ATTACHMENT W: L200 IP90PCT NOISE, VIBRATION AND GROUNDBORNE NOISE REPORT

Lynnwood Link Extension | Northgate Station to Lynnwood Transit Center

Contract No. RTA/AE 0010-15

Contract L200
Noise, Vibration, and Groundborne Noise Report
In-Progress 90% Submittal

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EXECUTIVE SUMMARY

This report provides design recommendations for the control of noise and vibration generated during the operation of Sound Transit's Lynnwood Link Extension (LLE). The design recommendations address Light Rail Vehicle (LRV) wayside noise and vibration control, noise control for Traction Power Substations (TPSS) and Park & Ride facilities, and acoustical design recommendations for the stations. In addition to LRV operations, the replacement of portions of the existing Interstate-5 (I-5) traffic noise walls was an integral part of the wayside noise analyses which included both Federal Transit Administration (FTA) and Federal Highway Administration (FHWA) Traffic Noise Model (TNM) based models.

This report addresses the Contract L200 segment of the alignment from the future Northgate Station through the City of Seattle and the City of Shoreline, and includes stations at NE 145th Street and NE 185th Street. The receptors include primarily single family residences with a few apartment complexes and a few places of worship. The existing environment is described in detail in the Lynnwood Link Extension Final Environmental Impact Statement (FEIS). The final design analysis was based on the approach described in the FEIS and incorporated changes to the alignment, right of way, stations, and train speed.

The updated impact analysis revealed the following for Contract L200:

- 252 total LRV noise impacts
- 159 moderate and 93 severe
- 6 potential residual impacts (to be considered for residential sound insulation)
- 30 total potential Park and Ride noise impacts
- 19 potential residual impacts
- 8 total groundborne noise impacts
- 16 total vibration impacts

The resulting mitigation recommendations include the following:

- 25,000 feet of new noise wall for LRV noise
- 1,200 feet of new noise wall for Park and Ride noise
- 5,700 feet of existing highway noise wall to be replaced
- 1,400 feet of isolation track + 3,925 feet of ballast mat for vibration and groundborne noise mitigation

The design recommendations are provided in two parts: Part 1 for noise and Part 2 for vibration (and groundborne noise).

PART 1: NOISE

1.0 INTRODUCTION AND SUMMARY

The goals of final design for project noise control were to incorporate design changes relative to the 60% design and cost saving analysis, refine predictions by introducing more details in the noise models, and reduce conservatism in the analysis. This report outlines the operational noise impact criteria, briefly describes the existing sound environment along the alignment, addresses the assumptions and noise analysis approach, summarizes the analysis results and potential noise impacts, and provides noise wall design and other recommendations for mitigation.

The Lynnwood Link Extension will include noise walls for the light rail vehicle (LRV) guideway as determined by Federal Transit Administration (FTA) guidelines. Construction of the extension will involve the removal and relocation of several Washington State Department of Transportation (WSDOT) noise walls that currently exist to abate traffic noise from I-5 at nearby sensitive receivers. Traffic noise analyses were performed to determine the height and location of the modified highway noise walls. In many cases, the project noise wall was designed to control both LRV and I-5 traffic noise.

