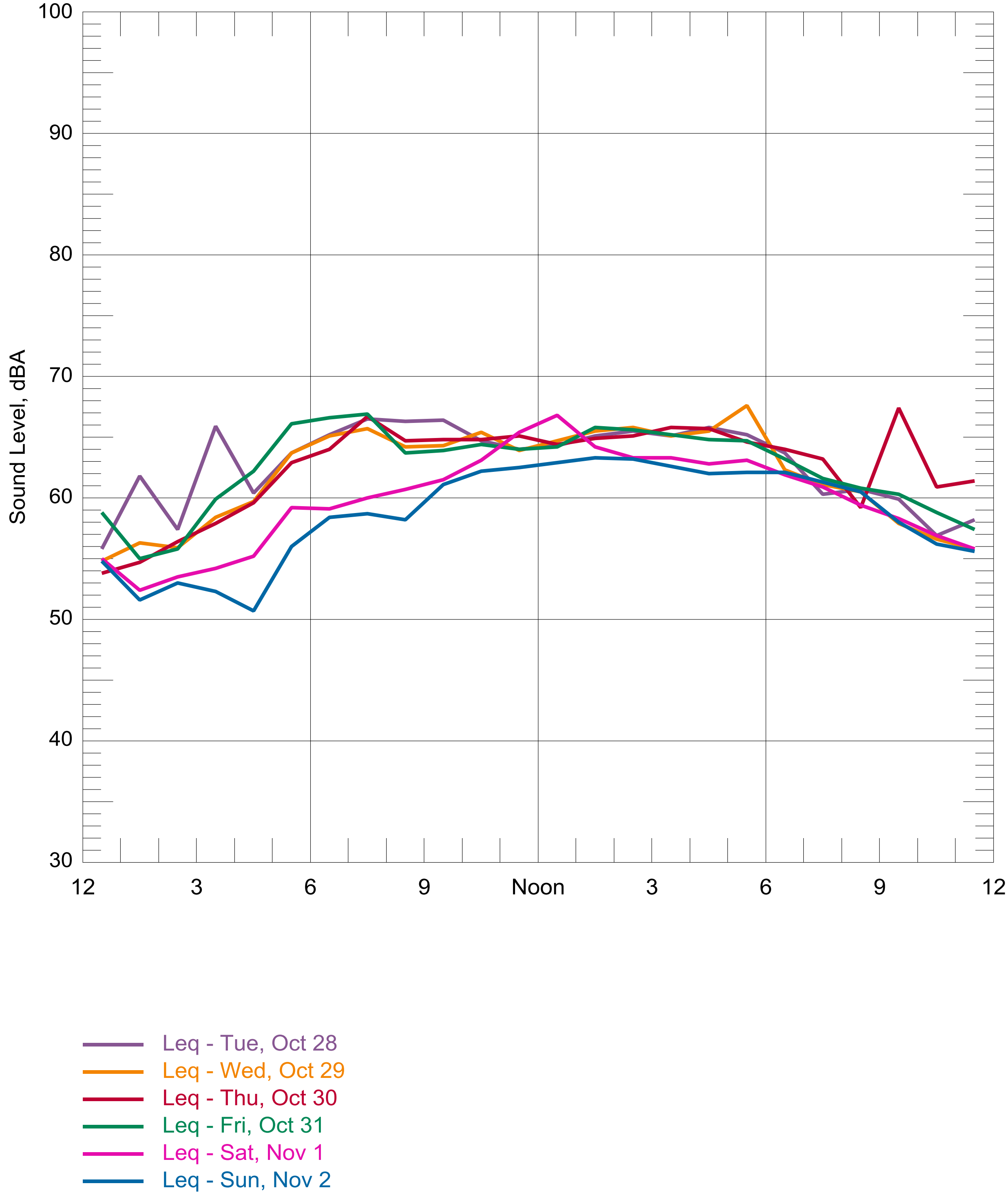

Figure A-7. Location N7, 4723 Mount Solo Road, Longview, WA, hourly L_{eq}

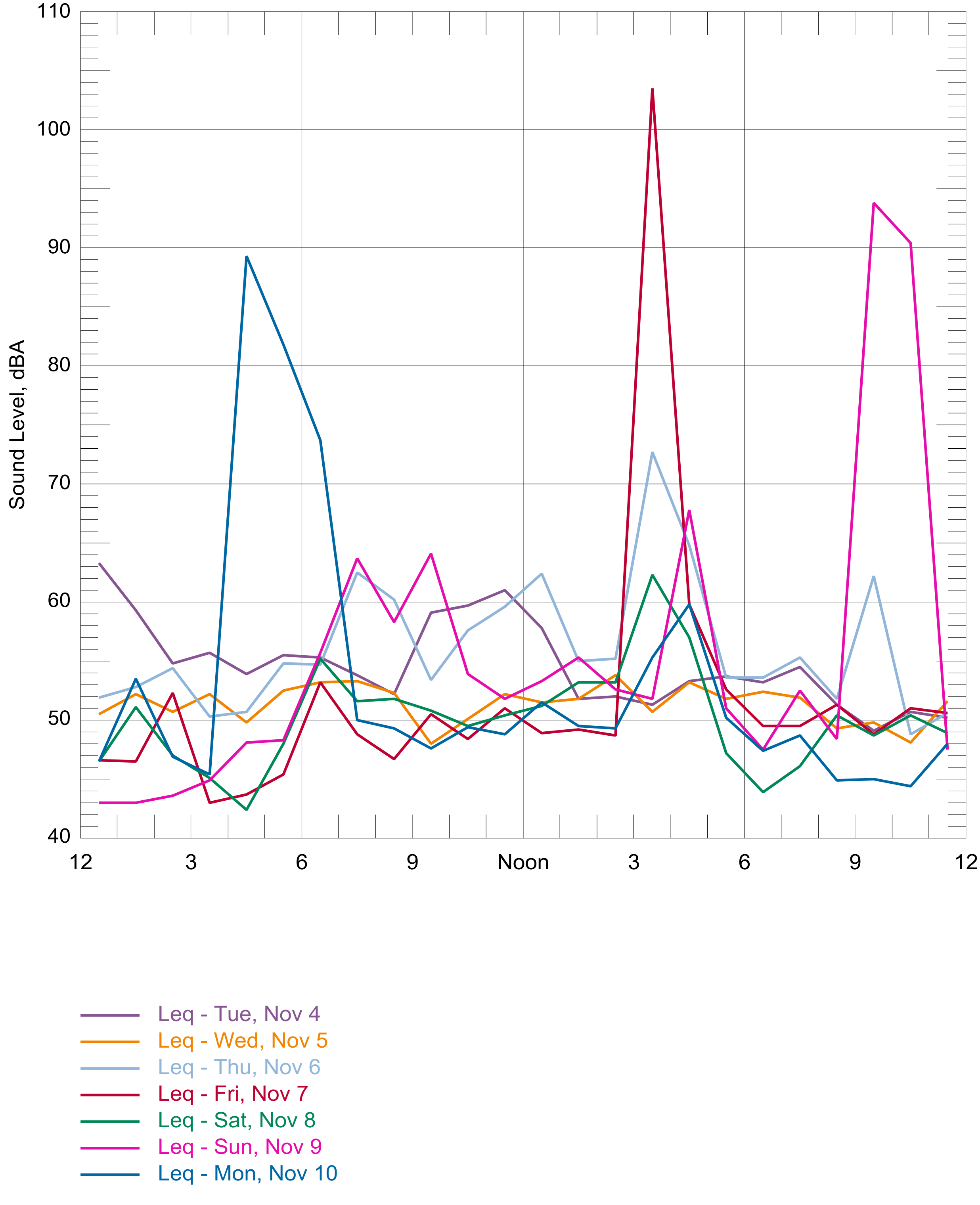

Figure A-8. Location N8, 1719 Dorothy Avenue, Longview, WA, hourly L_{eq}

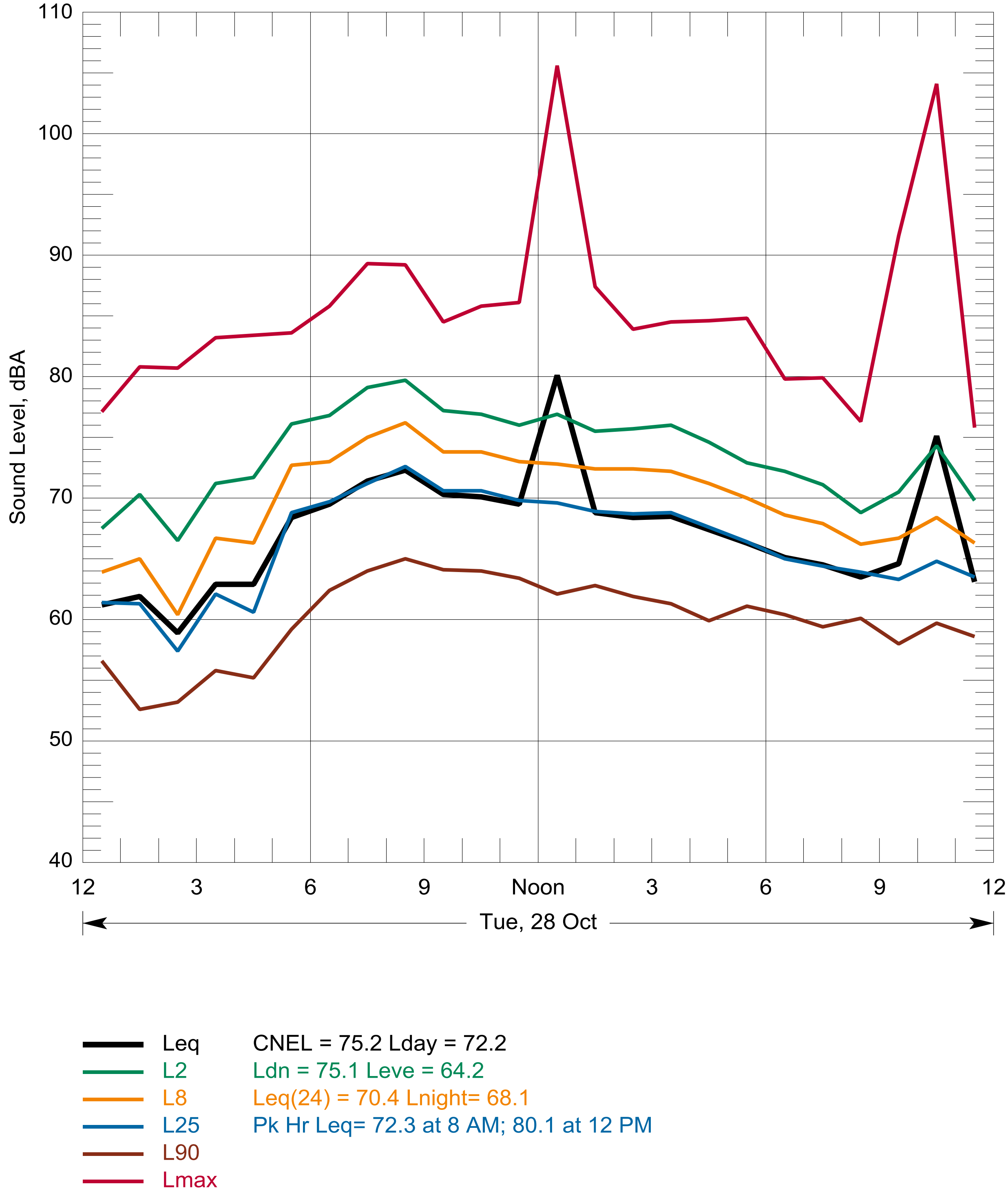

Figure A-9. Hourly Statistical Summary of Noise Levels on Oct 28, 2014 Location N1, 602 California Way, Longview, WA

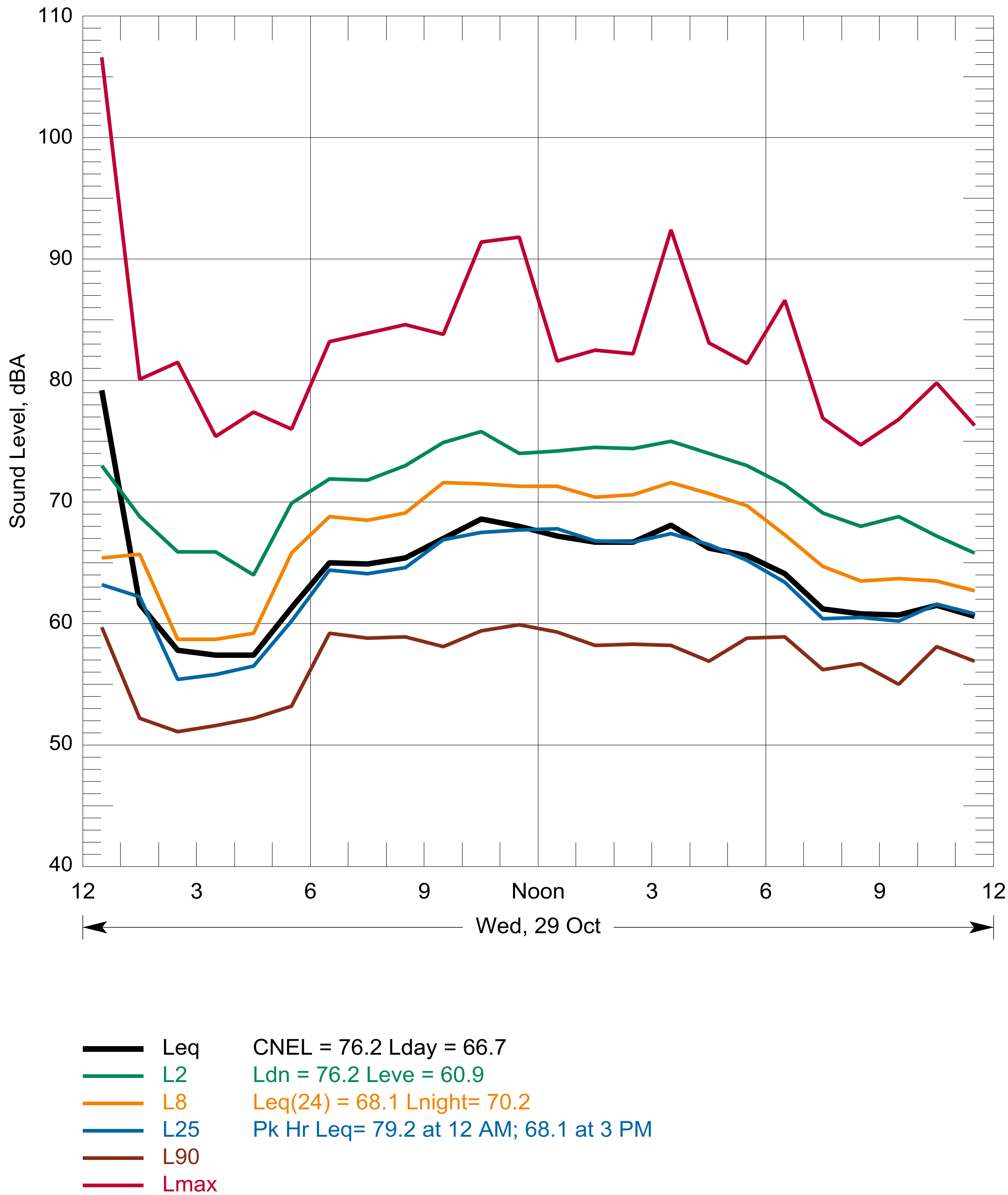

Figure A-10. Hourly Statistical Summary of Noise Levels on Oct 29, 2014 Location N1, 602 California Way, Longview, WA

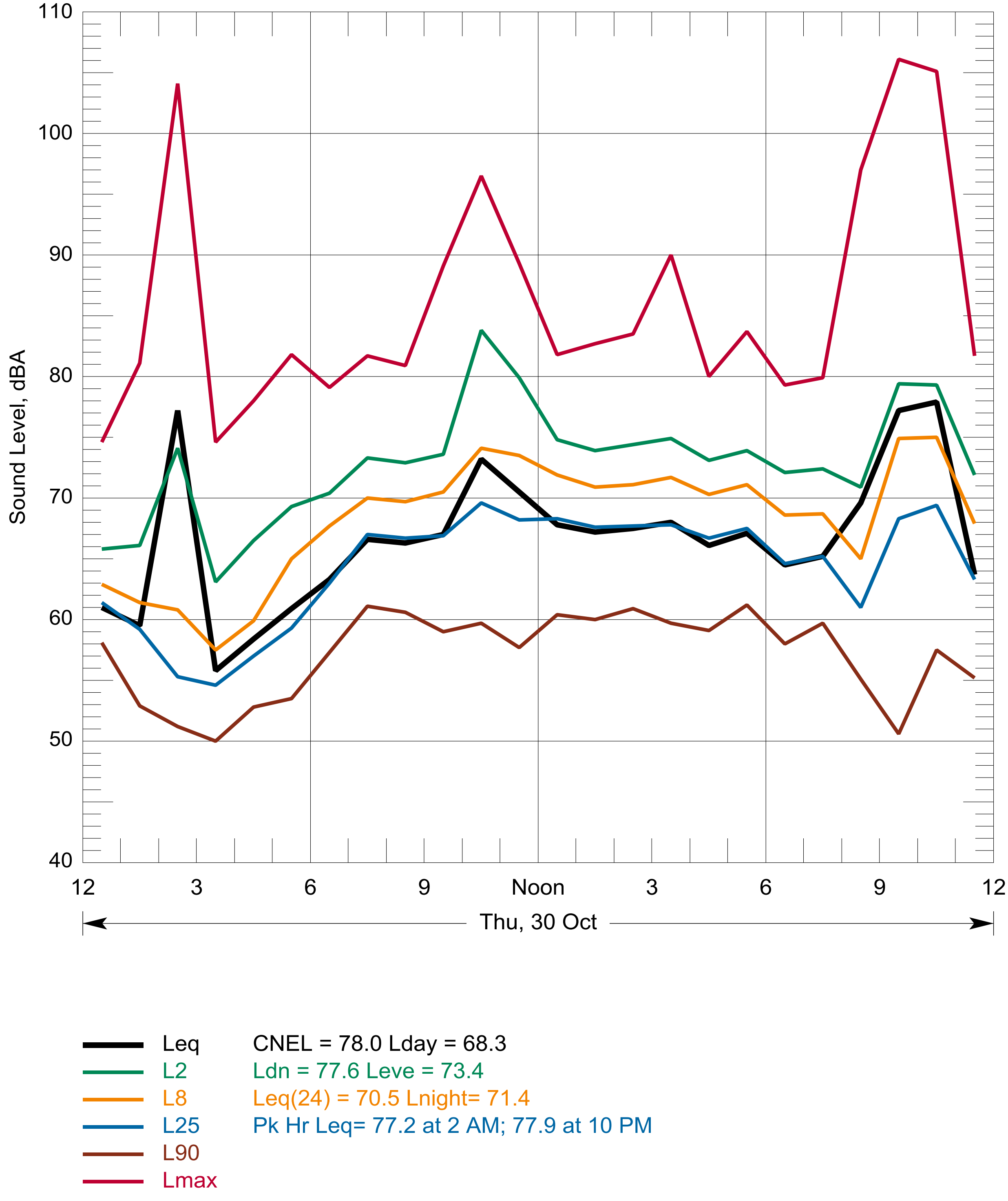

Figure A-11. Hourly Statistical Summary of Noise Levels on Oct 30, 2014 Location N1, 602 California Way, Longview, WA

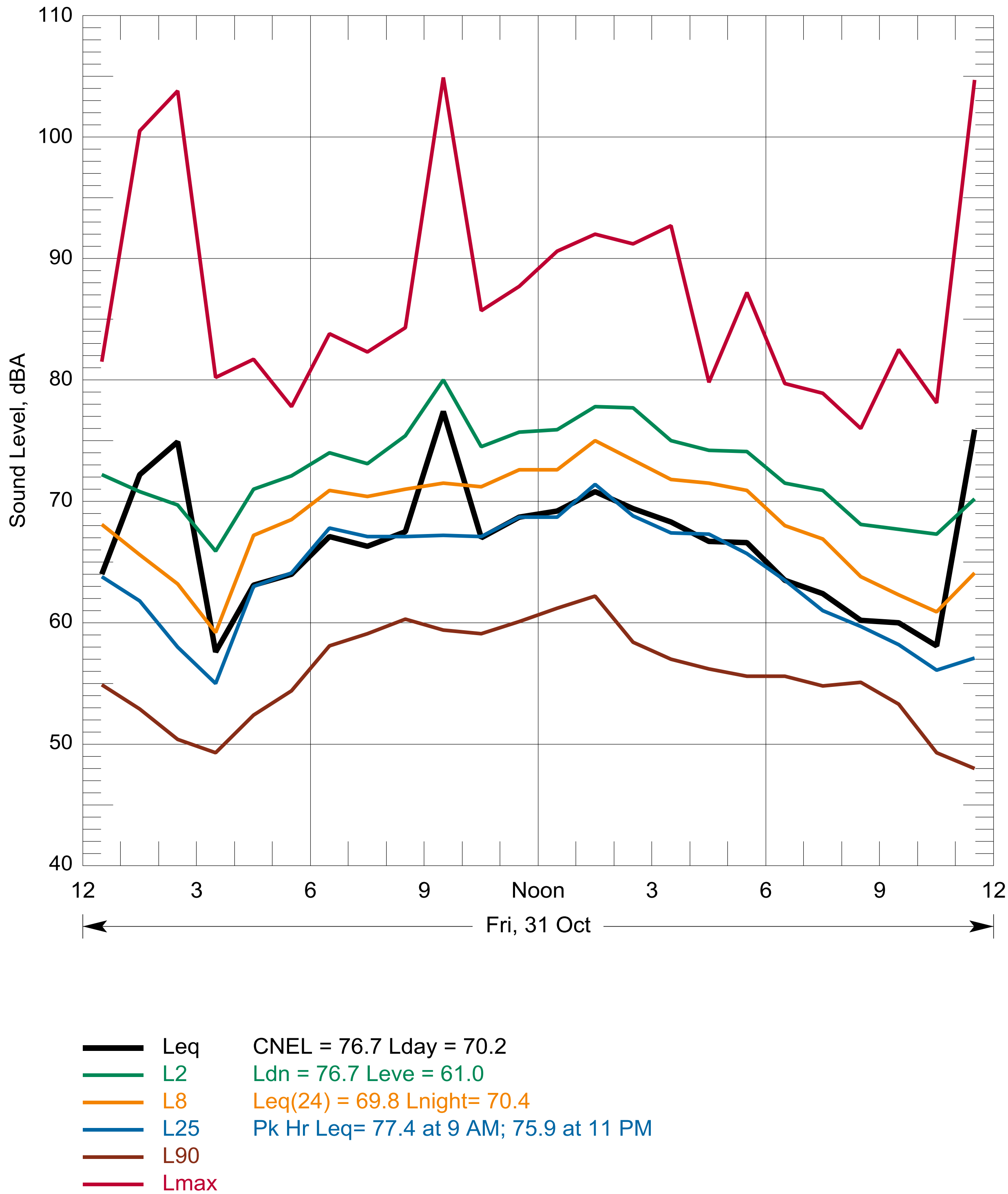

Figure A-12. Hourly Statistical Summary of Noise Levels on Oct 31, 2014 Location N1, 602 California Way, Longview, WA

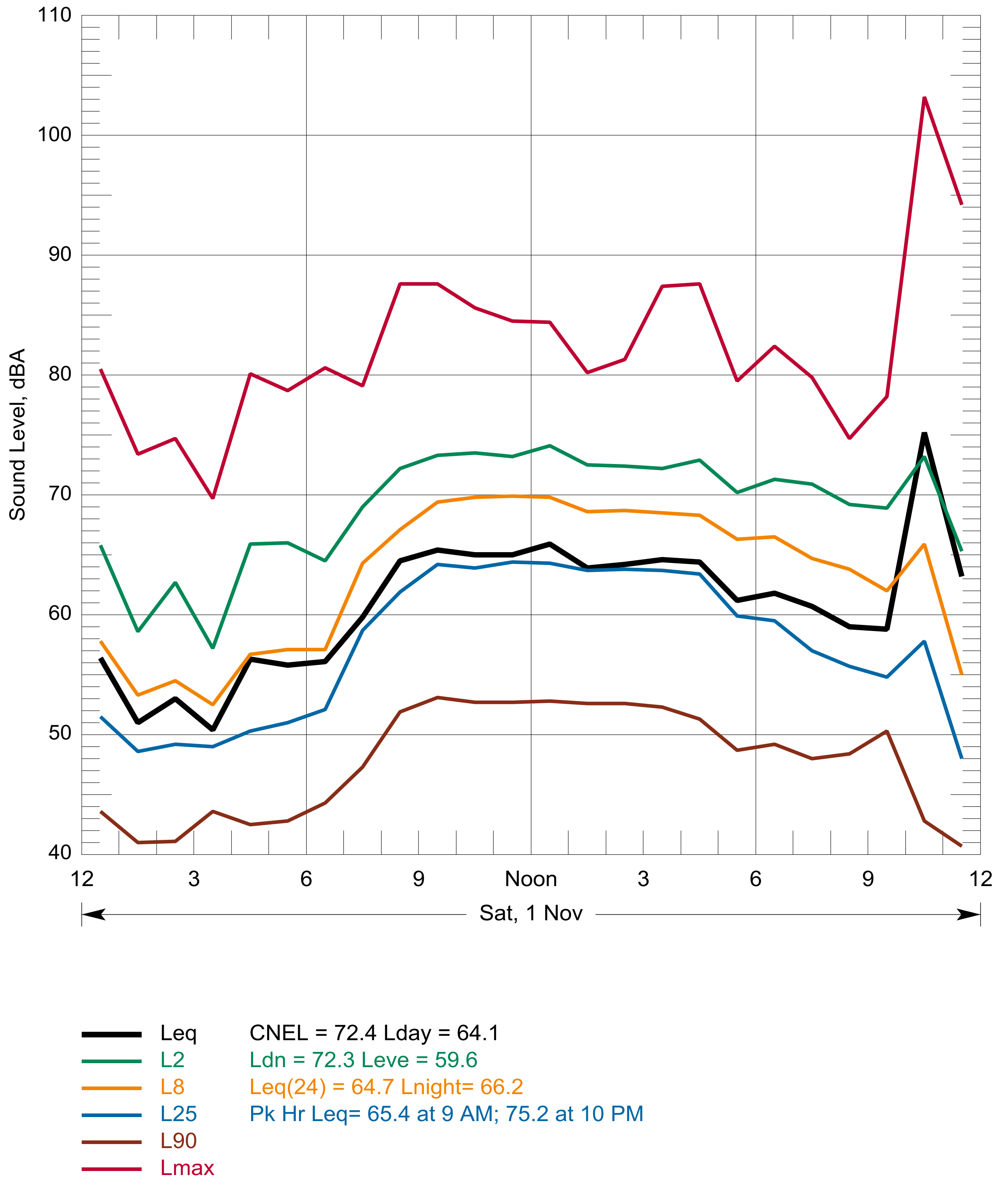

Figure A-13. Hourly Statistical Summary of Noise Levels on Nov 1, 2014 Location N1, 602 California Way, Longview, WA

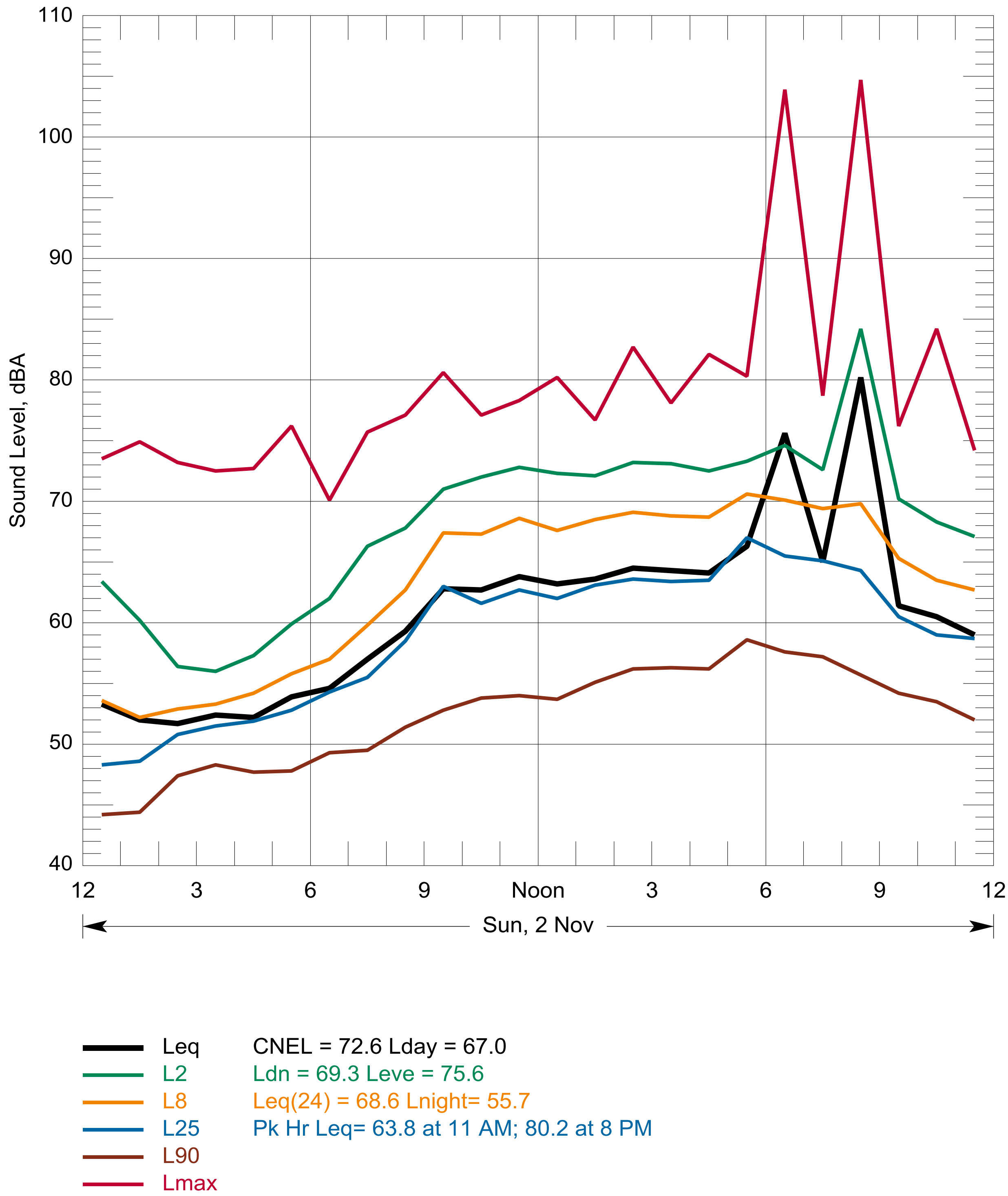

Figure A-14. Hourly Statistical Summary of Noise Levels on Nov 2, 2014 Location N1, 602 California Way, Longview, WA

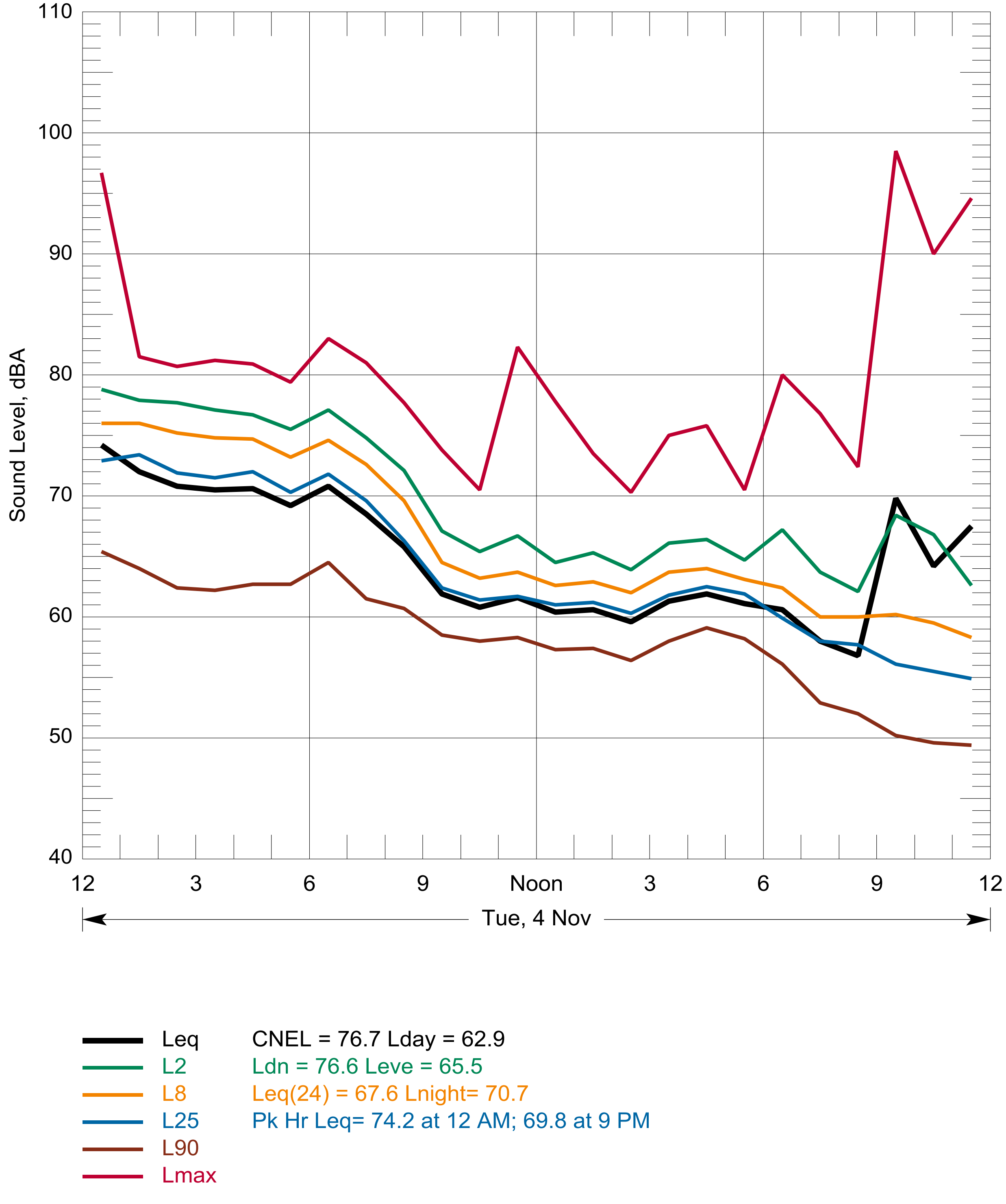

Figure A-15. Hourly Statistical Summary of Noise Levels on Nov 4, 2014 Location N2, 111-15th Avenue, Longview, WA

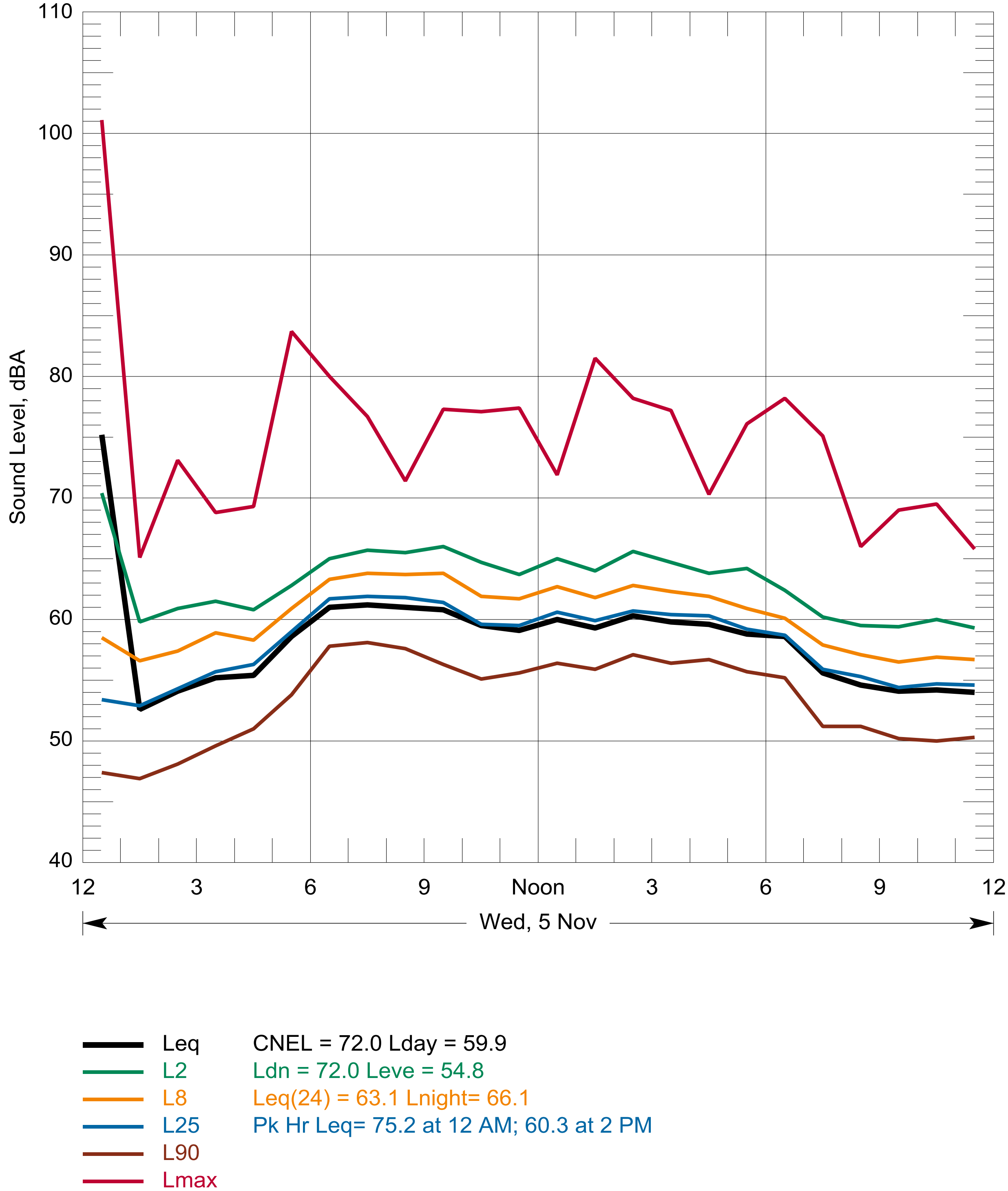

Figure A-16. Hourly Statistical Summary of Noise Levels on Nov 5, 2014 Location N2, 111-15th Avenue, Longview, WA

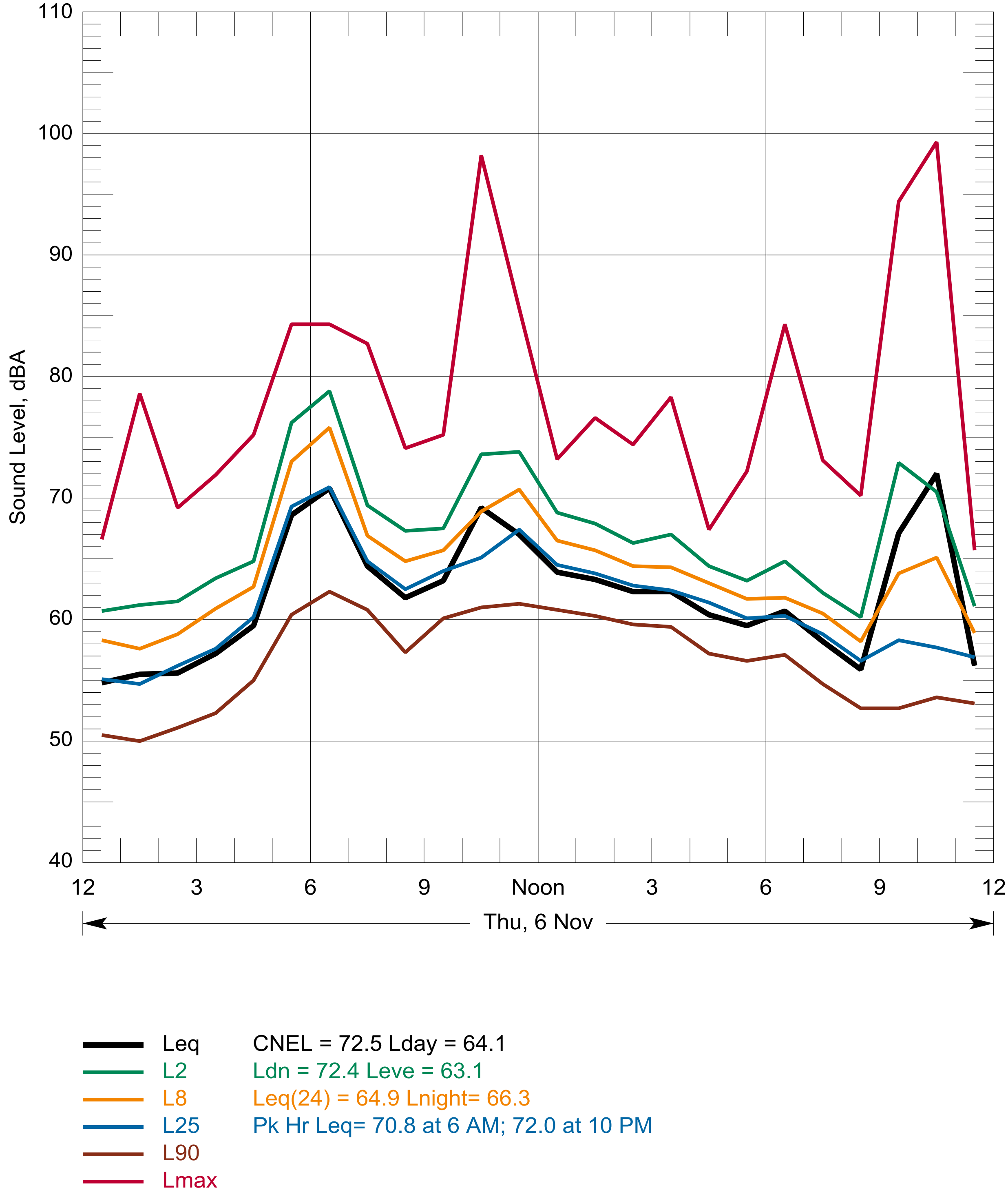

Figure A-17. Hourly Statistical Summary of Noise Levels on Nov 6, 2014 Location N2, 111-15th Avenue, Longview, WA

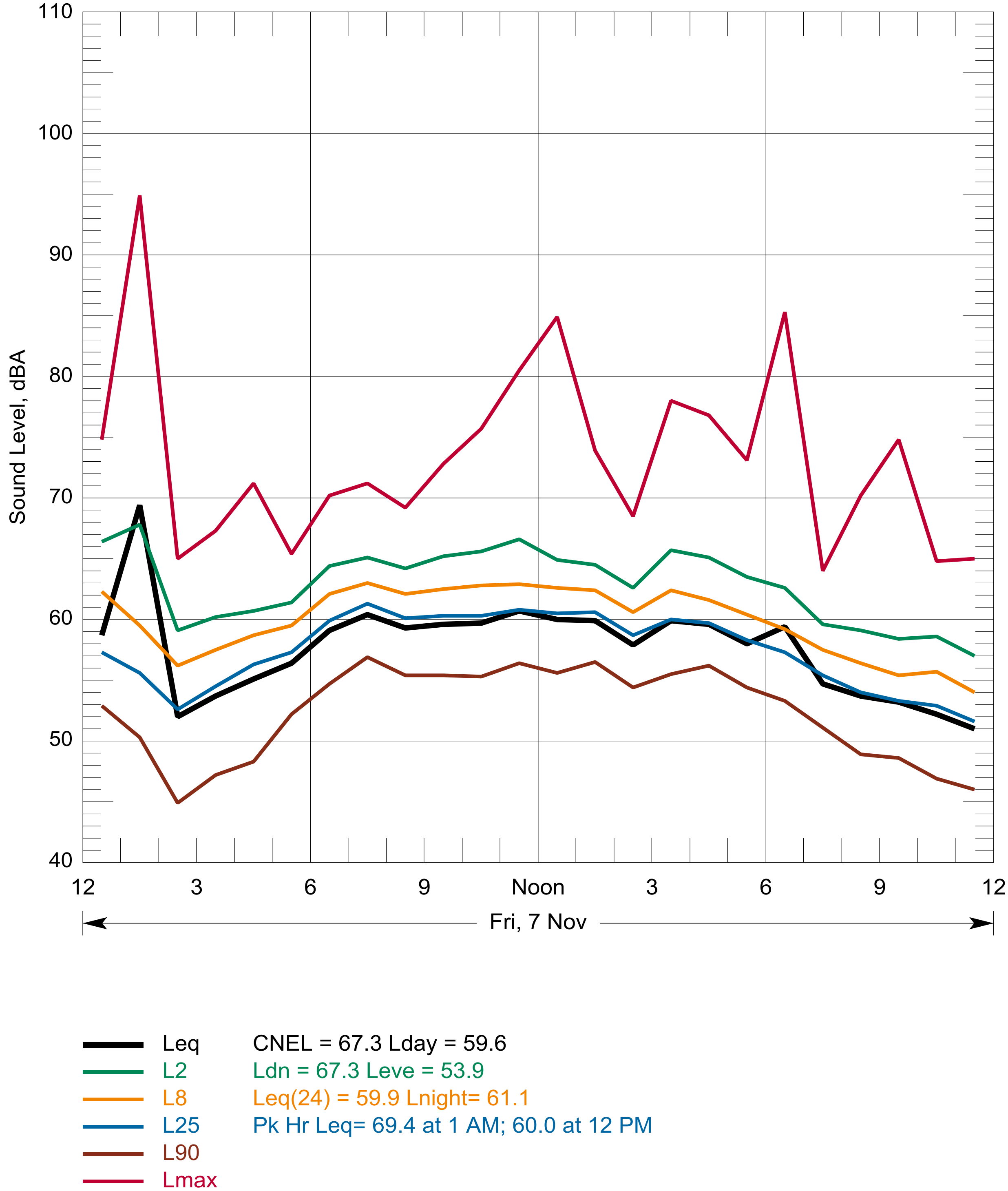

Figure A-18. Hourly Statistical Summary of Noise Levels on Nov 7, 2014 Location N2, 111-15th Avenue, Longview, WA

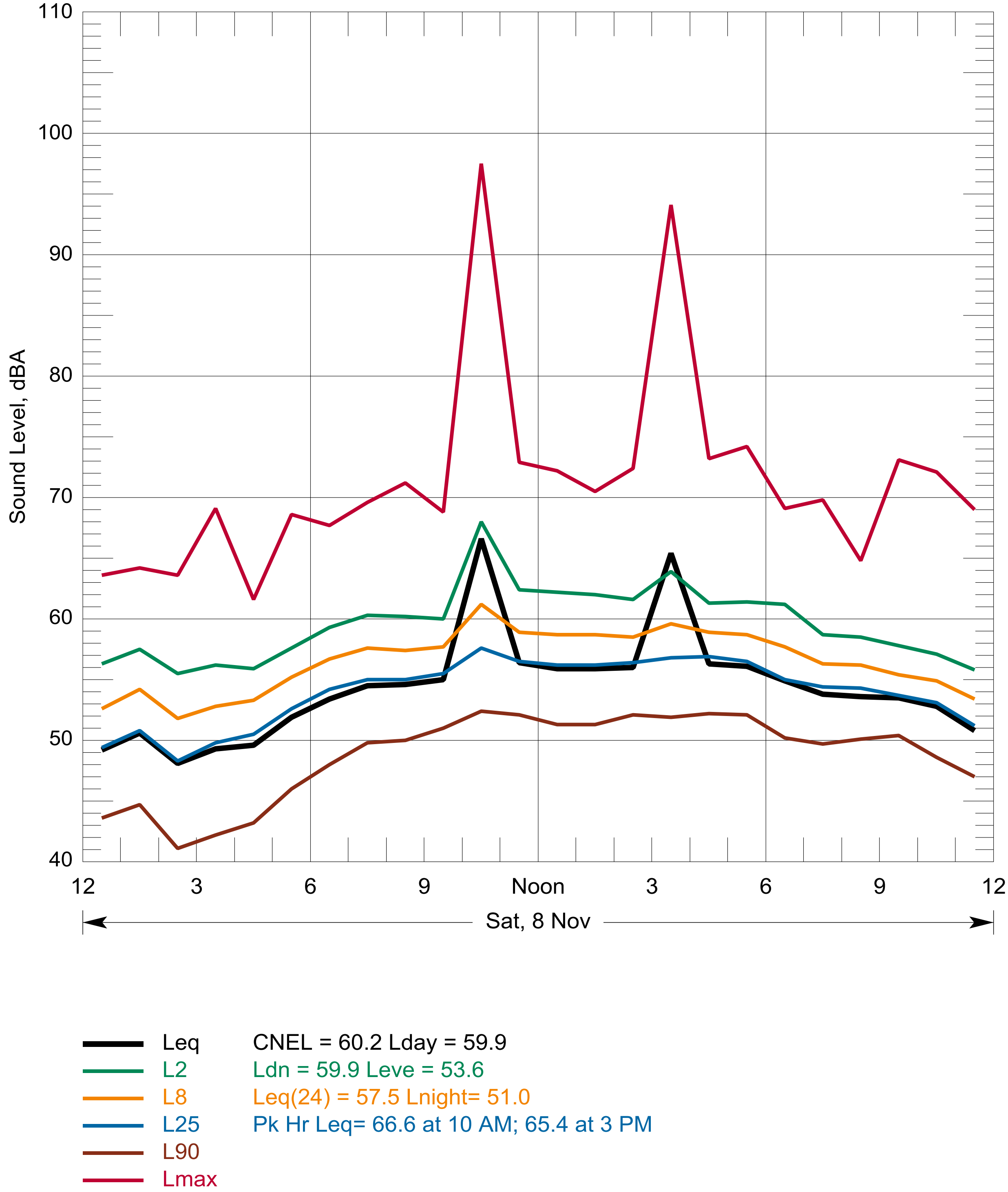

Figure A-19. Hourly Statistical Summary of Noise Levels on Nov 8, 2014 Location N2, 111-15th Avenue, Longview, WA

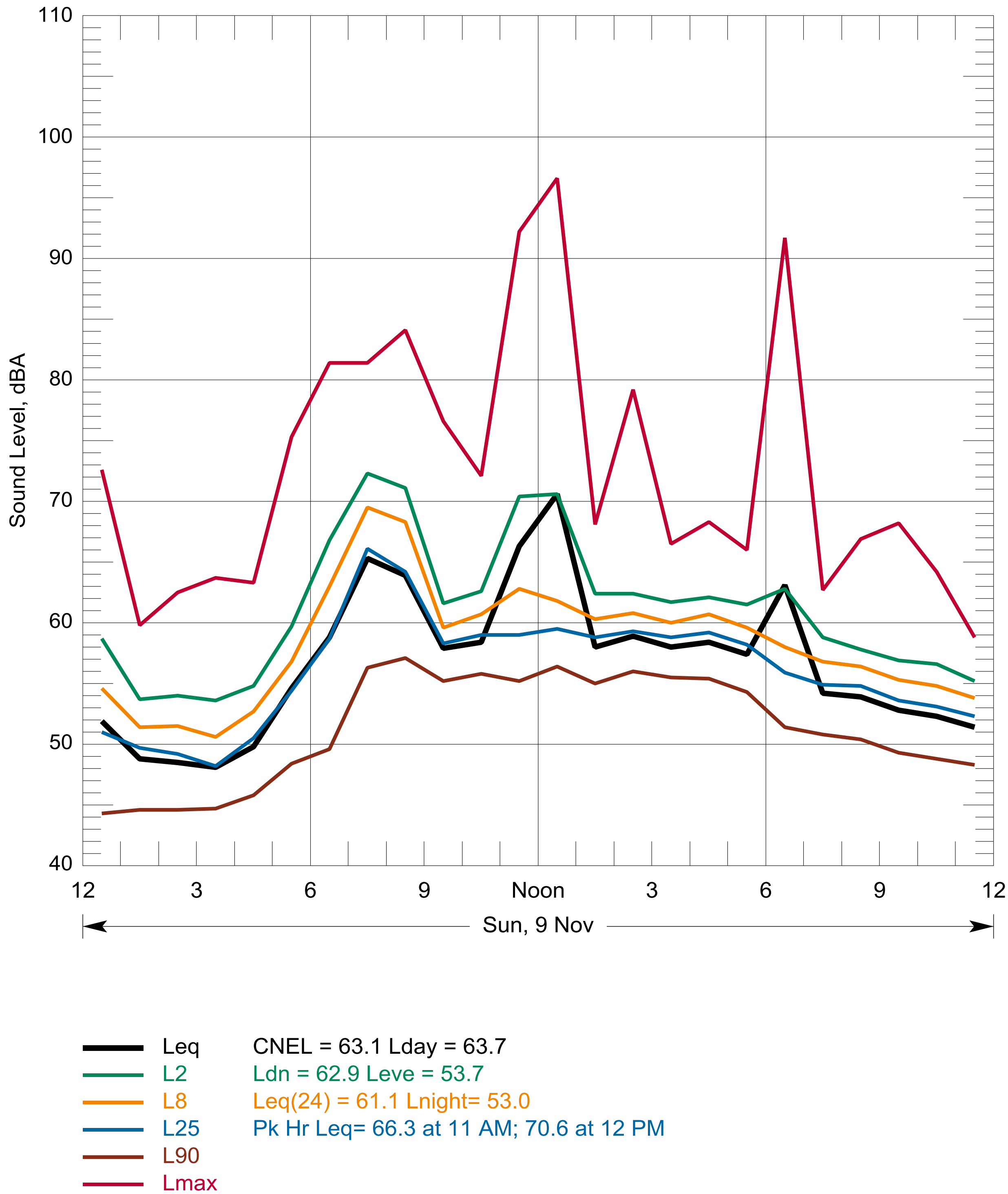

Figure A-20. Hourly Statistical Summary of Noise Levels on Nov 9, 2014 Location N2, 111-15th Avenue, Longview, WA

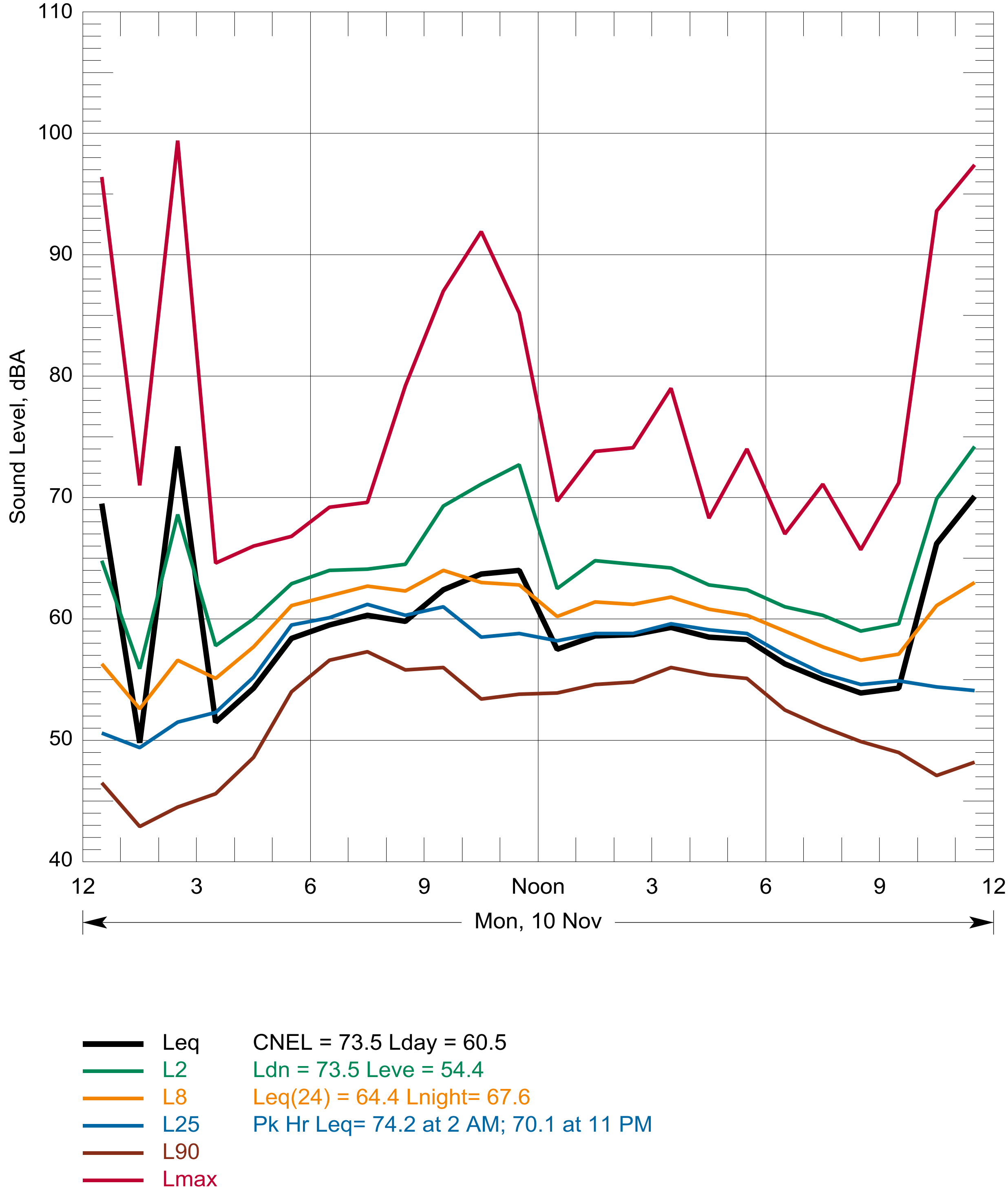

Figure A-21. Hourly Statistical Summary of Noise Levels on Nov 10, 2014 Location N2, 111-15th Avenue, Longview, WA

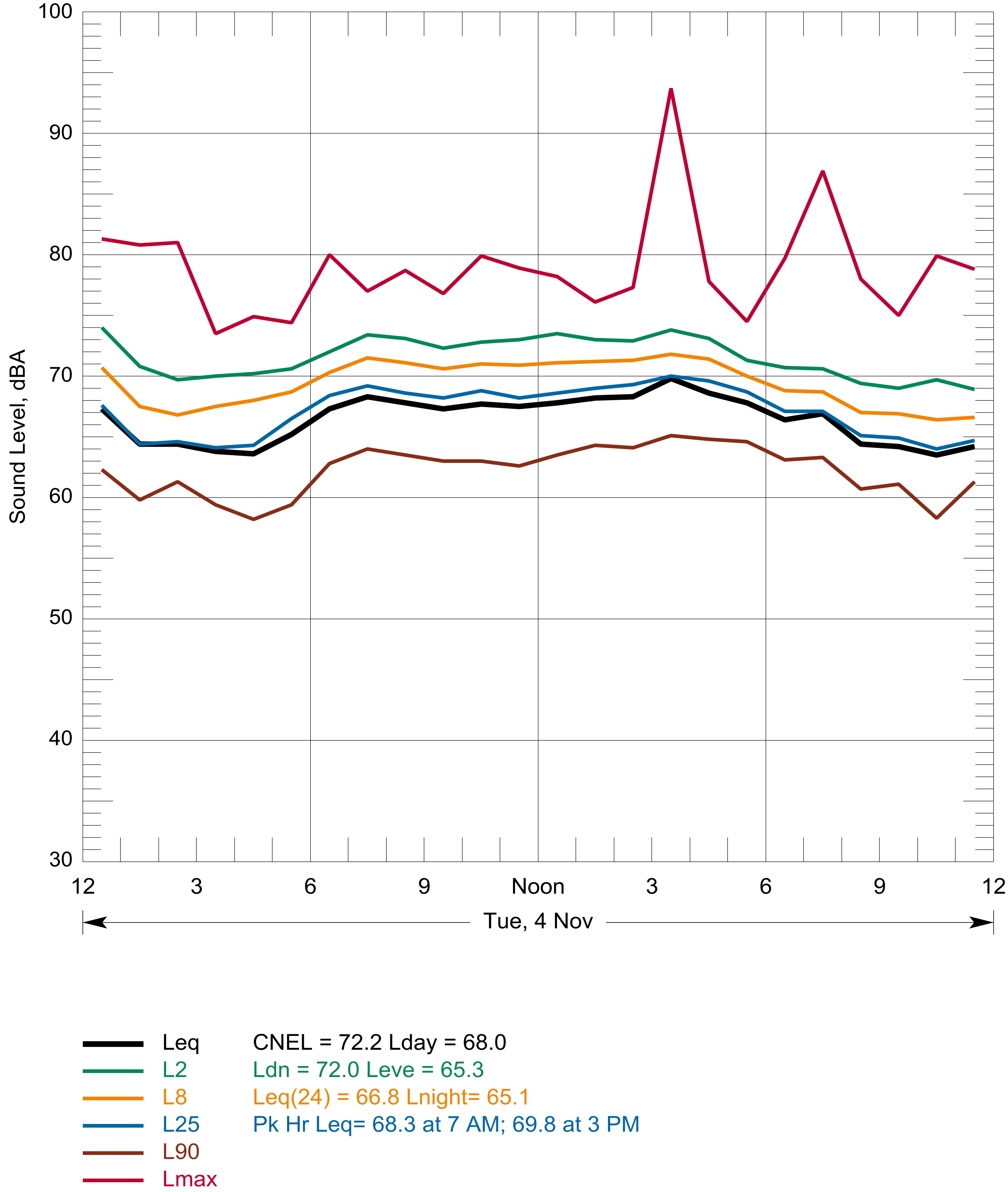

Figure A-22. Hourly Statistical Summary of Noise Levels on Nov 4, 2014 Location N3, 221 Beech Street at Alder St., Longview, WA

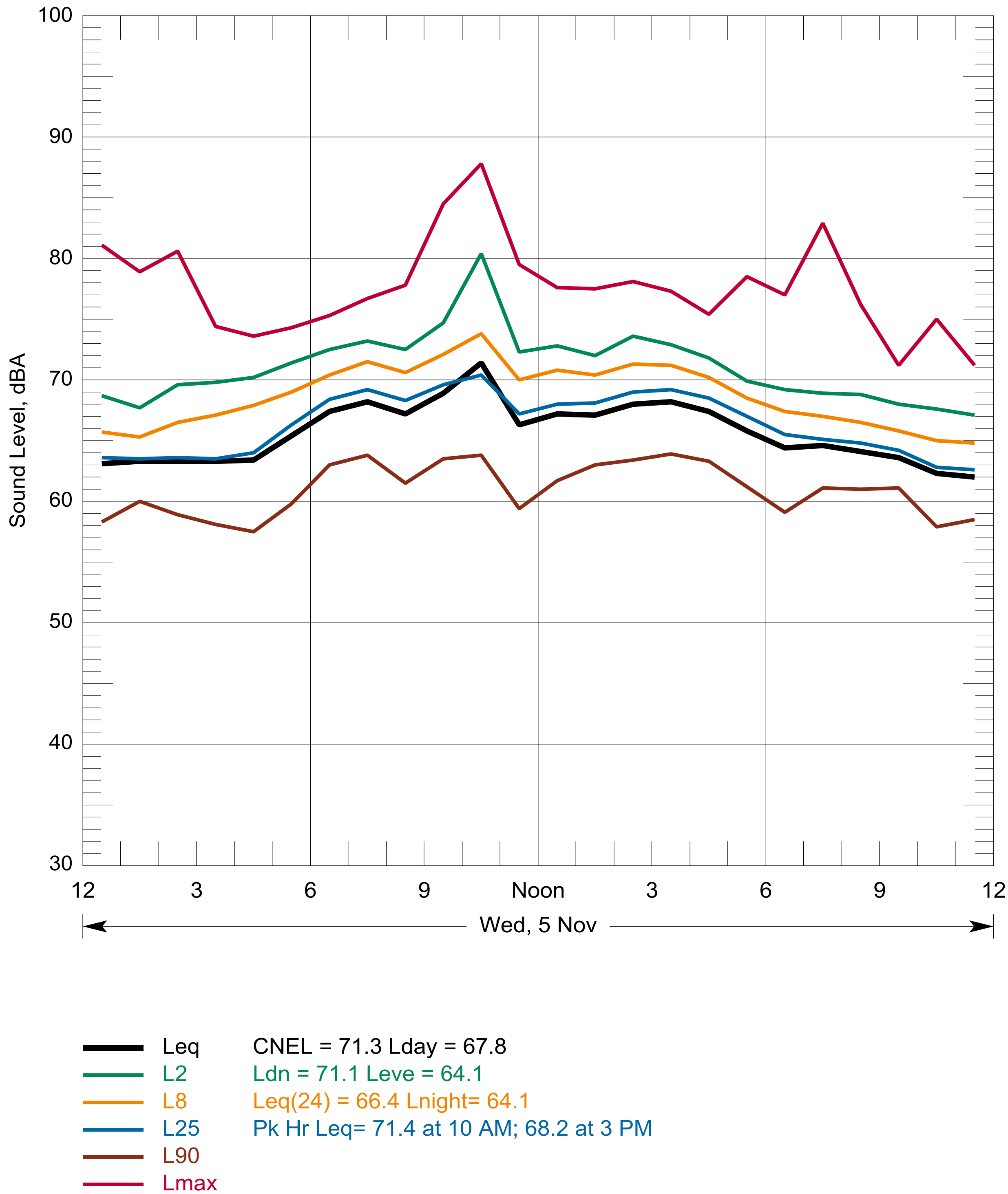

Figure A-23. Hourly Statistical Summary of Noise Levels on Nov 5, 2014 Location N3, 221 Beech Street at Alder St., Longview, WA

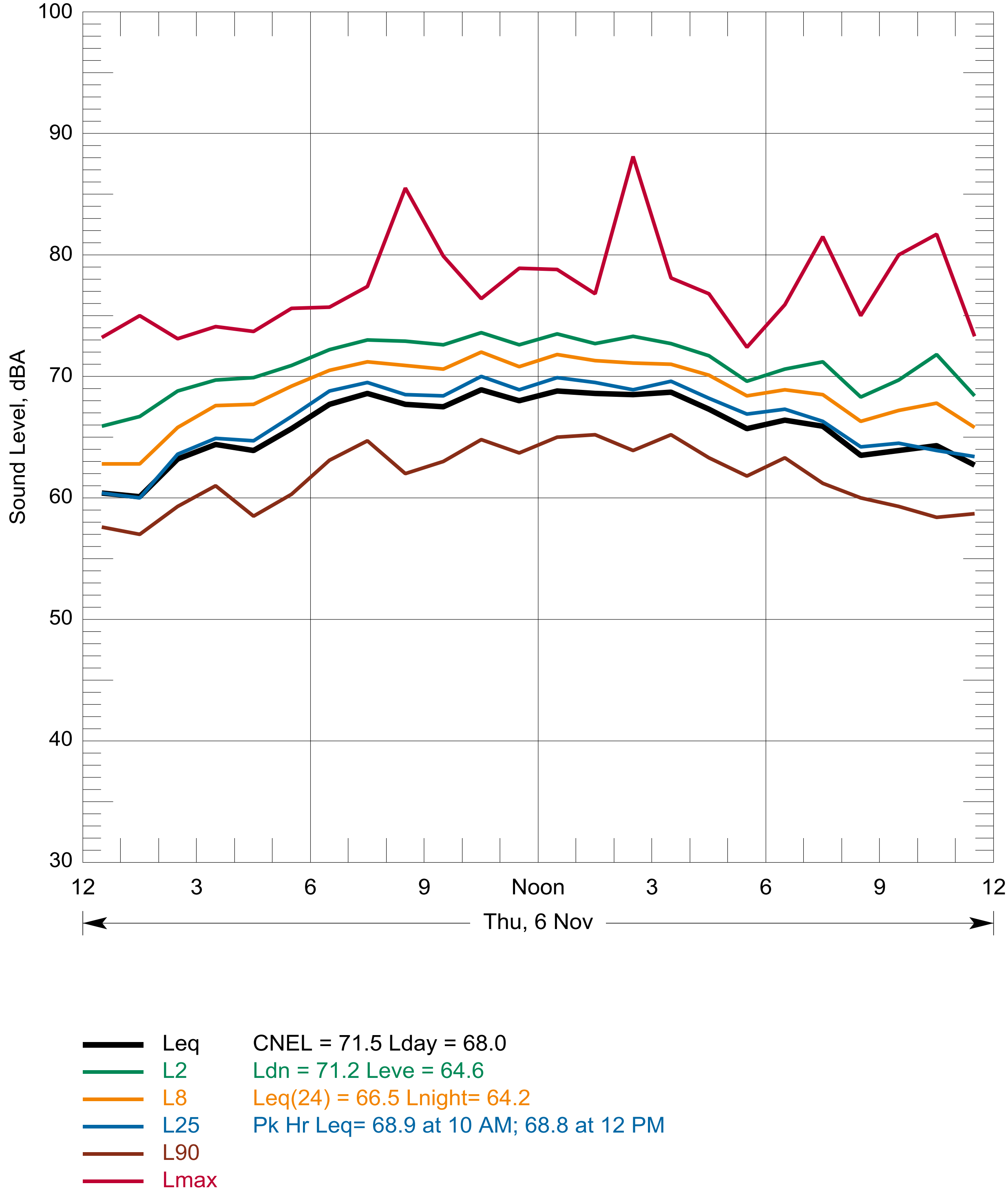

Figure A-24. Hourly Statistical Summary of Noise Levels on Nov 6, 2014 Location N3, 221 Beech Street at Alder St., Longview, WA

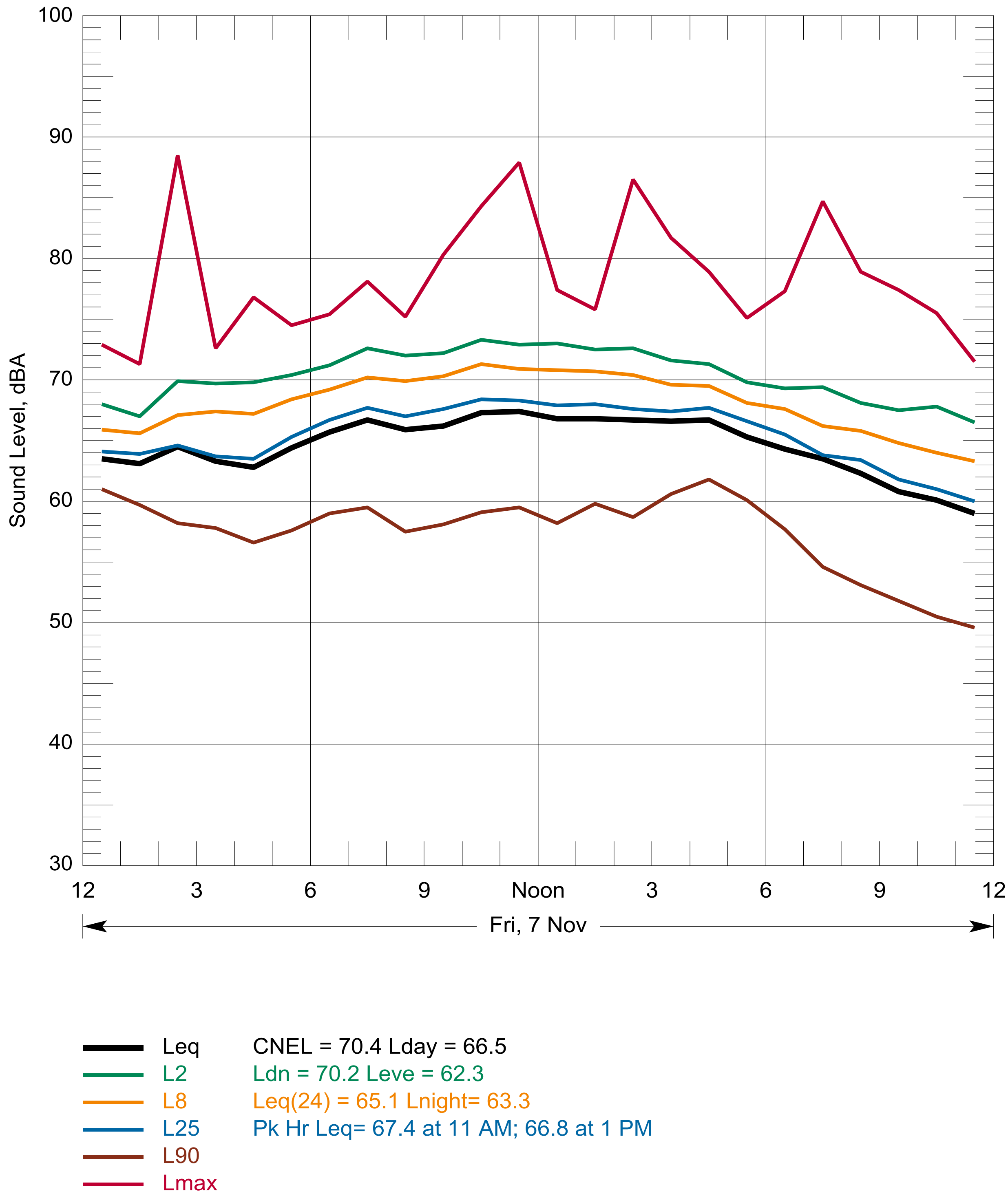

Figure A-25. Hourly Statistical Summary of Noise Levels on Nov 7, 2014 Location N3, 221 Beech Street at Alder St., Longview, WA

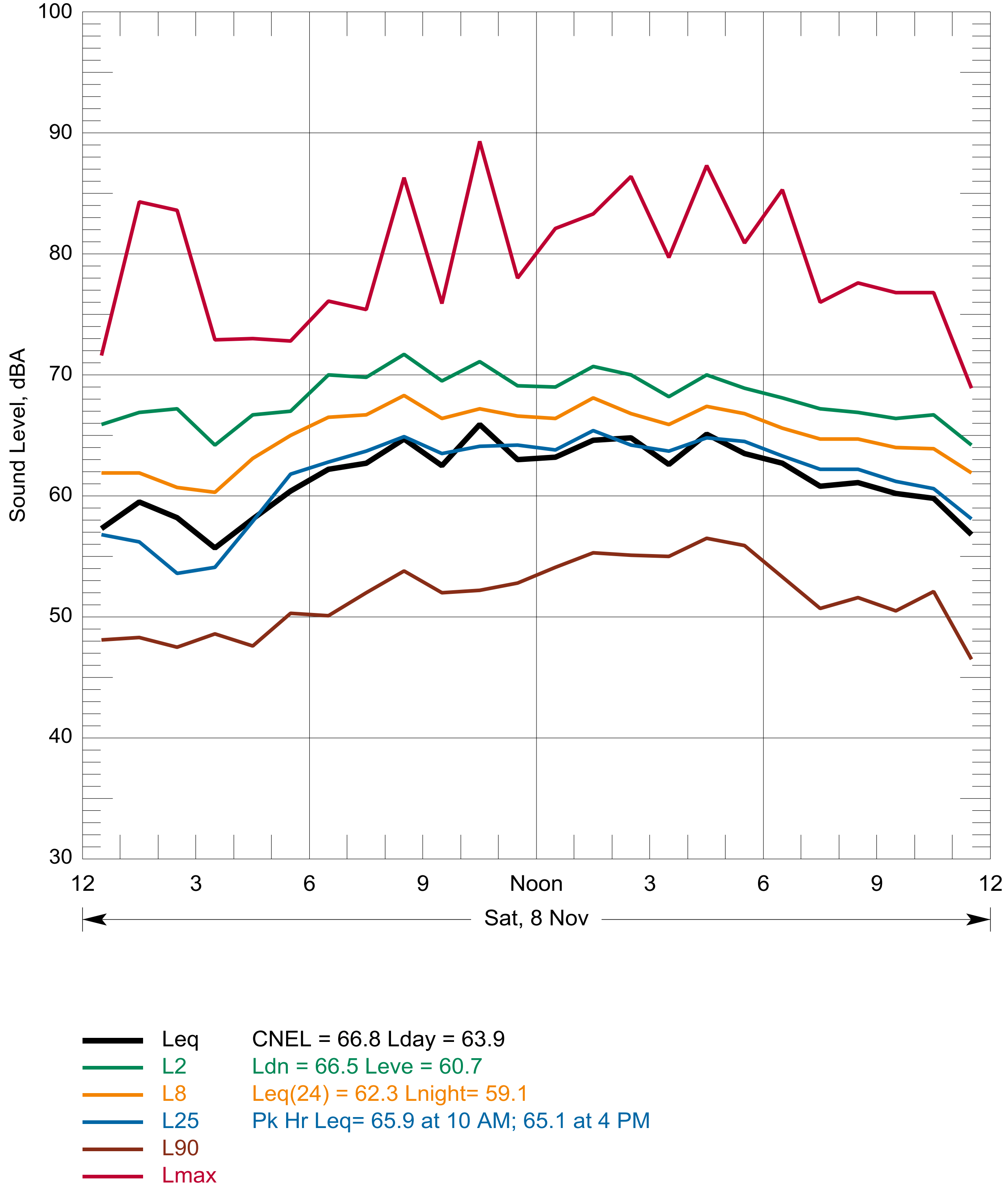

Figure A-26. Hourly Statistical Summary of Noise Levels on Nov 8, 2014 Location N3, 221 Beech Street at Alder St., Longview, WA

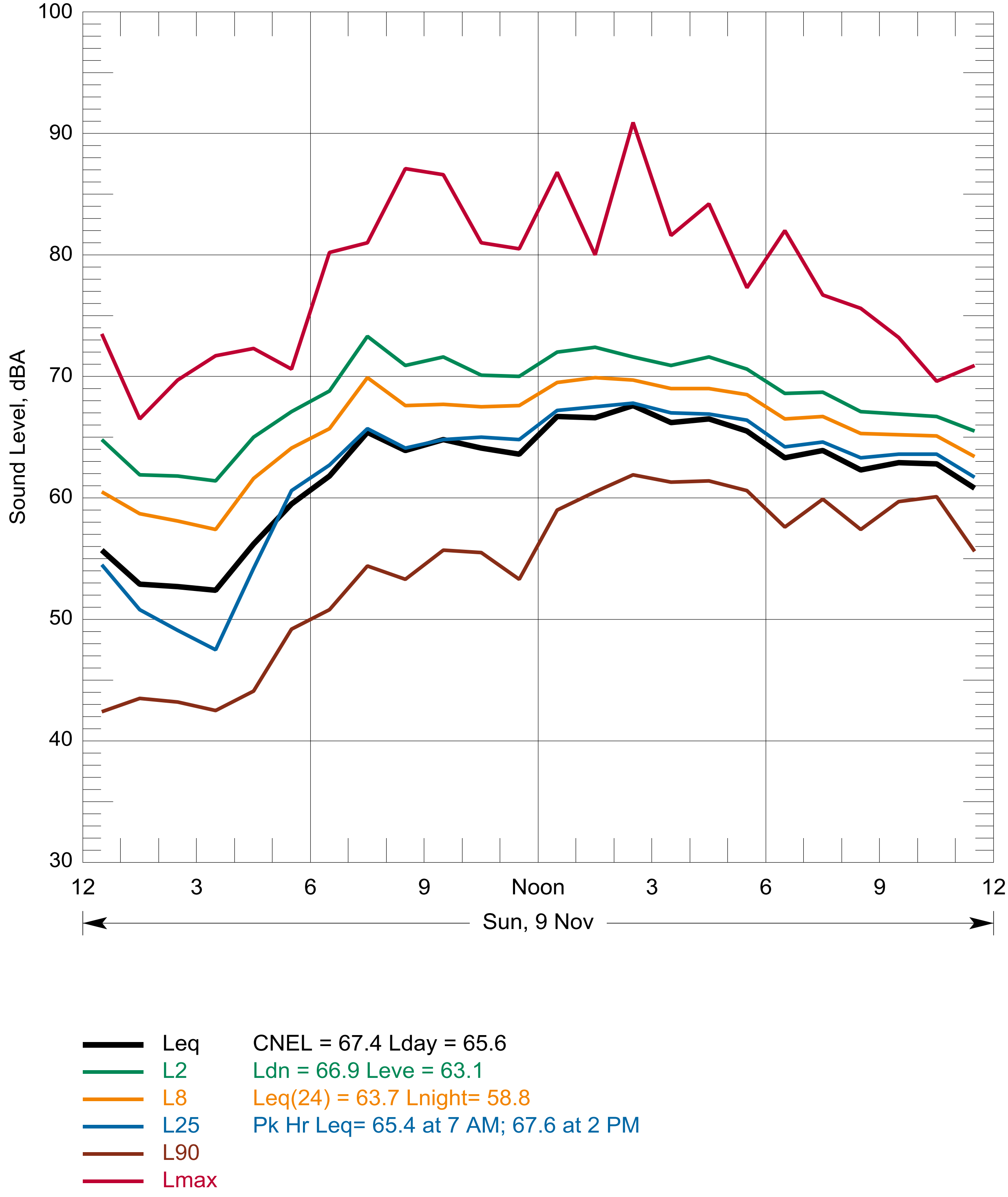

Figure A-27. Hourly Statistical Summary of Noise Levels on Nov 9, 2014 Location N3, 221 Beech Street at Alder St., Longview, WA

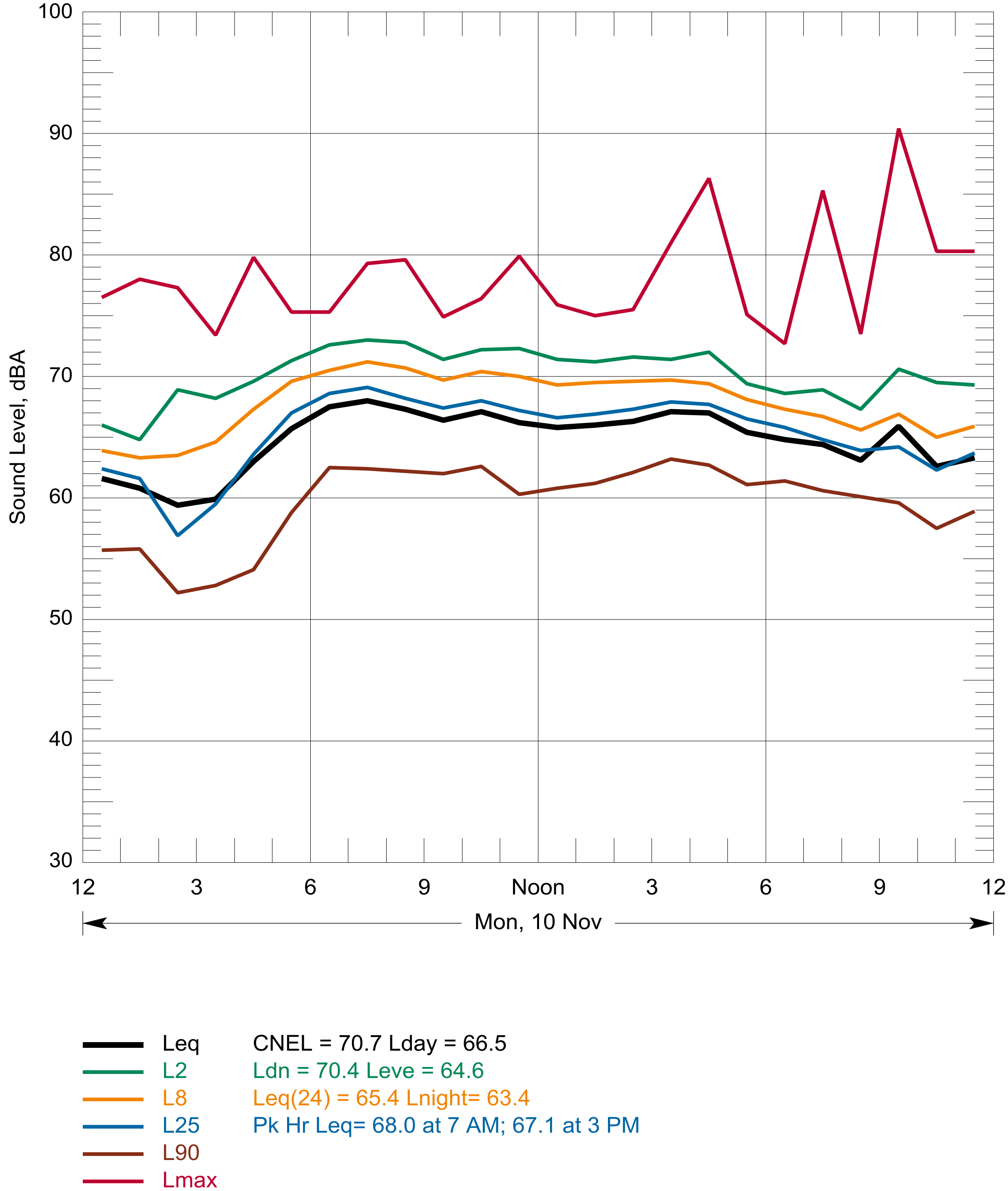

Figure A-28. Hourly Statistical Summary of Noise Levels on Nov 10, 2014 Location N3, 221 Beech Street at Alder St., Longview, WA

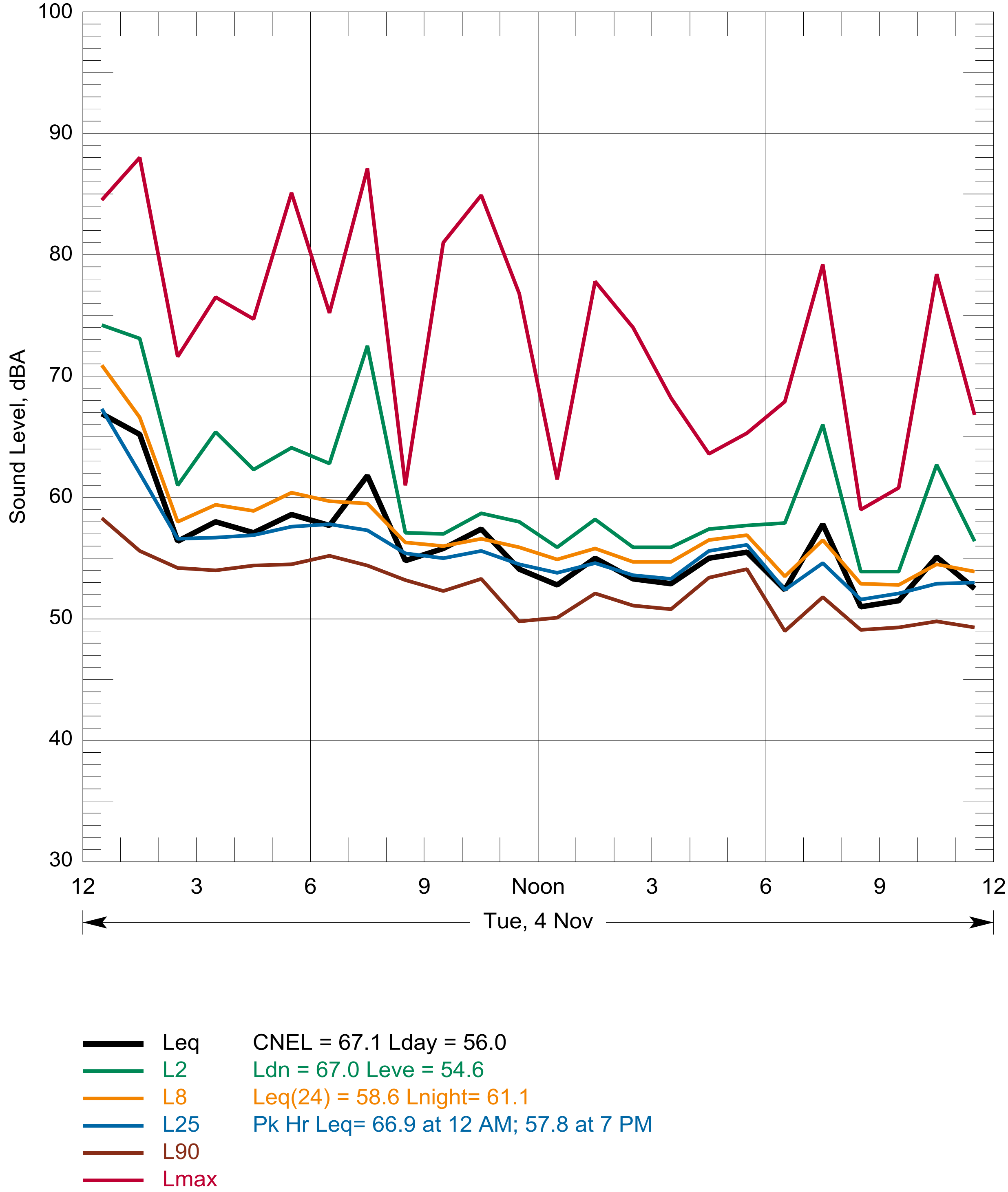

Figure A-29. Hourly Statistical Summary of Noise Levels on Nov 4, 2014 Location N4, 875-34th Avenue, Longview, WA

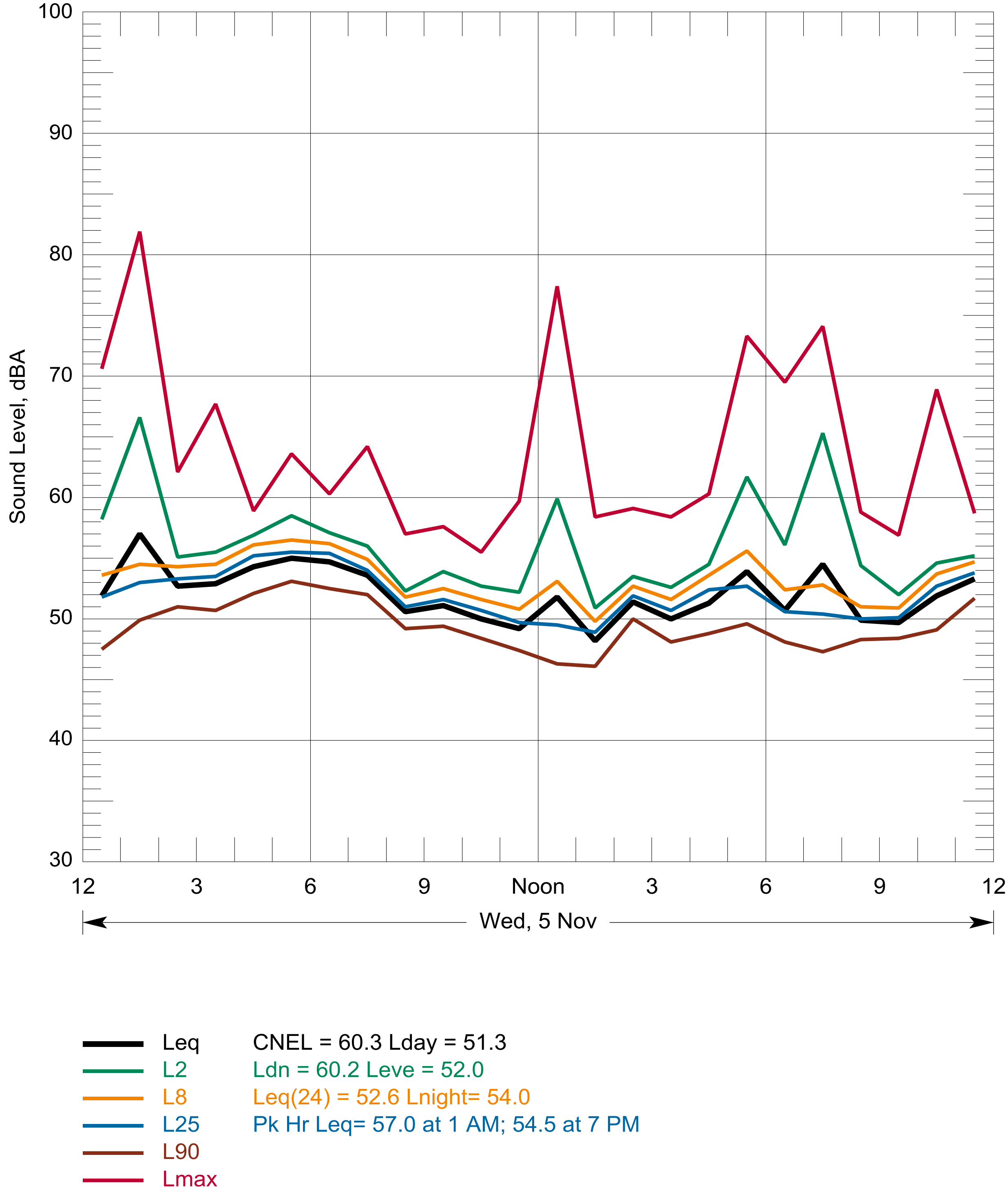

Figure A-30. Hourly Statistical Summary of Noise Levels on Nov 5, 2014 Location N4, 875-34th Avenue, Longview, WA

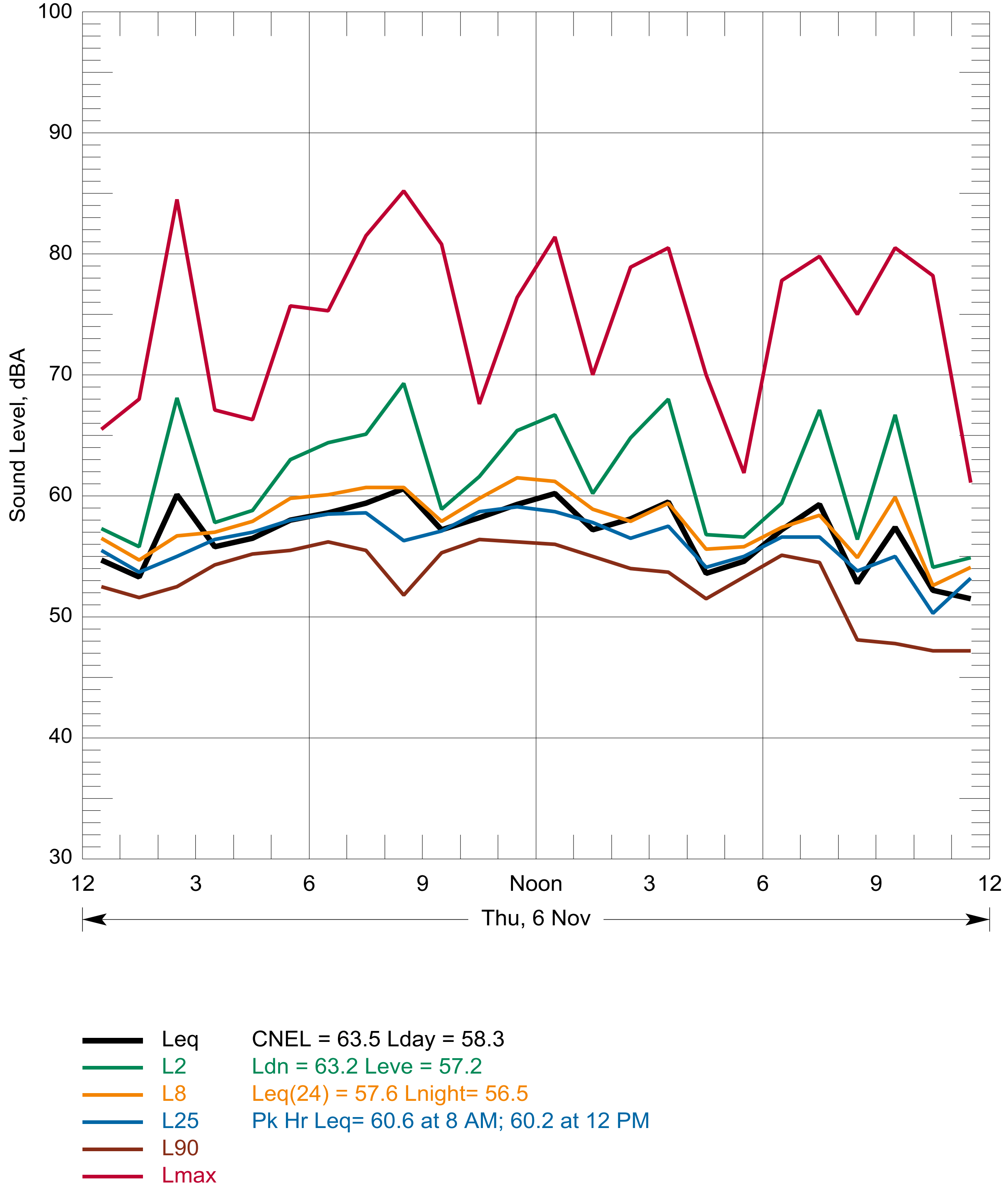

Figure A-31. Hourly Statistical Summary of Noise Levels on Nov 6, 2014 Location N4, 875-34th Avenue, Longview, WA

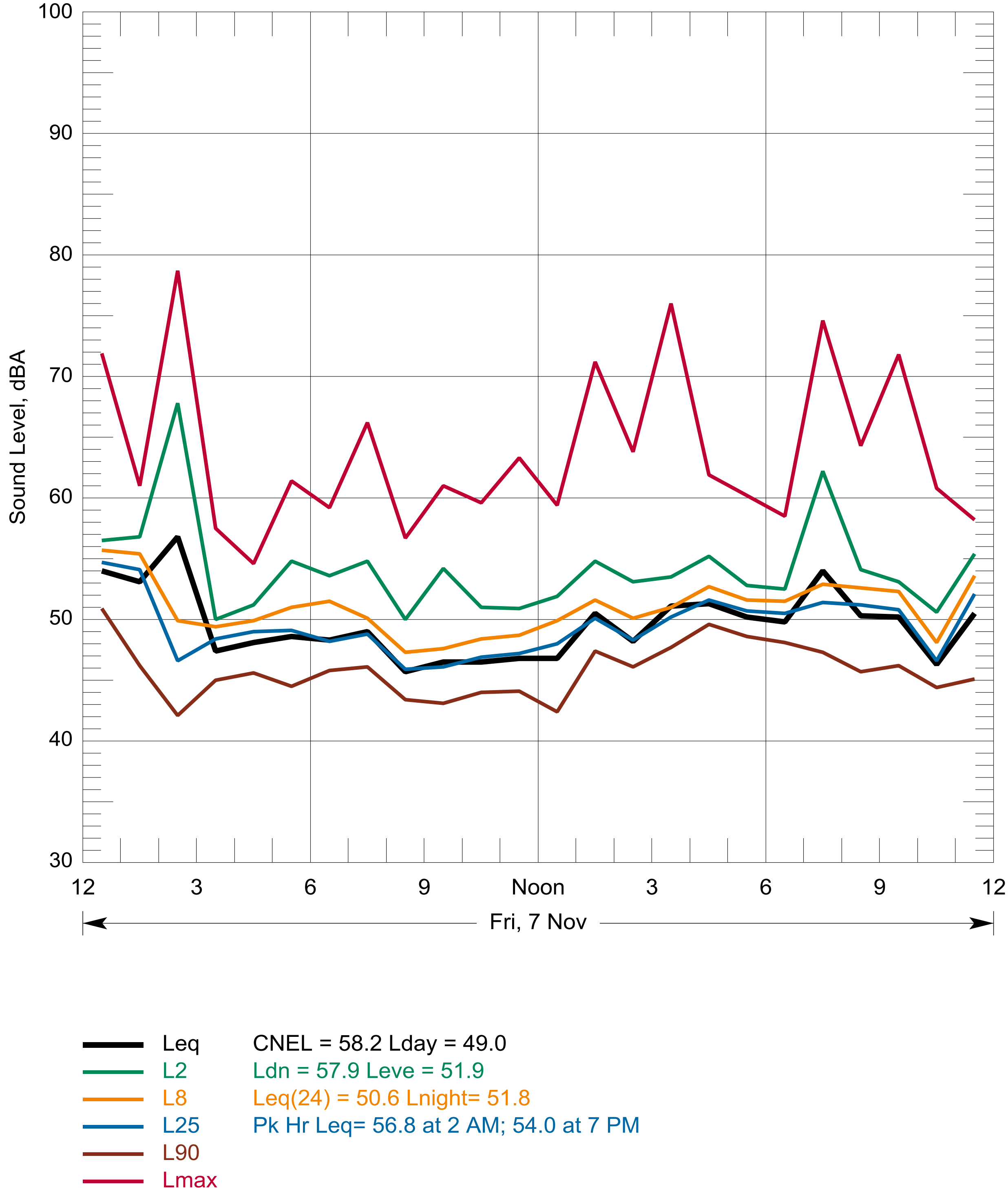

Figure A-32. Hourly Statistical Summary of Noise Levels on Nov 7, 2014 Location N4, 875-34th Avenue, Longview, WA

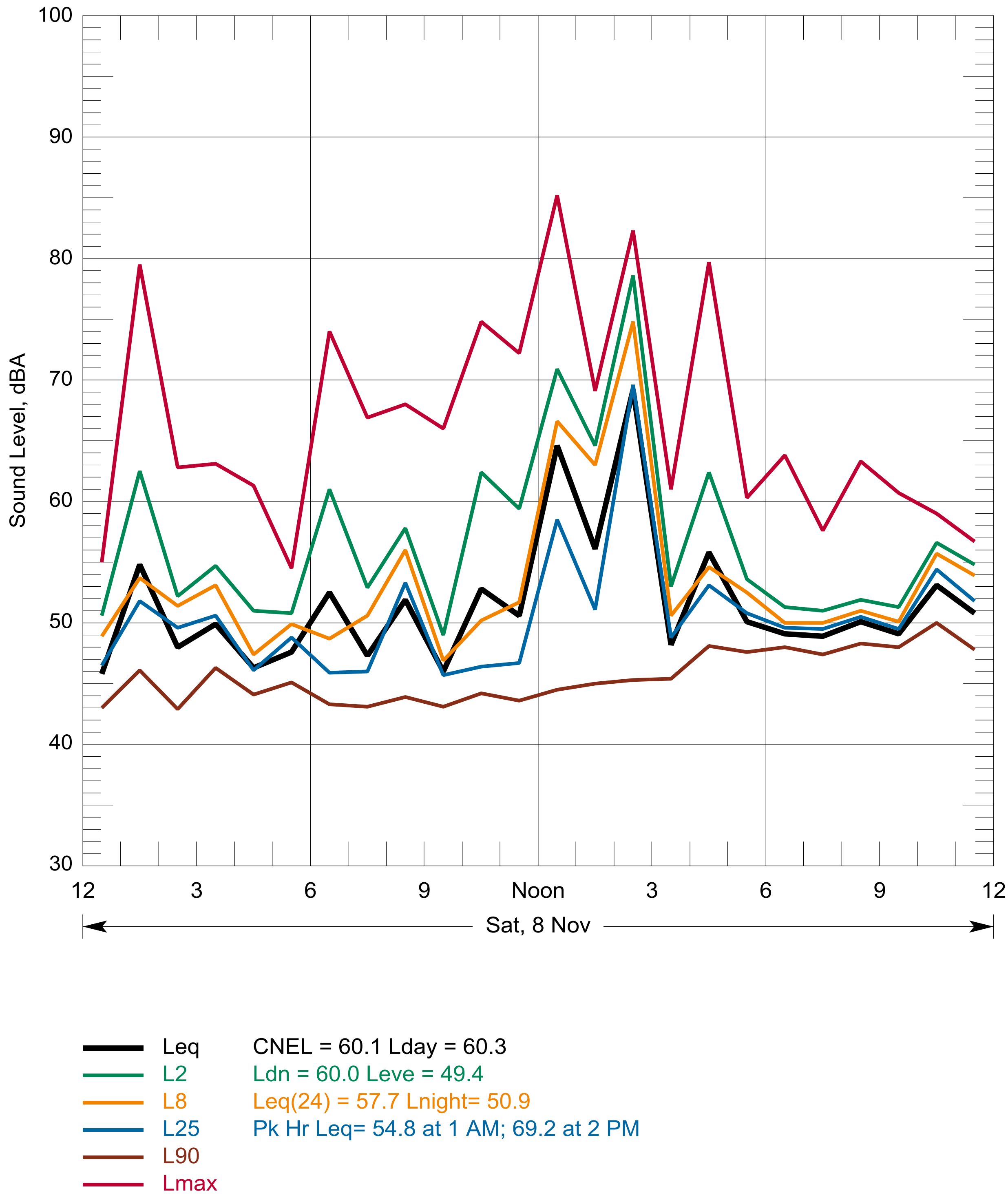

Figure A-33. Hourly Statistical Summary of Noise Levels on Nov 8, 2014 Location N4, 875-34th Avenue, Longview, WA

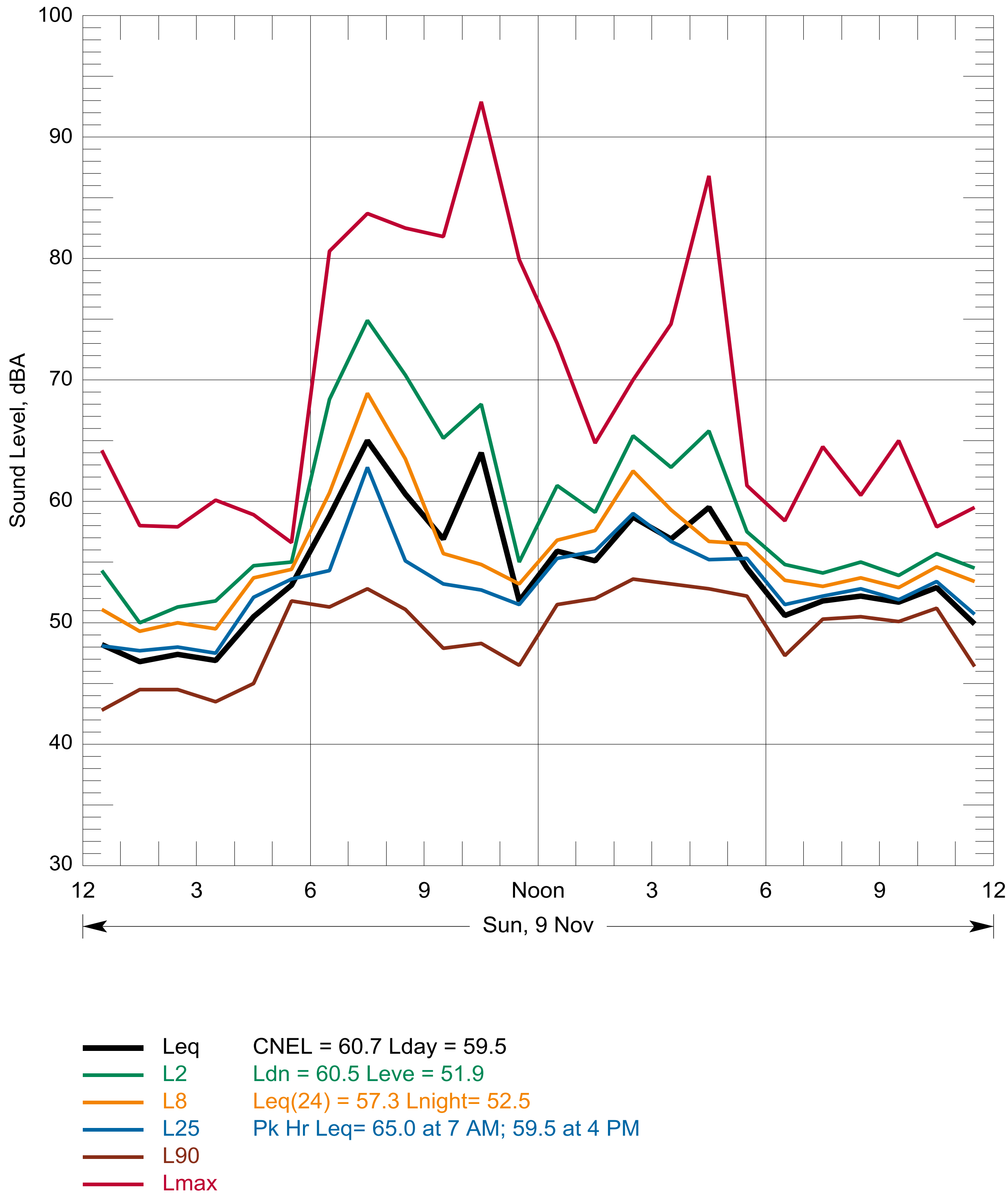

Figure A-34. Hourly Statistical Summary of Noise Levels on Nov 9, 2014 Location N4, 875-34th Avenue, Longview, WA

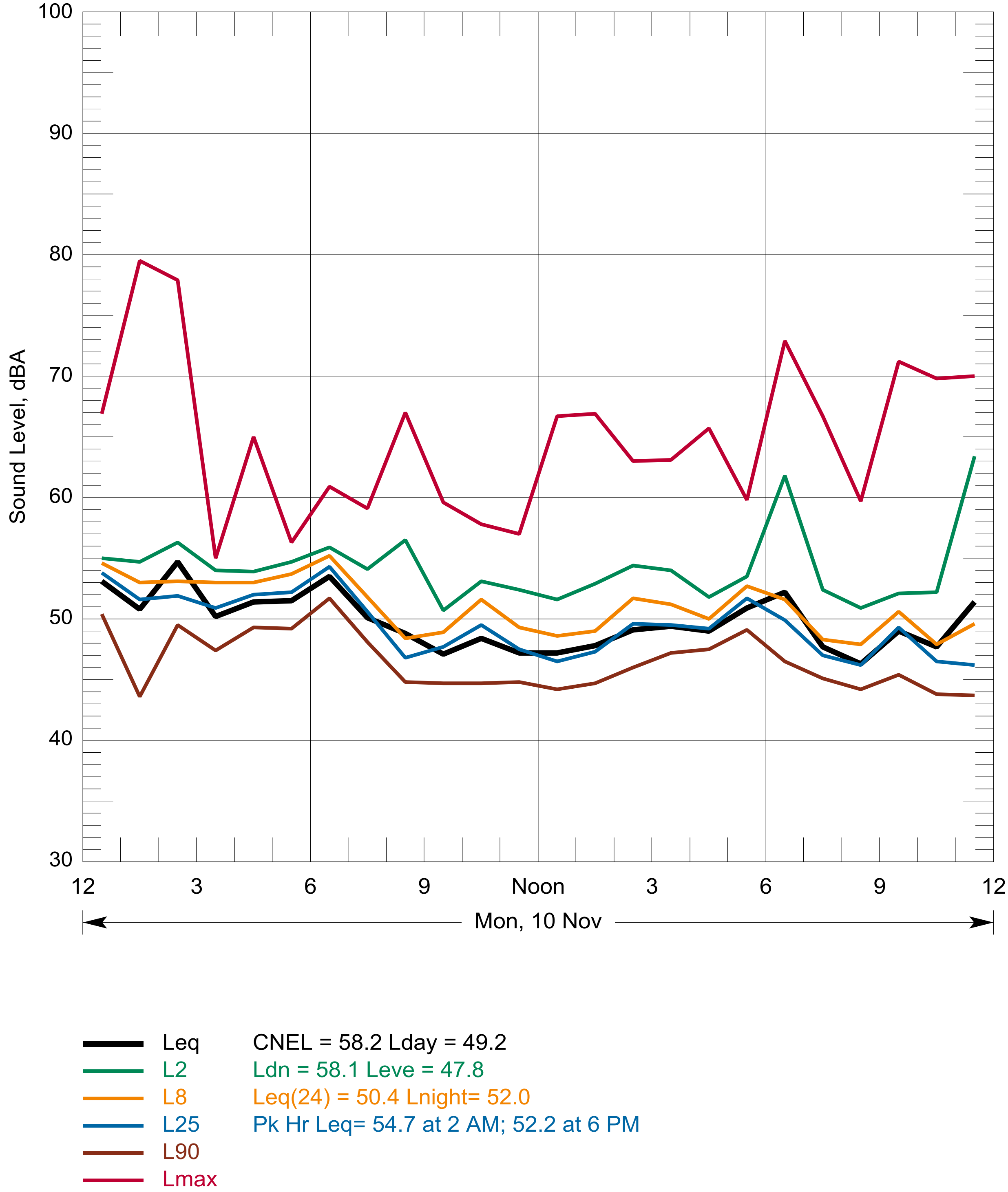

Figure A-35. Hourly Statistical Summary of Noise Levels on Nov 10, 2014 Location N4, 875-34th Avenue, Longview, WA

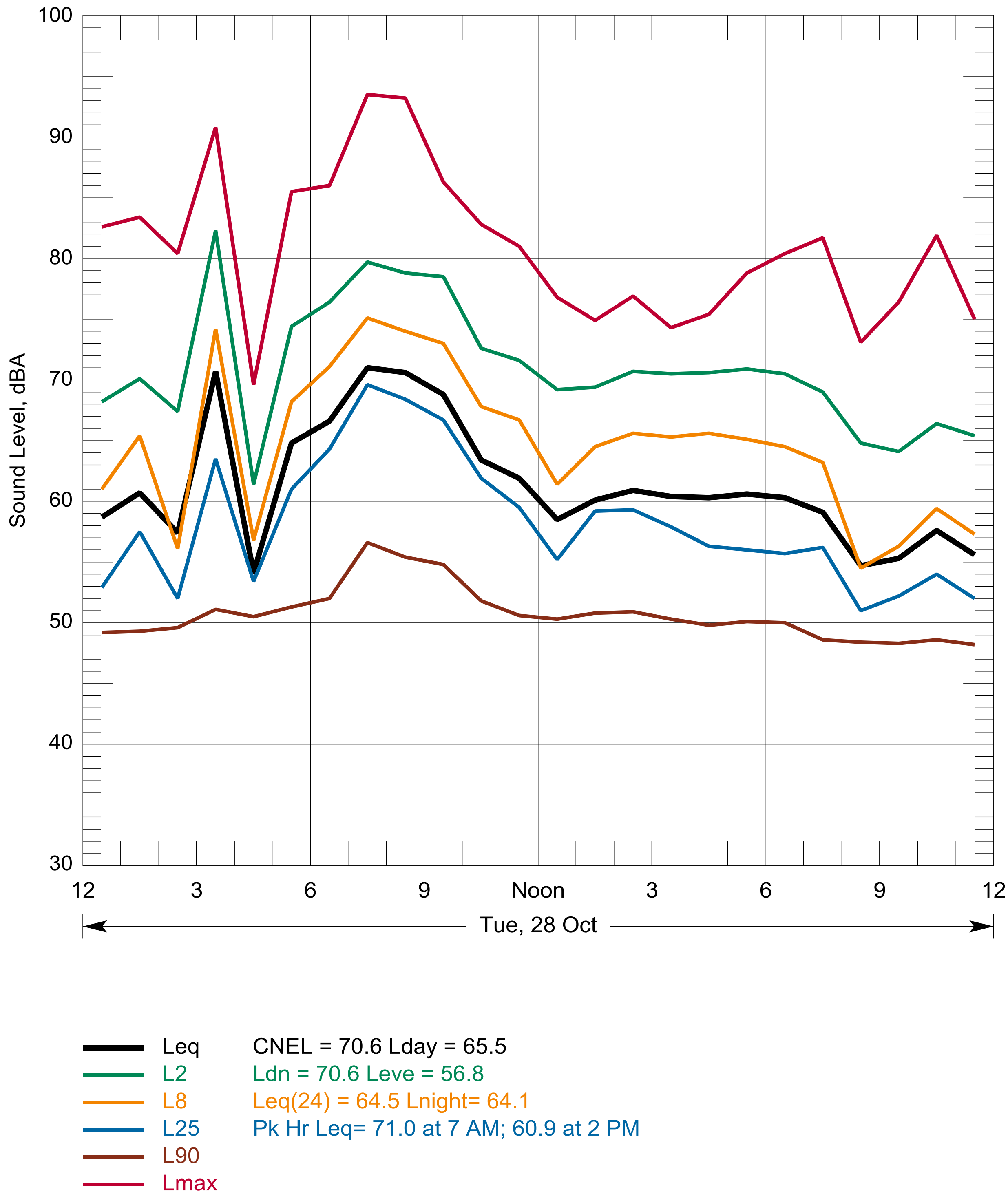

Figure A-36. Hourly Statistical Summary of Noise Levels on Oct 28, 2014 Location N5, 3600 Memorial Park Drive, Longview, WA

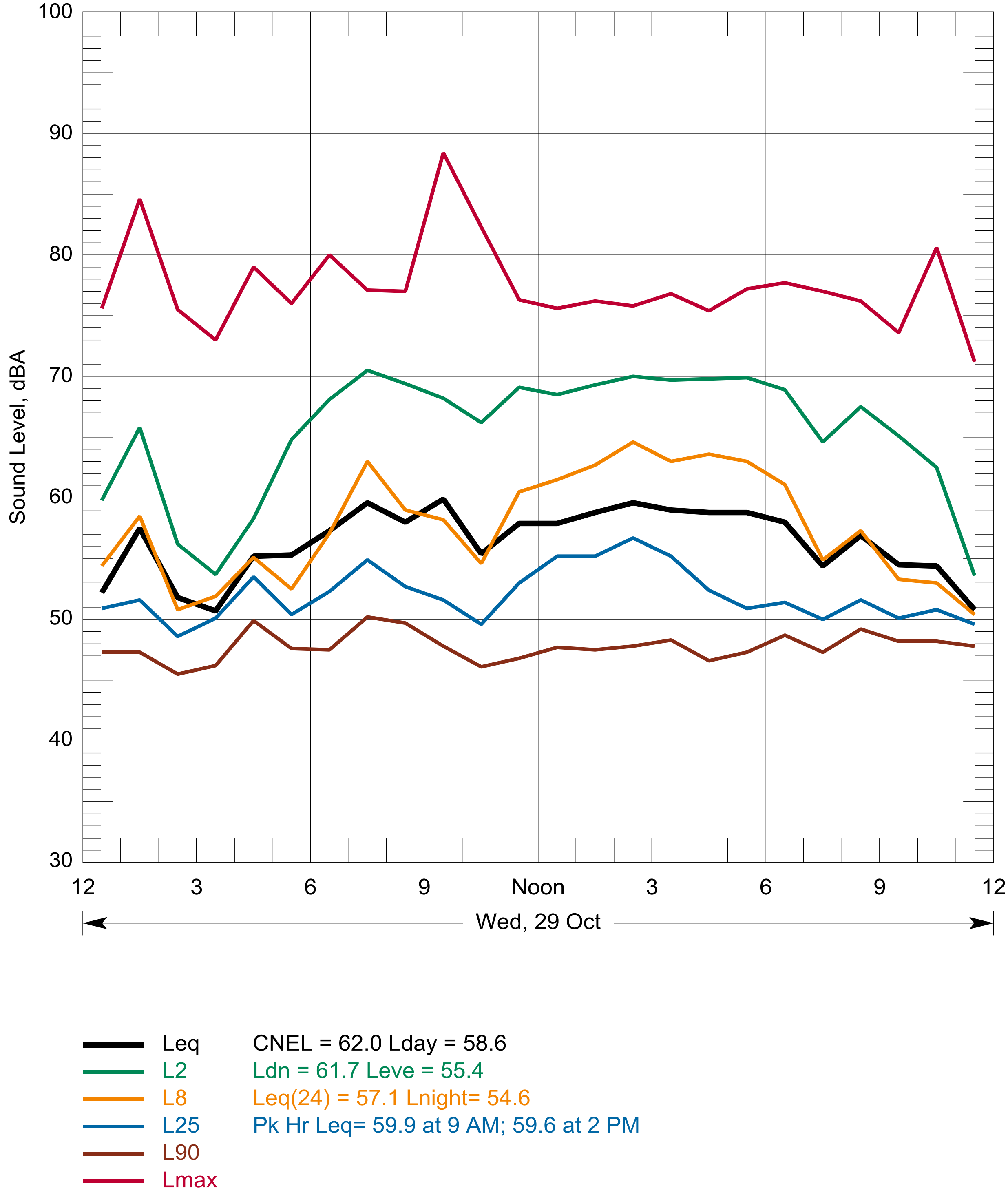

Figure A-37. Hourly Statistical Summary of Noise Levels on Oct 29, 2014 Location N5, 3600 Memorial Park Drive, Longview, WA

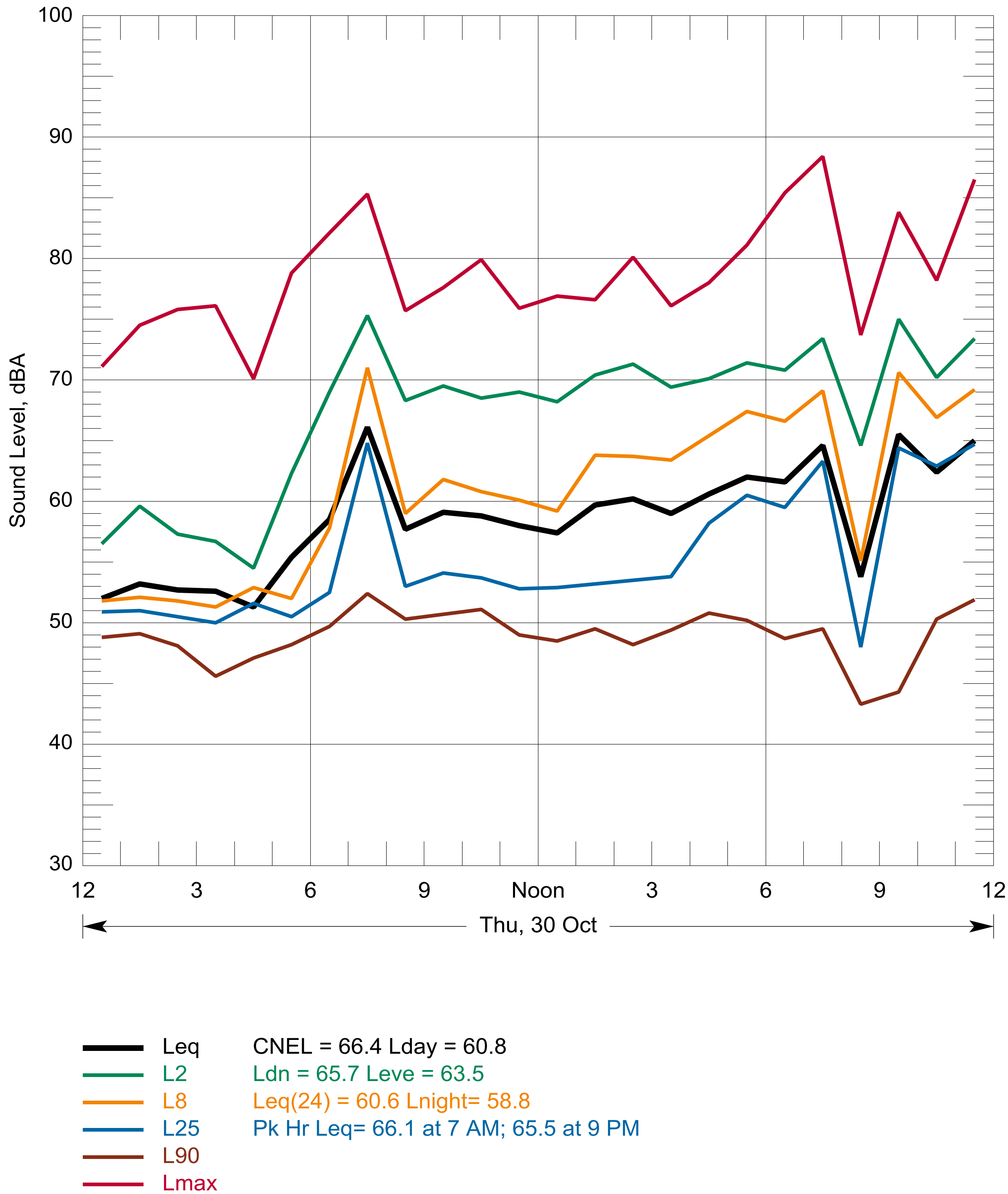

Figure A-38. Hourly Statistical Summary of Noise Levels on Oct 30, 2014 Location N5, 3600 Memorial Park Drive, Longview, WA

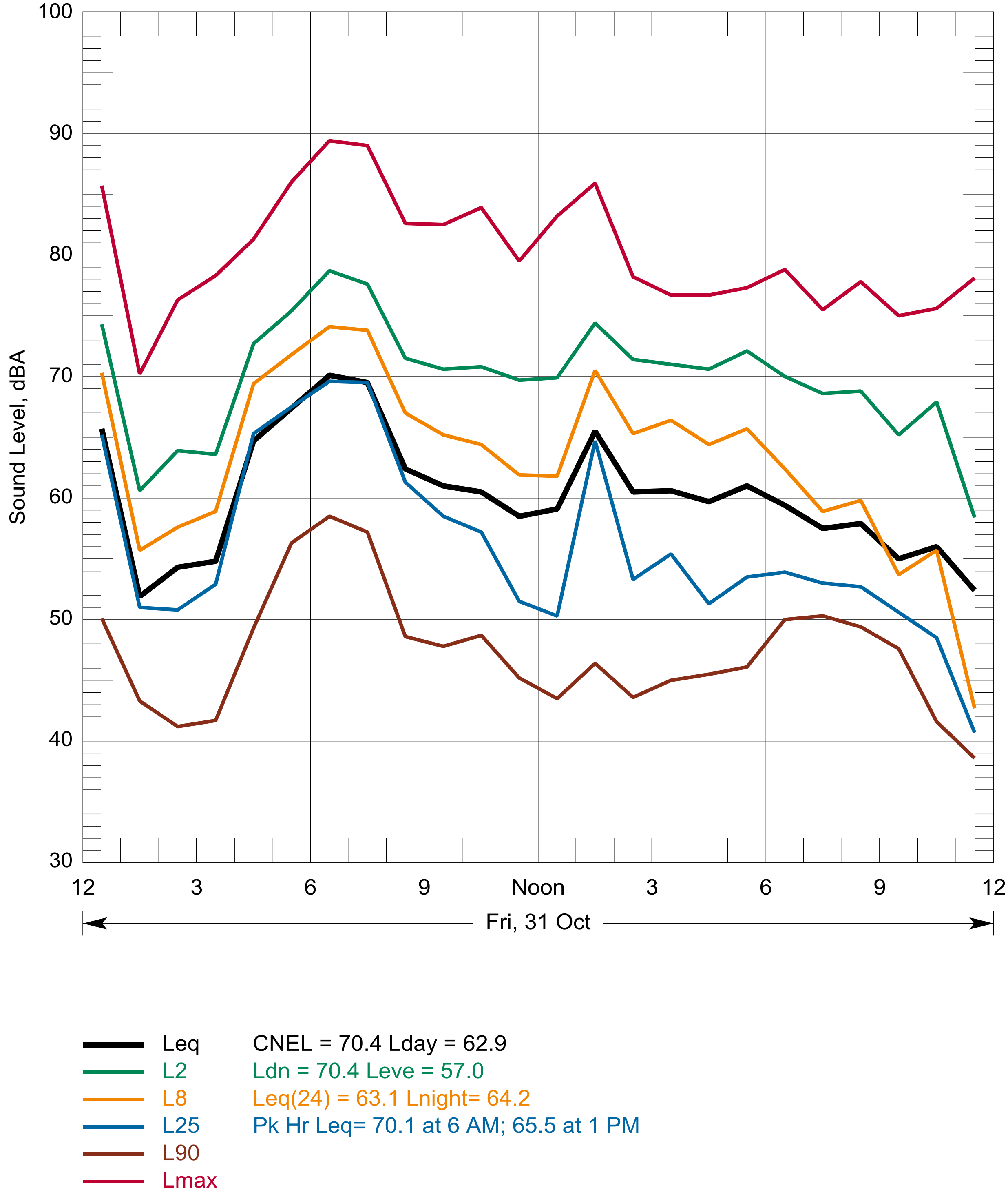

Figure A-39. Hourly Statistical Summary of Noise Levels on Oct 31, 2014 Location N5, 3600 Memorial Park Drive, Longview, WA

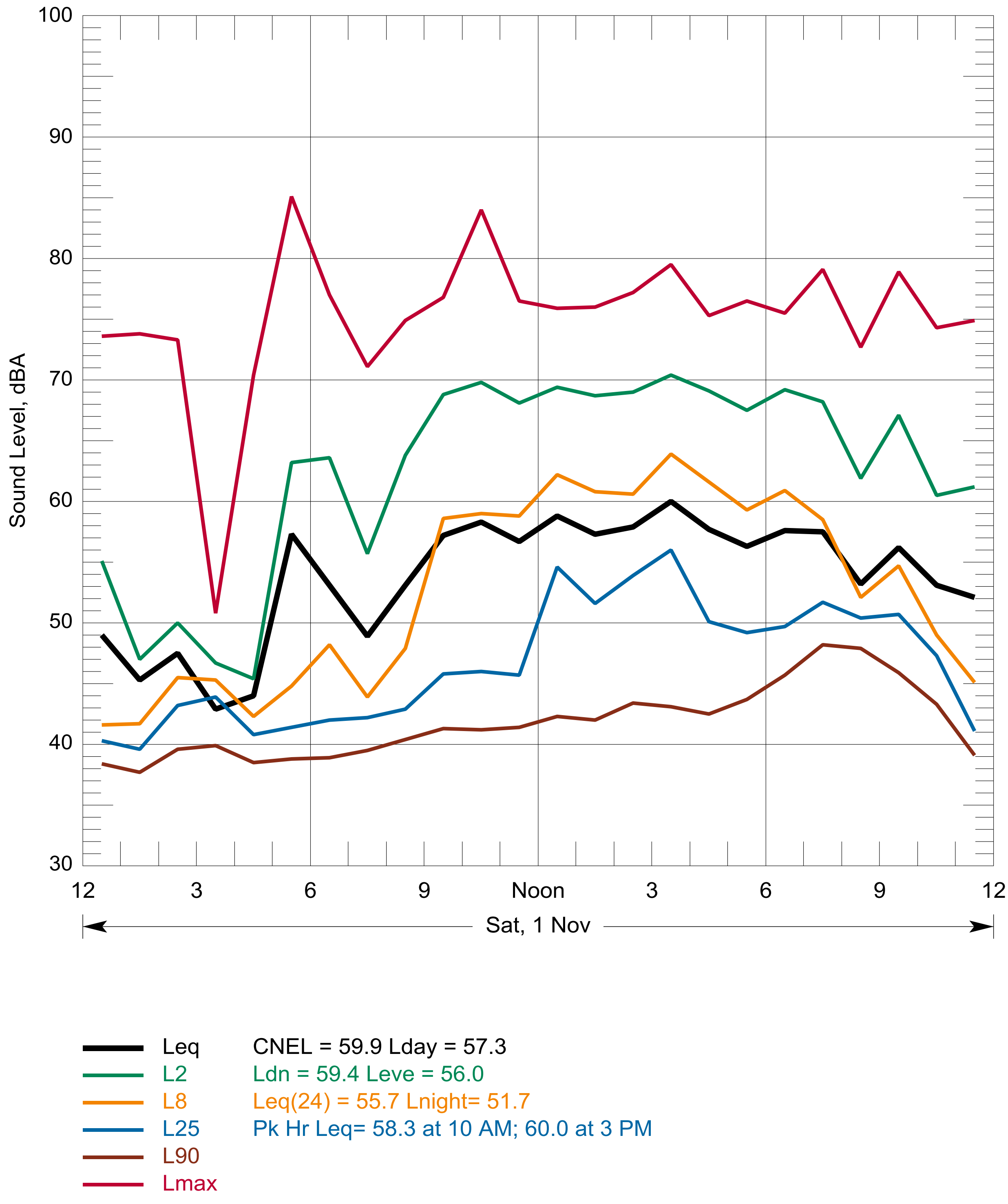

Figure A-40. Hourly Statistical Summary of Noise Levels on Nov 1, 2014 Location N5, 3600 Memorial Park Drive, Longview, WA

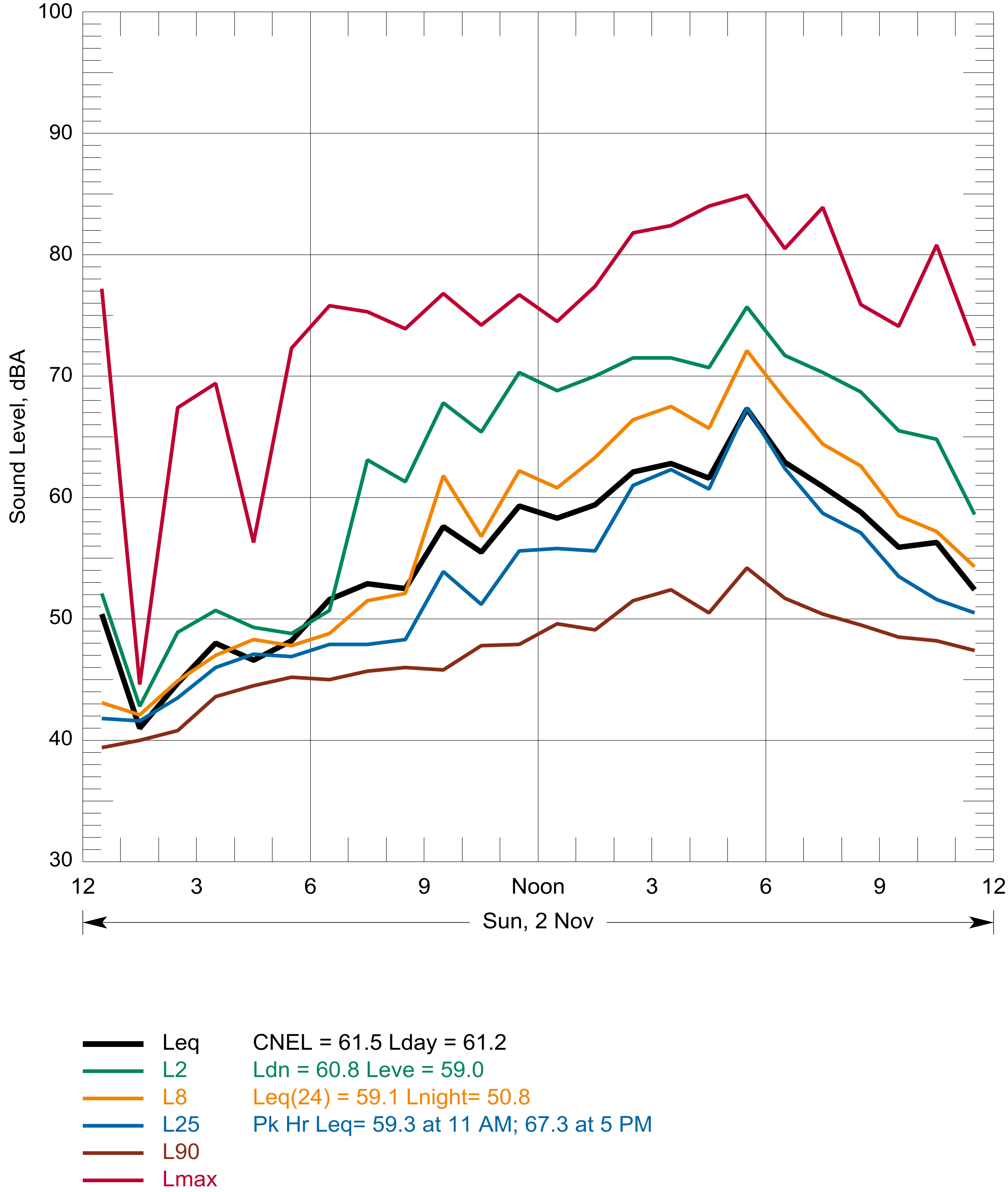

Figure A-41. Hourly Statistical Summary of Noise Levels on Nov 2, 2014 Location N5, 3600 Memorial Park Drive, Longview, WA

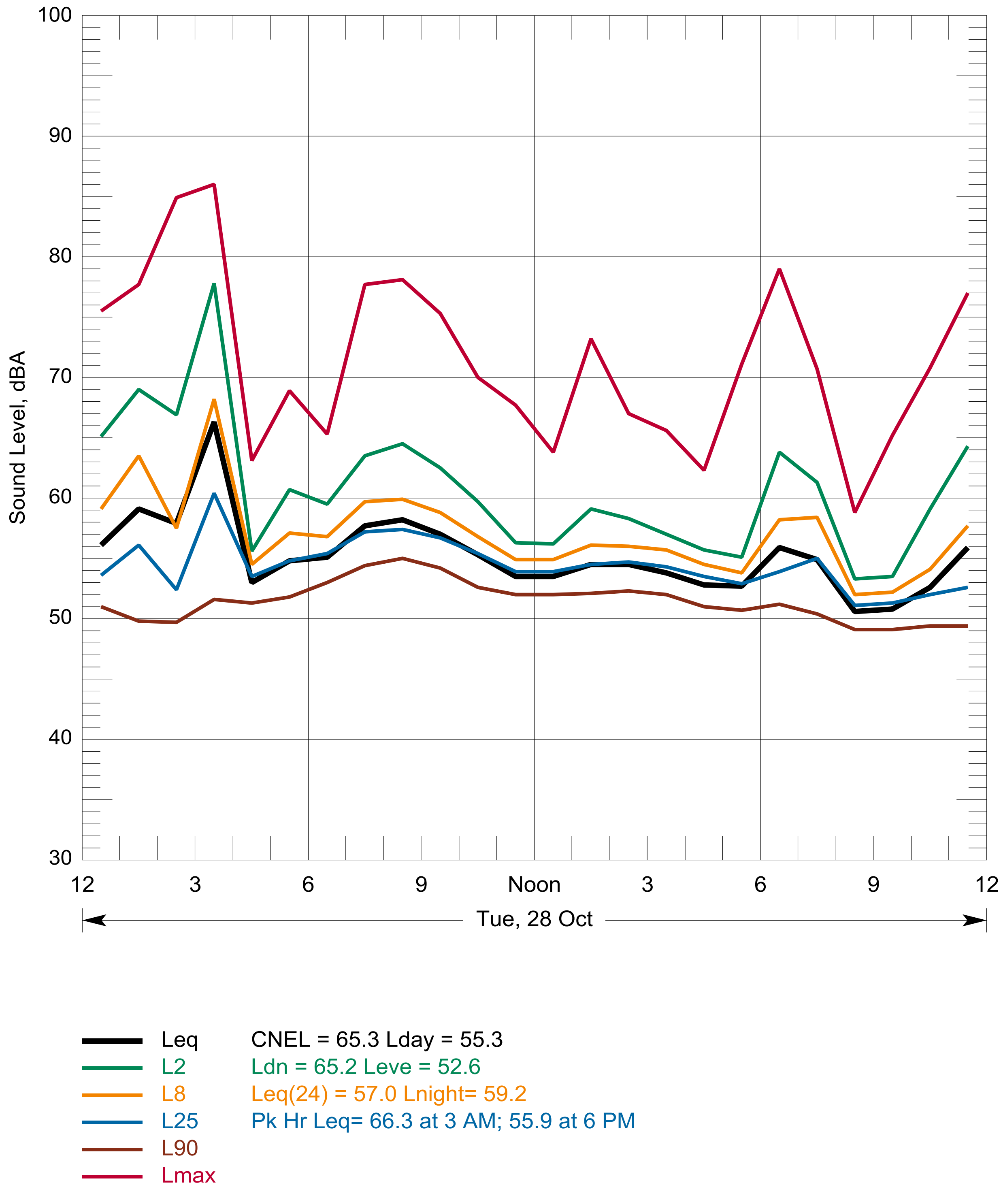

Figure A-42. Hourly Statistical Summary of Noise Levels on Oct 28, 2014 Location N6, 420 Rutherglen Drive, Longview, WA

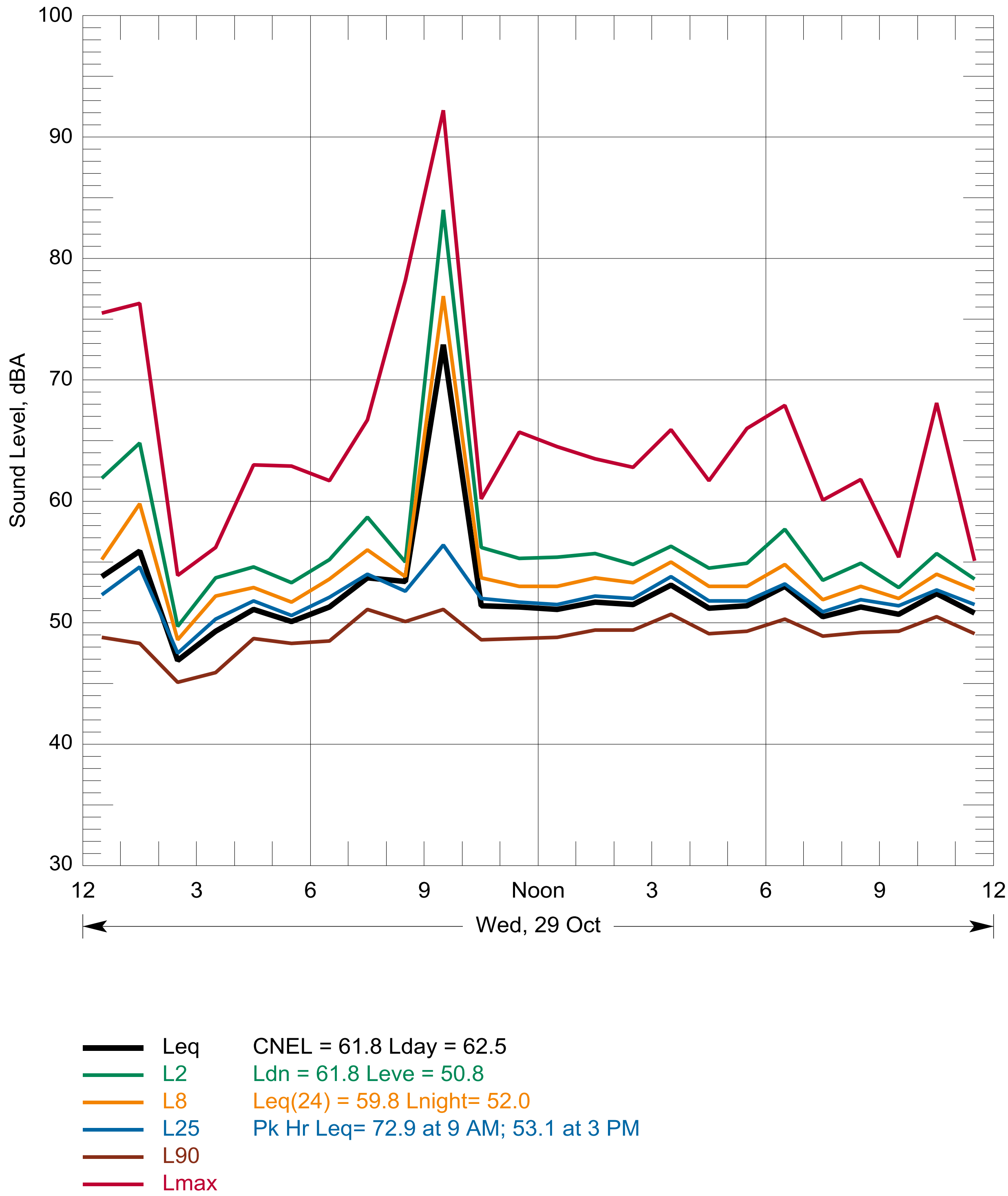

Figure A-43. Hourly Statistical Summary of Noise Levels on Oct 29, 2014 Location N6, 420 Rutherglen Drive, Longview, WA

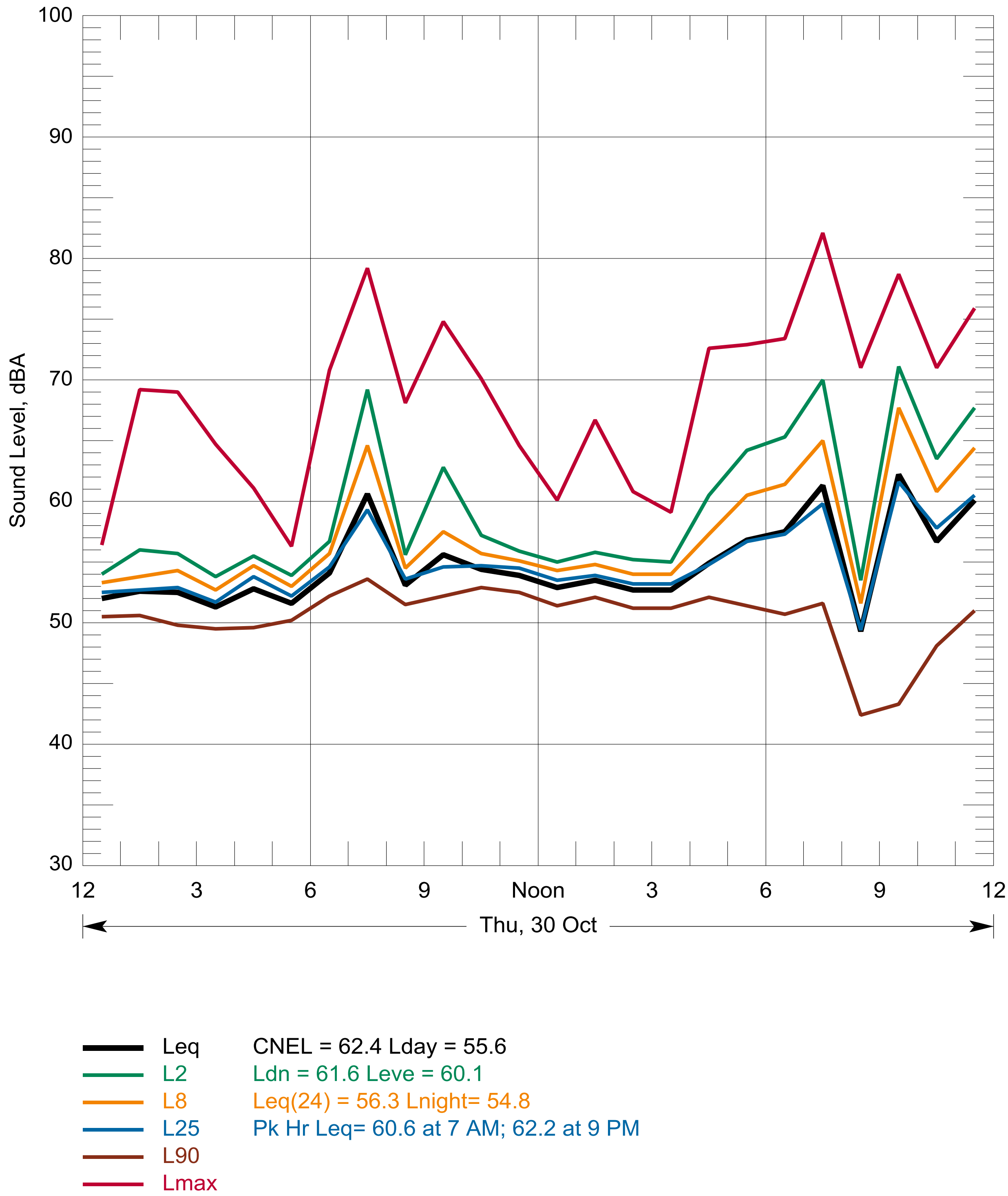

Figure A-44. Hourly Statistical Summary of Noise Levels on Oct 30, 2014 Location N6, 420 Rutherglen Drive, Longview, WA

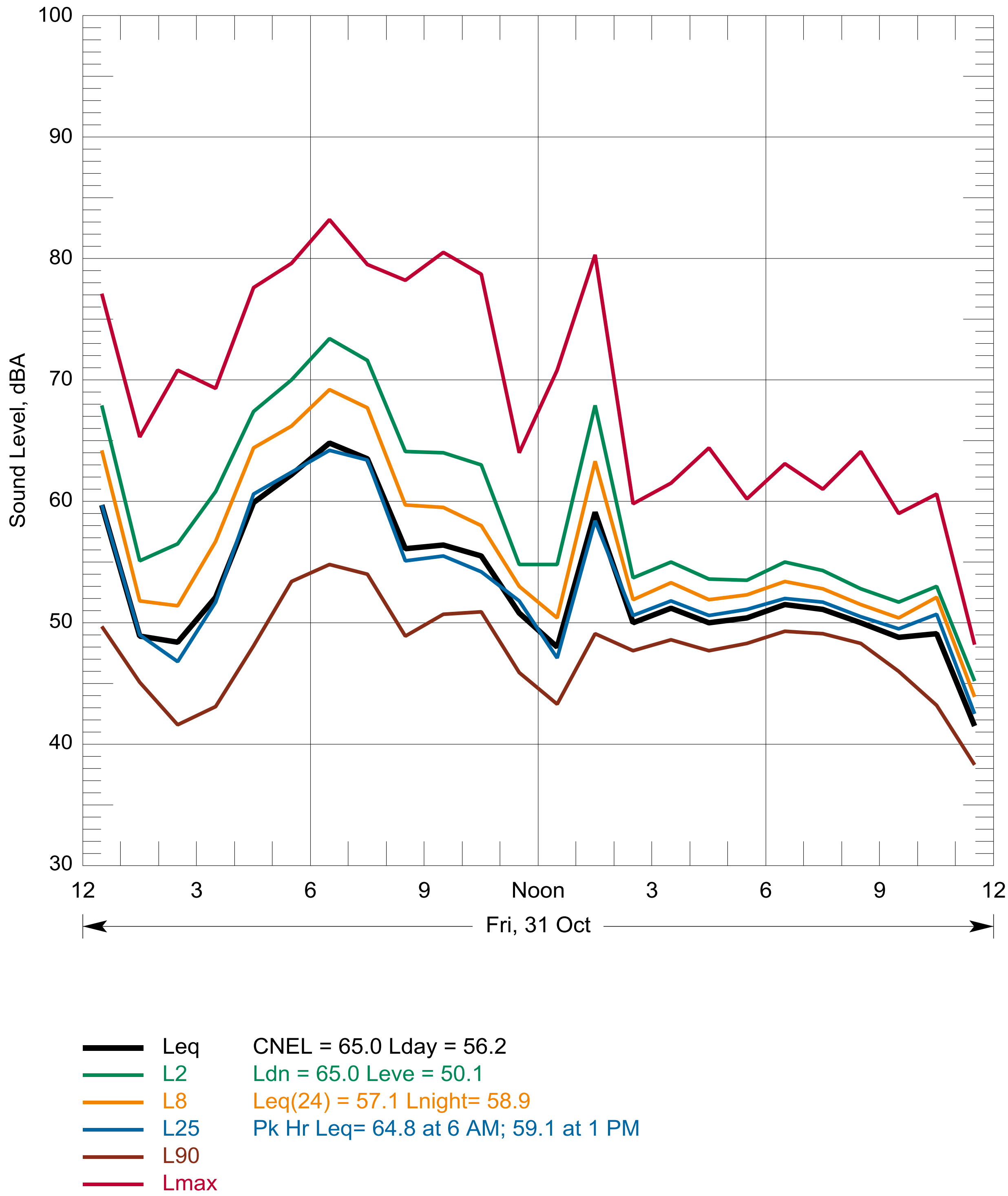

Figure A-45. Hourly Statistical Summary of Noise Levels on Oct 31, 2014 Location N6, 420 Rutherglen Drive, Longview, WA

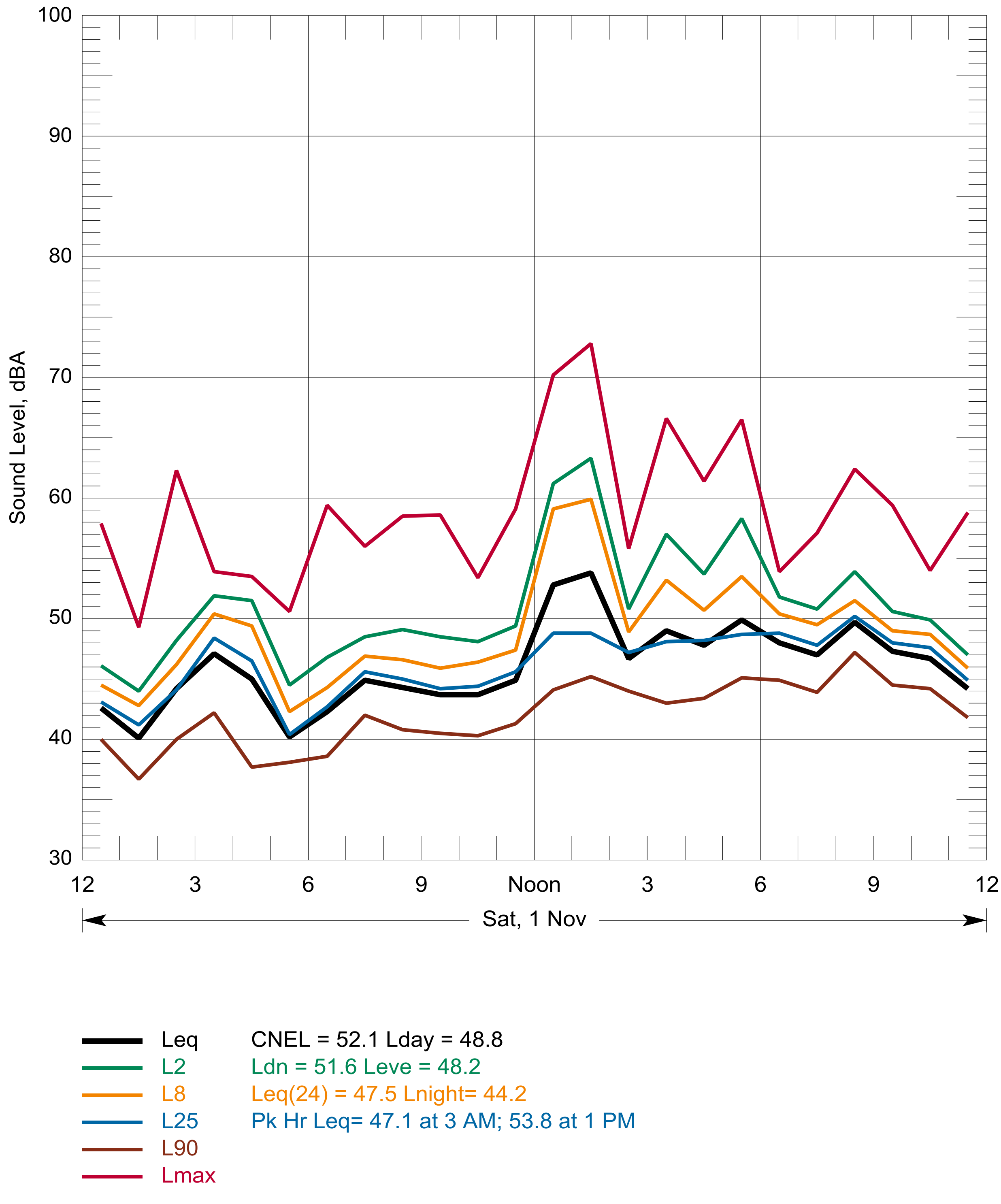

Figure A-46. Hourly Statistical Summary of Noise Levels on Nov 1, 2014 Location N6, 420 Rutherglen Drive, Longview, WA

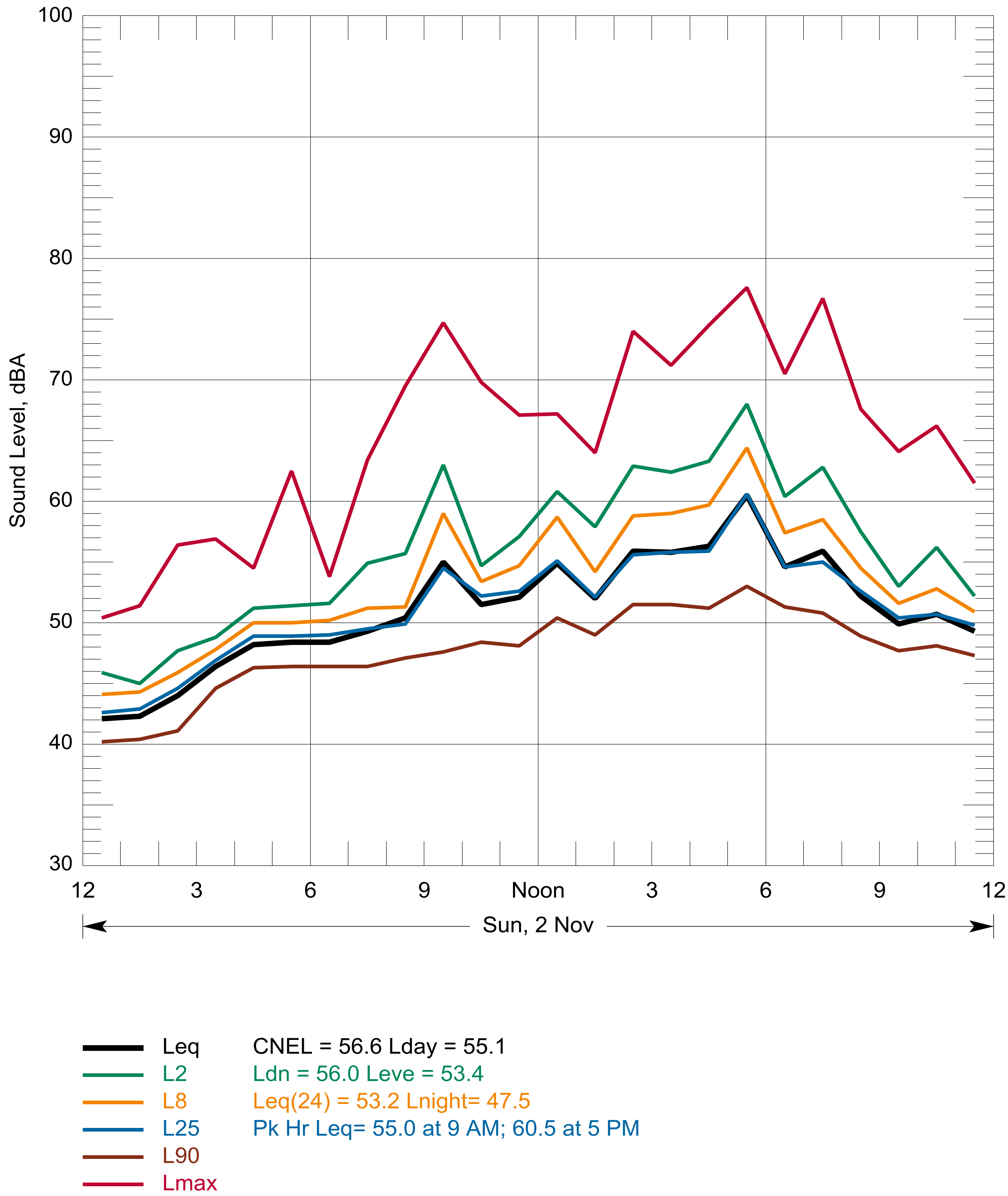

Figure A-47. Hourly Statistical Summary of Noise Levels on Nov 2, 2014 Location N6, 420 Rutherglen Drive, Longview, WA

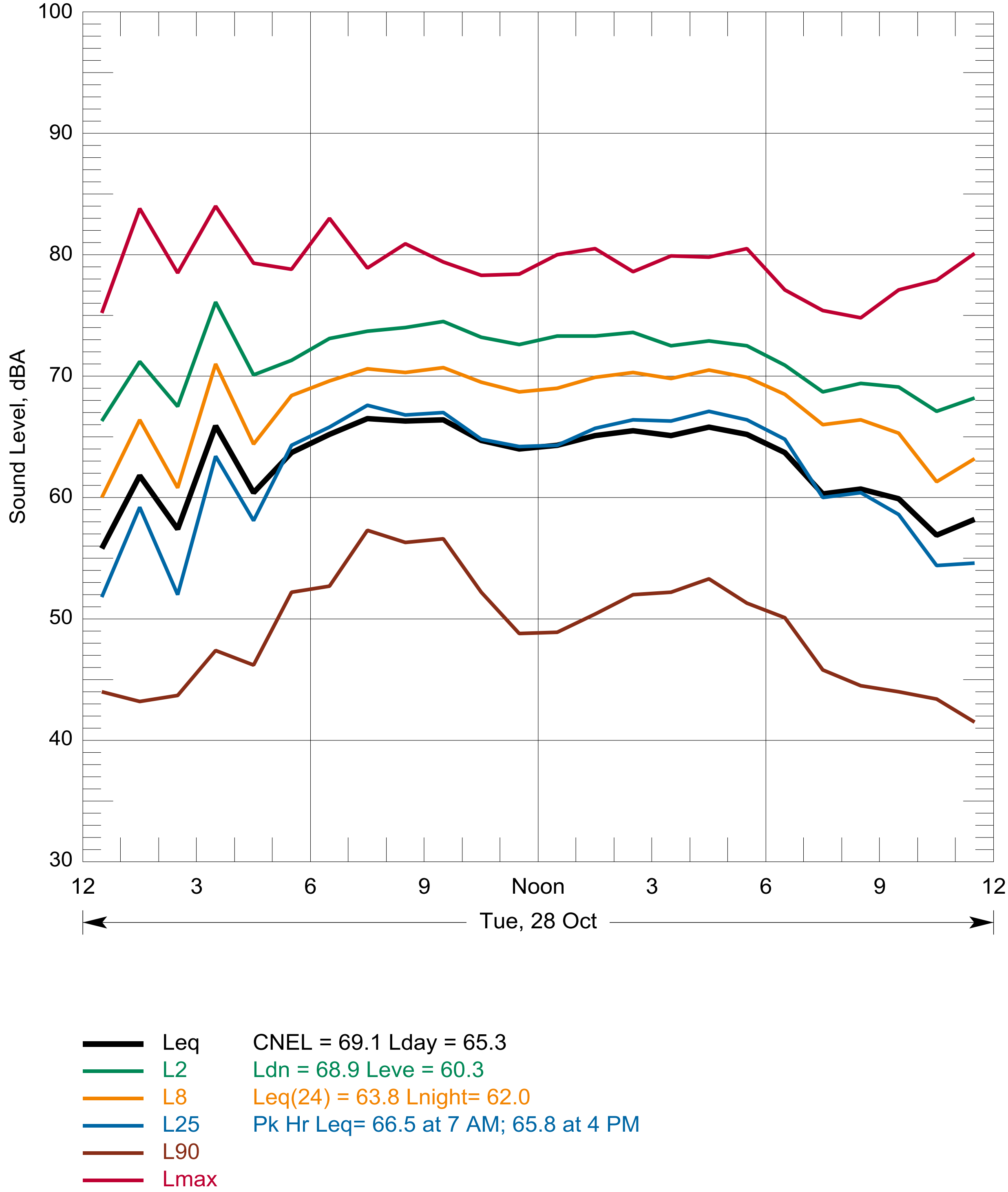

Figure A-48. Hourly Statistical Summary of Noise Levels on Oct 28, 2014 Location N7, 4723 Mount Solo Road, Longview, WA

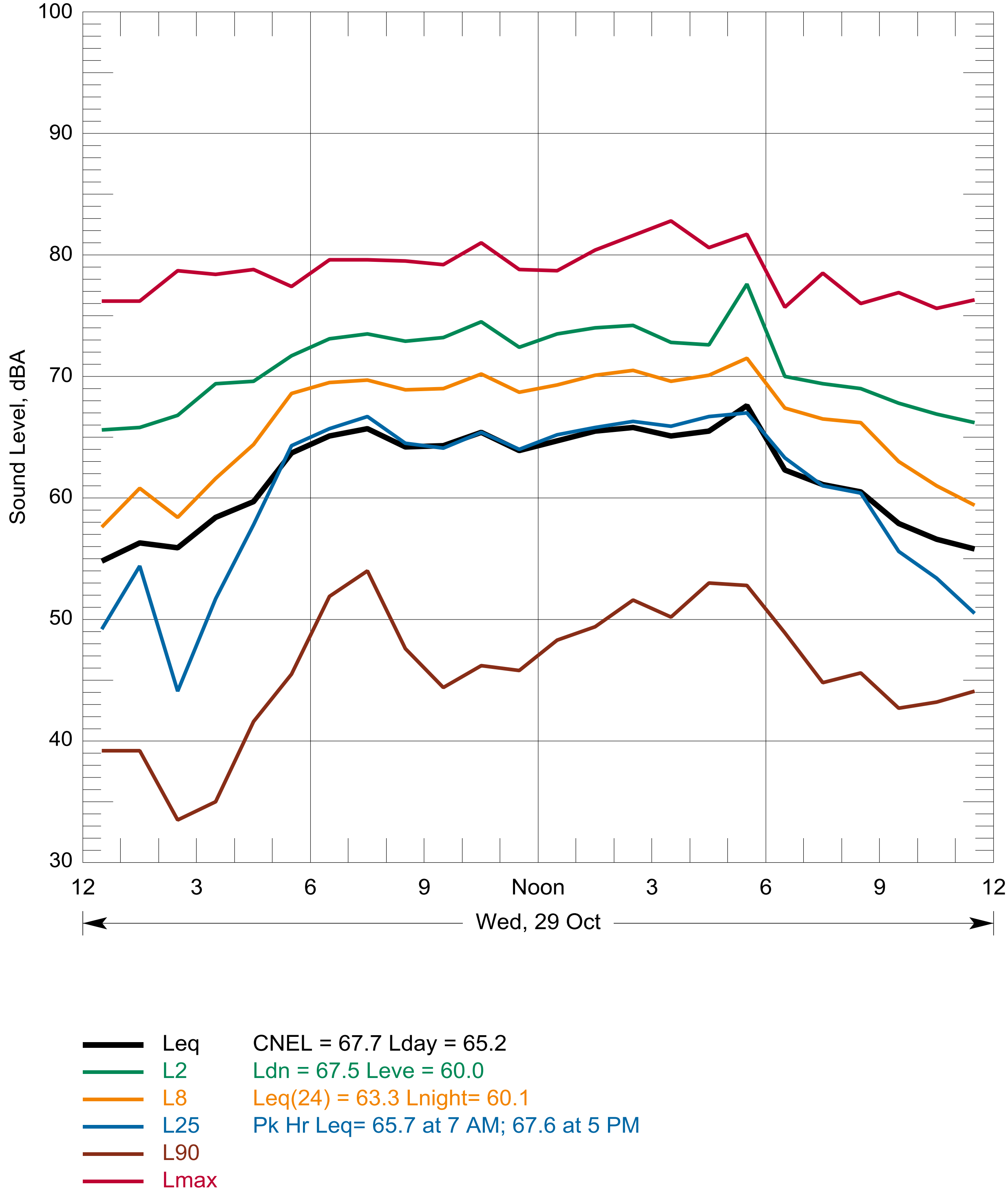

Figure A-49. Hourly Statistical Summary of Noise Levels on Oct 29, 2014 Location N7, 4723 Mount Solo Road, Longview, WA

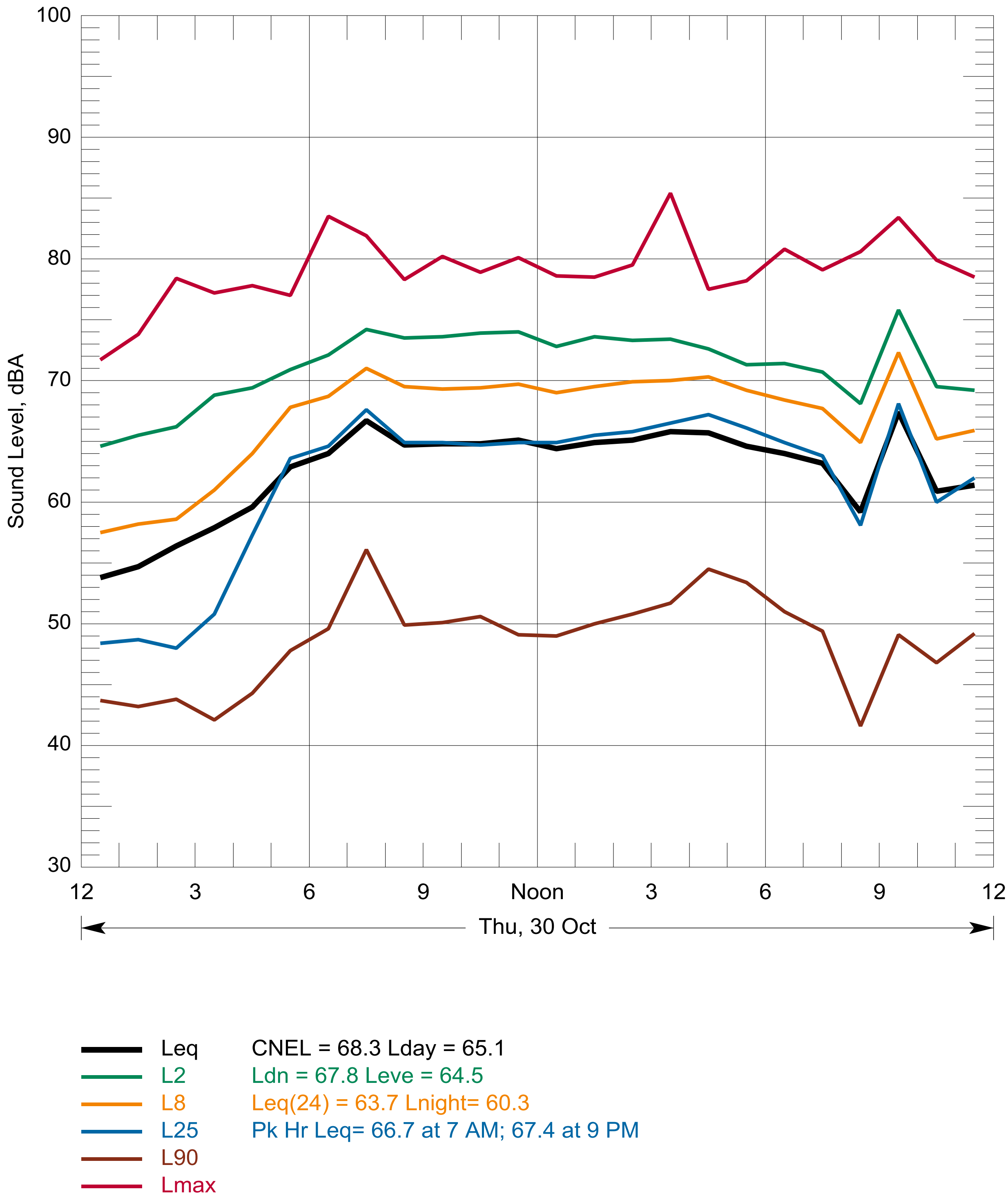

Figure A-50. Hourly Statistical Summary of Noise Levels on Oct 30, 2014 Location N7, 4723 Mount Solo Road, Longview, WA

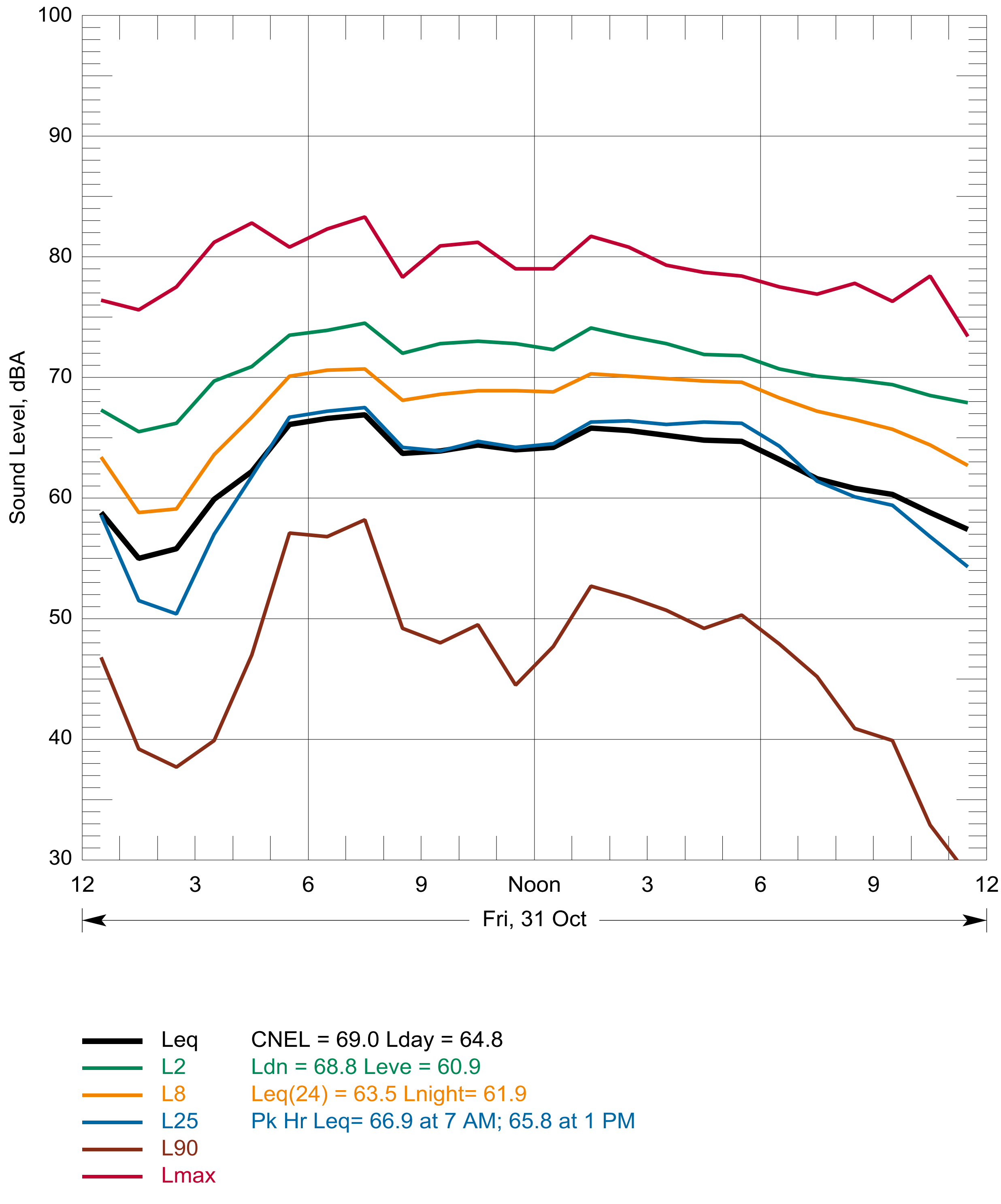

Figure A-51. Hourly Statistical Summary of Noise Levels on Oct 31, 2014 Location N7, 4723 Mount Solo Road, Longview, WA

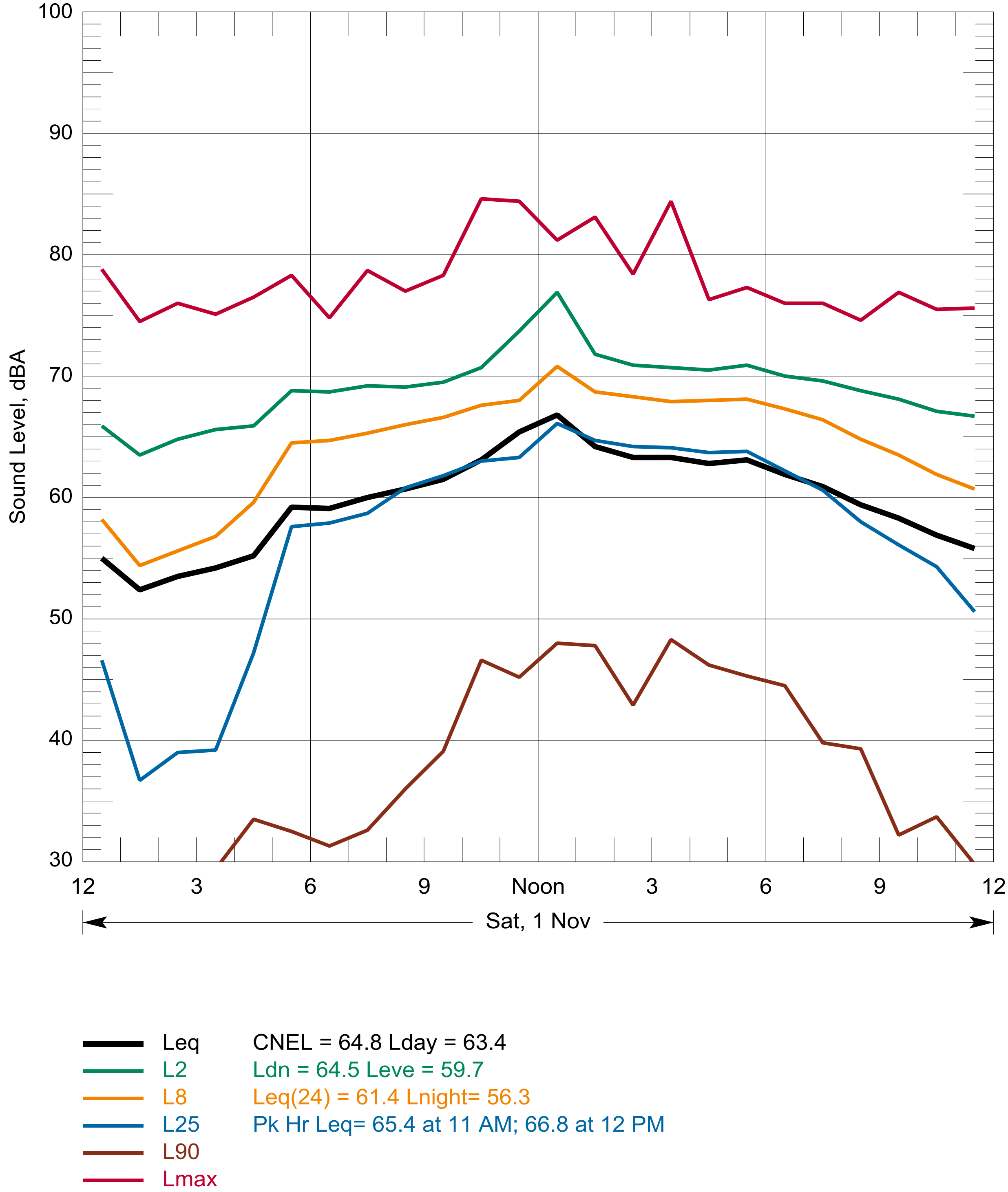

Figure A-52. Hourly Statistical Summary of Noise Levels on Nov 1, 2014 Location N7, 4723 Mount Solo Road, Longview, WA

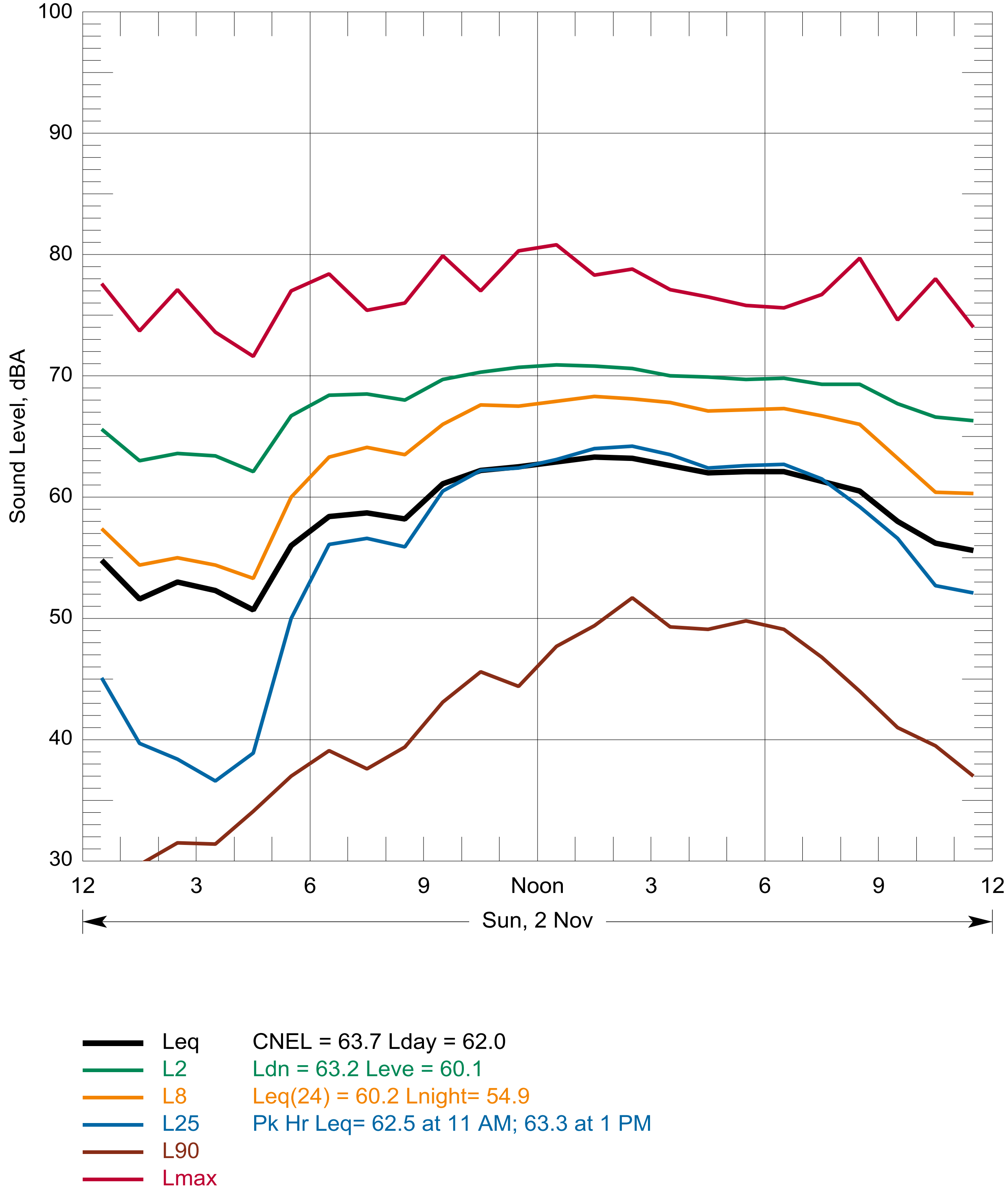

Figure A-53. Hourly Statistical Summary of Noise Levels on Nov 2, 2014 Location N7, 4723 Mount Solo Road, Longview, WA

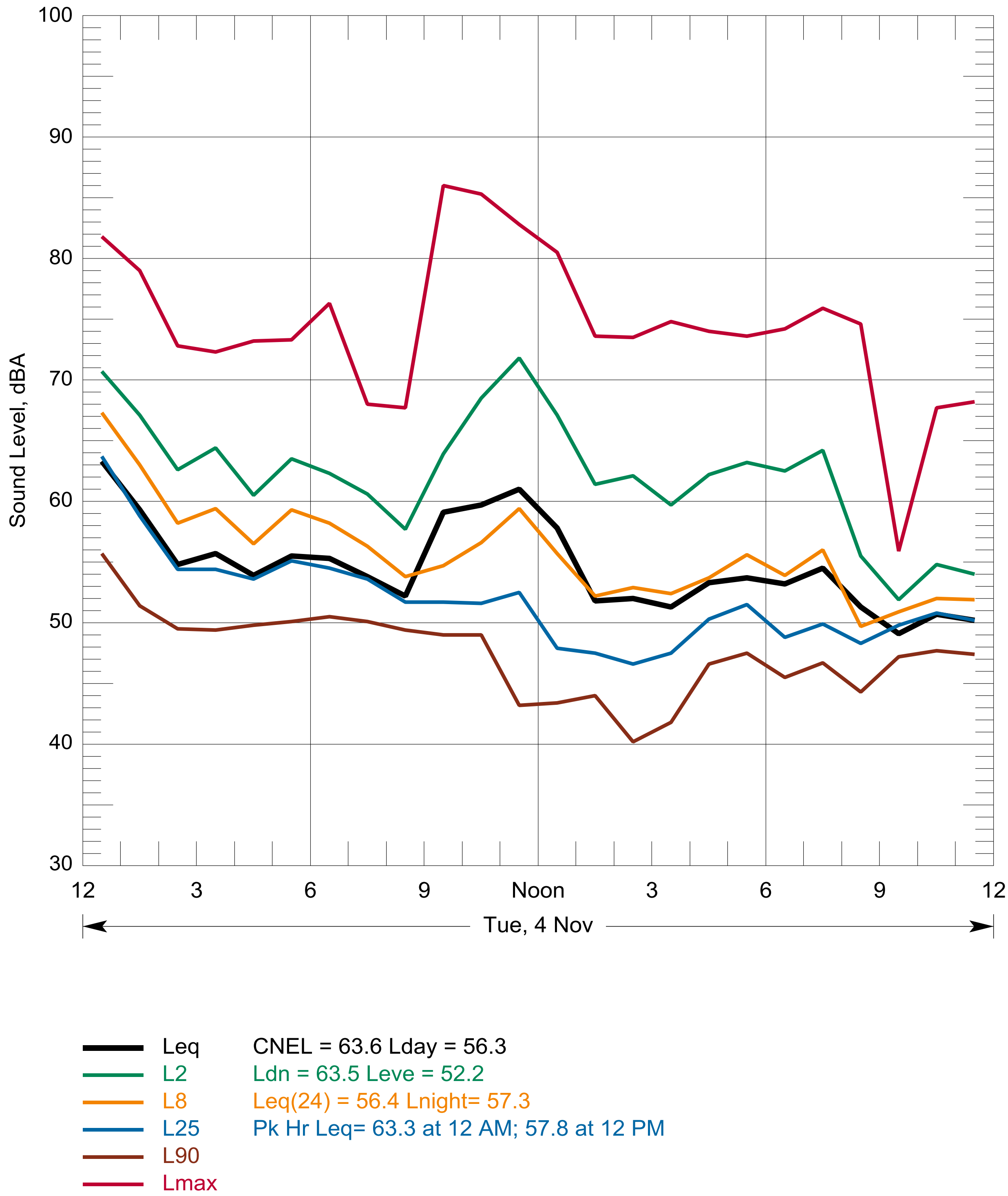

Figure A-54. Hourly Statistical Summary of Noise Levels on Nov 4, 2014 Location N8, 1719 Dorothy Avenue, Longview, WA

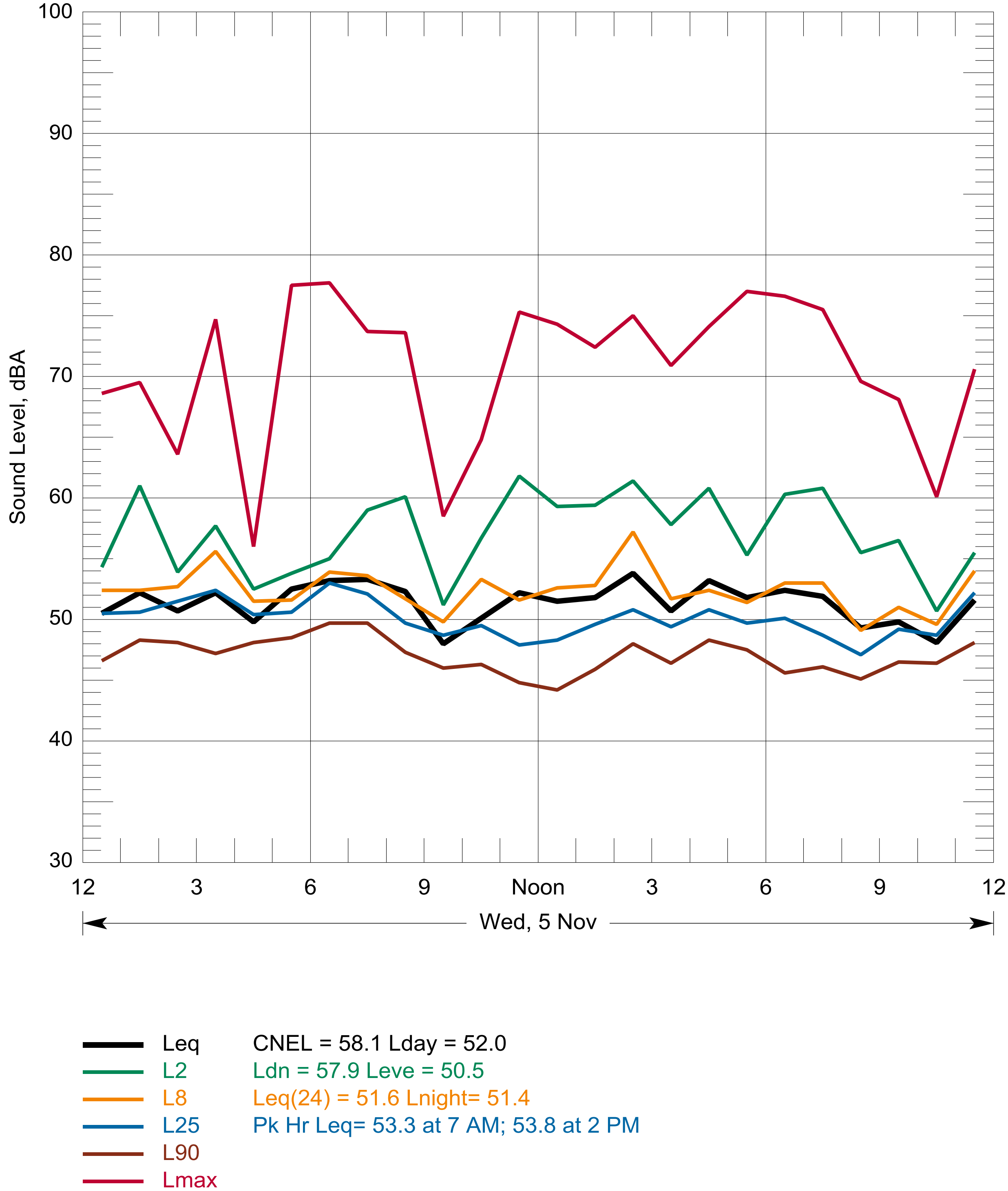

Figure A-55. Hourly Statistical Summary of Noise Levels on Nov 5, 2014 Location N8, 1719 Dorothy Avenue, Longview, WA

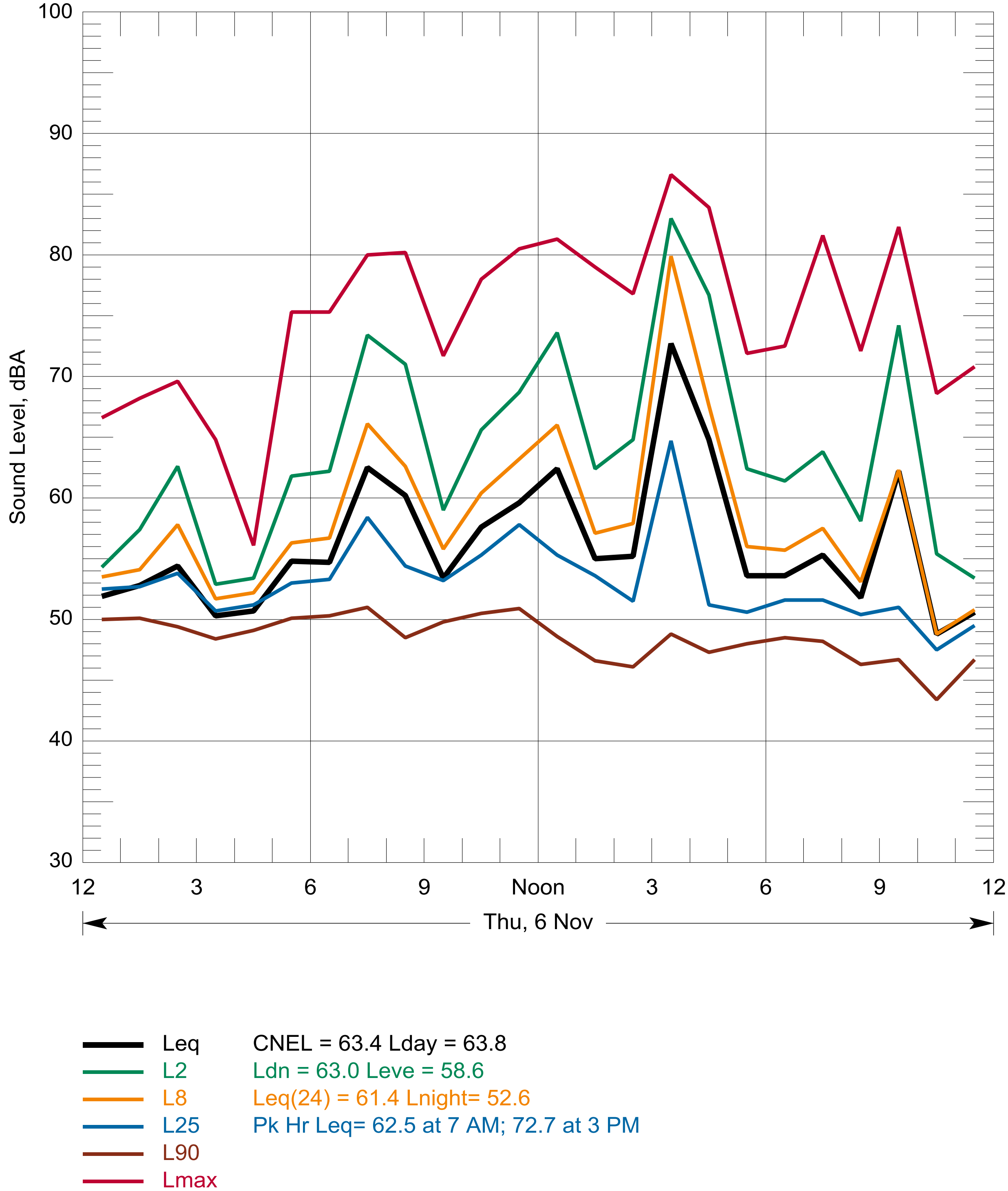

Figure A-56. Hourly Statistical Summary of Noise Levels on Nov 6, 2014 Location N8, 1719 Dorothy Avenue, Longview, WA

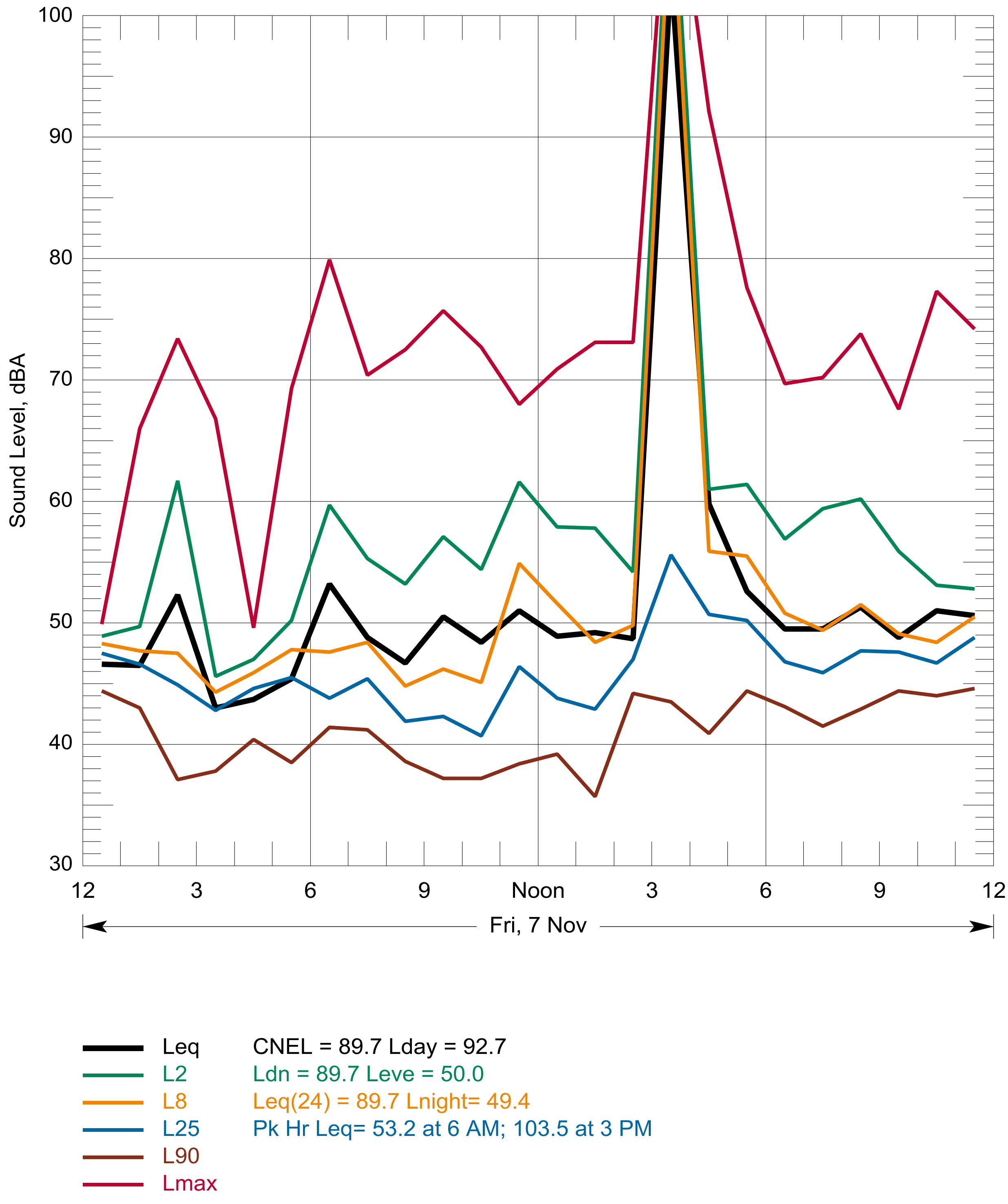

Figure A-57. Hourly Statistical Summary of Noise Levels on Nov 7, 2014 Location N8, 1719 Dorothy Avenue, Longview, WA

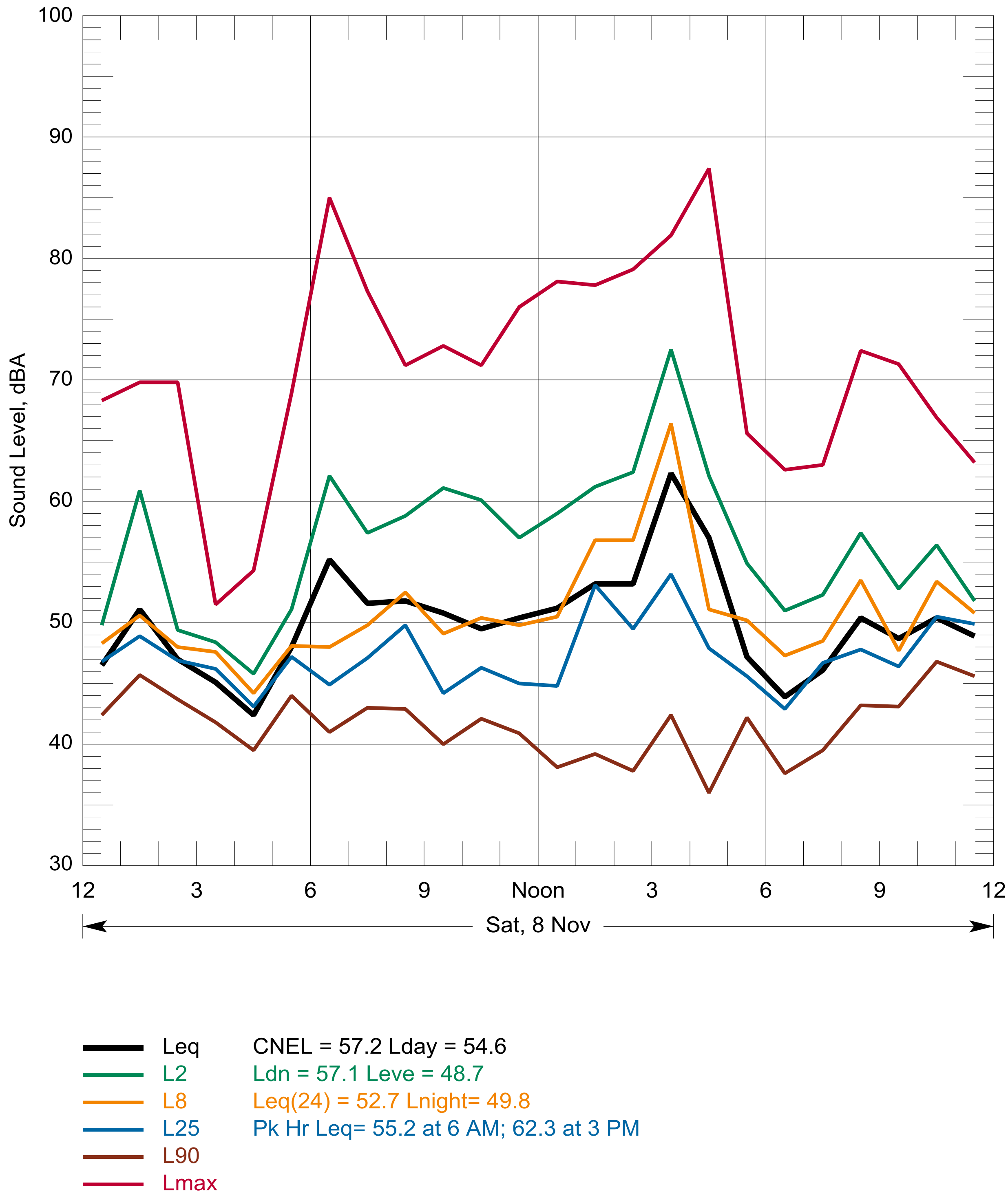

Figure A-58. Hourly Statistical Summary of Noise Levels on Nov 8, 2014 Location N8, 1719 Dorothy Avenue, Longview, WA

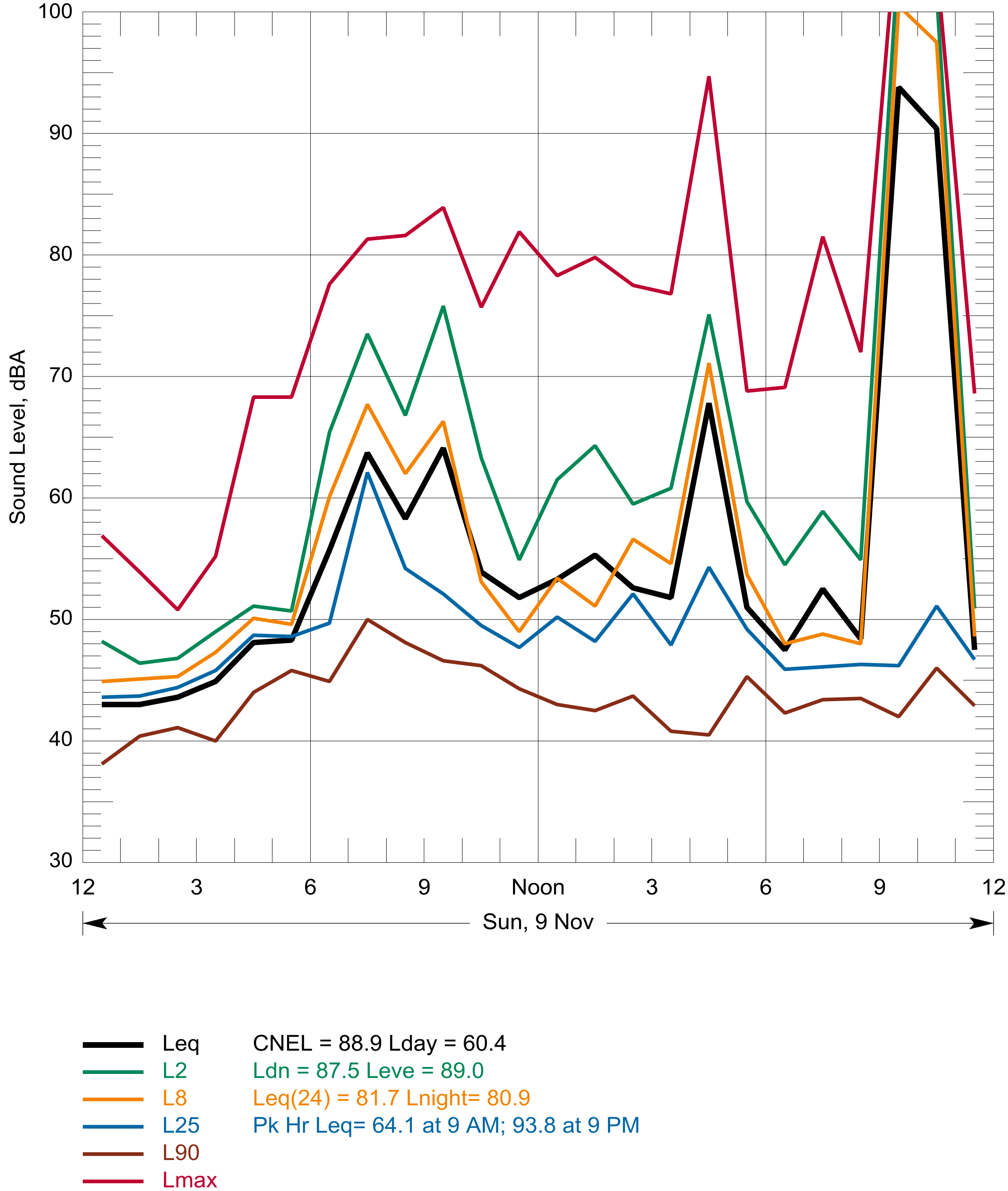

Figure A-59. Hourly Statistical Summary of Noise Levels on Nov 9, 2014 Location N8, 1719 Dorothy Avenue, Longview, WA

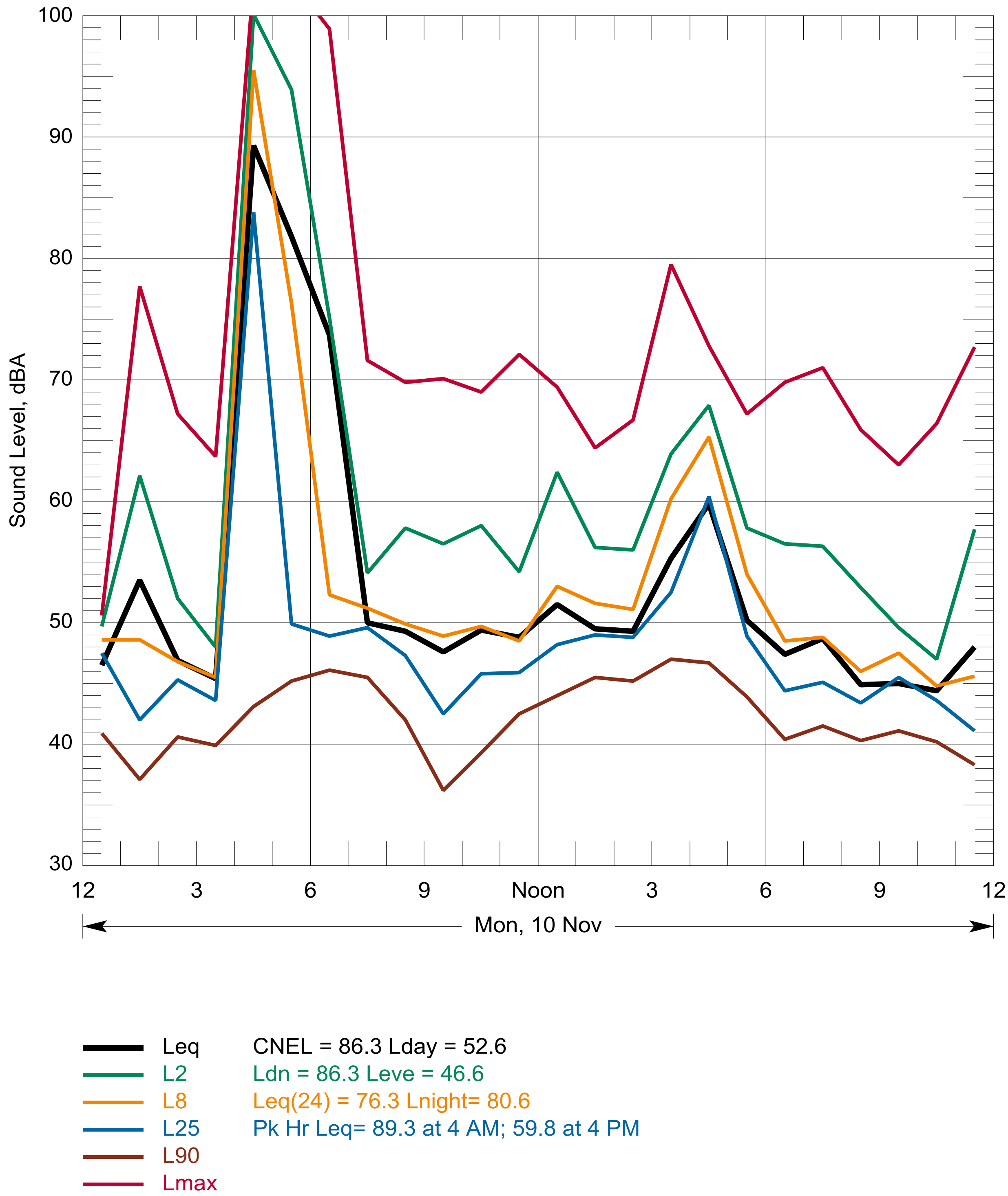

Figure A-60. Hourly Statistical Summary of Noise Levels on Nov 10, 2014 Location N8, 1719 Dorothy Avenue, Longview, WA

Appendix B

Construction Noise Impact Analysis

Appendix B
Construction Noise Impact Analysis

Table B-1 lists the predicted noise levels at noise-sensitive receivers in the study area during construction of the Proposed Action.

Table B-1. Predicted Construction Noise—Proposed Action

Address	Land Use	Construction $L_{eq,\ 8\ hour}$ (dBA)	Pile Driver L_{max} (dBA)	Construction + Pile Driver L_{max} (dBA)
104 Bradford Pl	Man. Home	79	80	83
114 Bradford Pl	SFR	72	76	78
4720 Mt. Solo Rd	SFR	63	67	68
4723 Mt. Solo Rd	Man. Home	62	66	68
4724 Solo Meadows Ln	SFR	62	66	67
4726 Mt. Solo Rd	Man. Home	62	66	68
4744 Mt. Solo Rd	SFR	61	65	66
4820 Mt. Solo Rd	SFR	60	64	66
4828a Mt. Solo Rd	SFR	60	64	65
4828b Mt. Solo Rd	SFR	60	63	65
4824 Mt. Solo Rd	SFR	60	64	65
115 Pioneer Mt Solo Cemetery Rd	SFR	59	63	65
120 Pioneer Mt Solo Cemetery Rd	SFR	58	62	64
Mt. Solo Cemetery	cemetery	59	63	64
130 Pioneer Mt. Solo Cemetery Rd	SFR	58	62	64
5006 Mt Solo Rd	SFR	58	62	63
5008 Mt Solo Rd	Man. Home	58	62	63
5005 Mt Solo Rd	SFR	58	61	63
5041 Mt Solo Rd	SFR	57	61	62
137 Ridgecrest Dr	SFR	58	62	63
141 Ridgecrest Dr	Man. Home	58	61	63
142 Ridgecrest Dr	SFR	58	62	63
149 Ridgecrest Dr	Man. Home	57	60	62
150 Ridgecrest Dr	Man. Home	57	61	63
160 Ridgecrest Dr	Man. Home	57	60	62
129 Ridgecrest Dr	Man. Home	59	63	64
103 Ridgecrest Ln	Man. Home	59	63	64
107 Ridgecrest Ln	Man. Home	58	62	64
111 Ridgecrest Ln	Man. Home	58	62	63
115 Ridgecrest Ln	SFR	59	62	64
127 Ridgecrest Ln	SFR	60	63	65
134 Ridgecrest Ln	SFR	60	64	65
120 Ridgecrest Ln	Man. Home	60	64	65

Address	Land Use	Construction $L_{eq, 8 hour}$ (dBA)	Pile Driver L_{max} (dBA)	Construction + Pile Driver L_{max} (dBA)
108 Ridgecrest Ln	Man. Home	60	64	65
106 Ridgecrest Ln	Man. Home	60	63	65
116 Ridgecrest Dr	Man. Home	60	64	66
104 Ridgecrest Dr	Man. Home	62	66	68
124 Solo Meadows Ln	Man. Home	60	64	65
114 Solo Meadows Ln	Man. Home	61	65	67
110 Solo Meadows Ln	Man. Home	62	66	67
106 Solo Meadows Ln	SFR	62	66	68
101 Solo View Dr	Man. Home	63	67	68
107 Southcrest Ln	SFR	61	65	67
115 Southcrest Ln	SFR	60	64	65
125 Pionte Rd	SFR	60	63	65
108 Southcrest Ln	SFR	61	65	67
123 Solo View Dr	Man. Home	62	66	67
127 Solo View Dr	Man. Home	63	67	68
120 Bridgeview Ln	SFR	65	68	70
115 Bridgeview Ln	SFR	63	67	68
129 Solo View Dr	SFR	63	66	68
131 Solo View Dr	Man. Home	62	66	67
151 Solo View Dr	SFR	62	65	67
164 Rutherglen Dr	Man. Home	61	64	66
232 Rutherglen Dr	SFR	60	64	66
222 Rutherglen Dr	SFR	60	64	65
Evergreen St & 46th Ave	SFRs	58	61	63
44th Ave	SFRs	58	61	63
42nd Ave	SFRs	58	61	63
Alter St	SFRs	58	61	63
Olive Way	SFRs	58	61	63
2133 38th Ave	SFR	58	61	63
2137 38th Ave	SFR	58	61	63
38th Ave	SFRs	58	61	63
2185 38th Ave	MFR	57	61	62
36th Ave	SFRs	57	61	62
Shelly Pl	SFRs	58	62	63
Olive Ct	SFRs	57	60	62
Longview Memorial Park	cemetery	57	61	62
2017a 48th Ave	SFR	56	60	61
2017b 48th Ave	SFR	56	59	61
2018 48th Ave	Man. Home	56	60	61
Charles St	SFRs	56	60	61
Julie Pl	SFRs	56	60	62

Address	Land Use	Construction $L_{eq, 8 hour}$ (dBA)	Pile Driver L_{max} (dBA)	Construction + Pile Driver L_{max} (dBA)
Zirkel Ct	SFRs	57	60	62

dBA = A-weighted decibel; SFRs = single-family residences, MFRs = multifamily residences