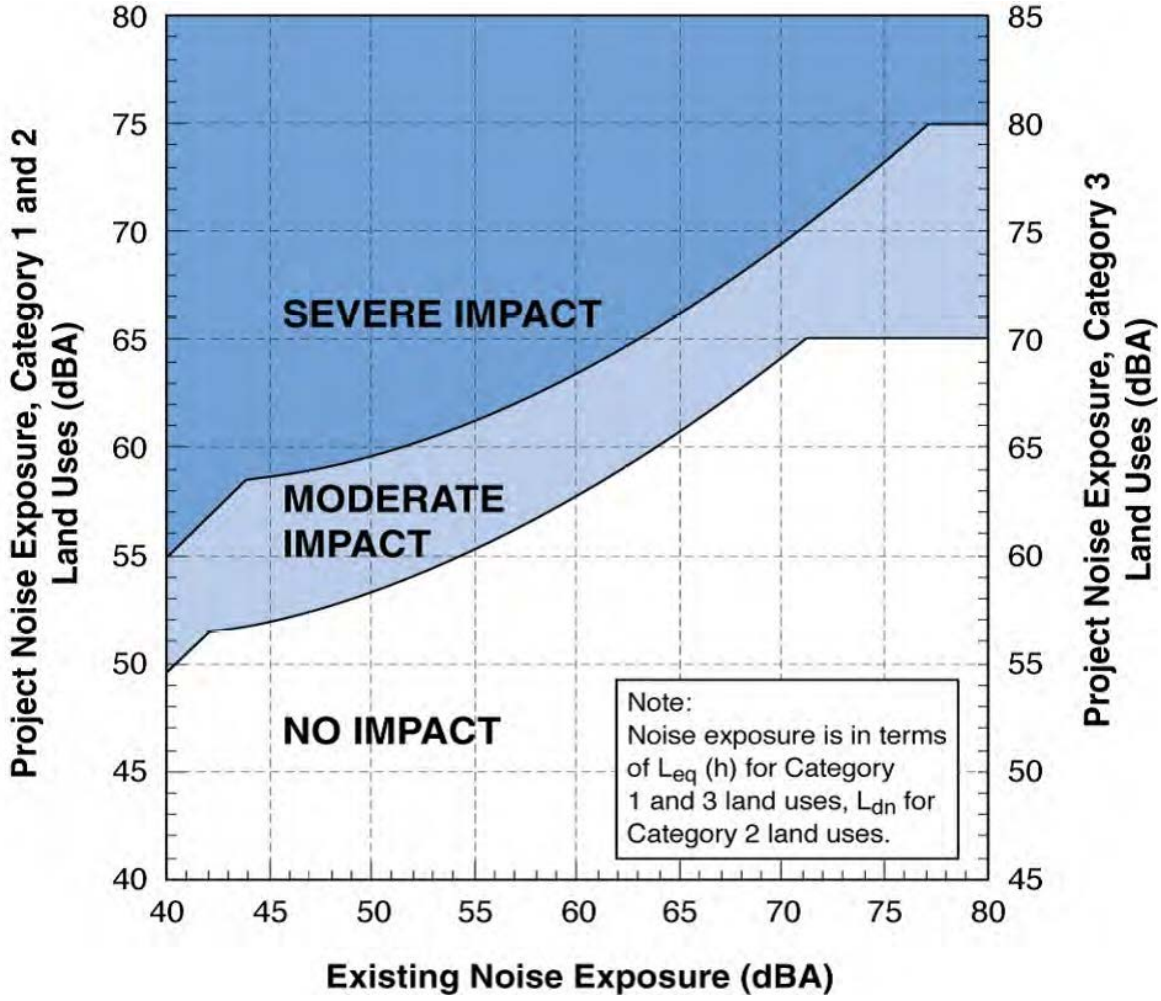
Impact analyses of the proposed NE Shoreline South Station and NE Shoreline North Station were conducted. The analyses addressed operational noise sources including light rail vehicles, and bus and automobile traffic in the adjacent Park & Ride facilities. Calculations were taken directly from the FTA guidelines.

2.0 IMPACT CRITERIA

2.1 Light Rail Noise Impact Criteria

For LRV noise and vibration, the criteria (as well as prediction methodology) specified in the *Transit Noise and Vibration Impact Assessment* manual published in May 2006 by the FTA were applied. The noise impact criteria, defined in Chapter 3 of the manual and shown graphically in Figure 1, are based on the comparison of existing outdoor noise levels and the future outdoor noise levels produced by the project. Most of the LLE project alignment extends through Category 2 land use (residential), with a few Category 3 receptors including parks and churches.

Figure 1: FTA Project Noise Impact Criteria



2.2 Highway Noise Impact Criteria

The applicable impact criteria for highway noise are those specified by WSDOT and derived from FHWA noise abatement criteria. The WSDOT noise policy states that if a noise level of 66 dBA Peak Hour L_{eq} is predicted for a new project due to traffic, noise mitigation should be considered. The above criterion applies to exterior use areas at residential receptors.

The design criterion used for walls adjacent to highway modifications use the WSDOT/FHWA standard criterion for new construction (66 dBA peak hour L_{eq}). The design criterion for the replacement walls was applied to adequately abate I-5 traffic noise to the extent that there are no new traffic noise impacts, and no increase in the severity of any existing traffic noise impacts, when the project becomes operational. For the Lynnwood Link Extension, the criterion only applies where existing highway noise walls in the corridor will be removed and/or relocated. Existing walls in the corridor that are not impacted by the project were not checked for noise performance and will not be modified.

2.3 Station Noise Impact Criteria

Chapter 3, Noise and Vibration of the Sound Transit Design Criteria Manual (DCM), Revision 4, dated March 2016, provides criteria and noise exposure limits for Stations and the areas serving the Stations such as Park-and-Ride and ancillary facilities. Following is a summary of the criteria and noise exposure limits applicable to the unenclosed stations.

2.3.1 Ancillary Equipment Noise

This refers to noise generated by power substations, ventilation fans, vent shafts and other mechanical equipment. These requirements are not applicable to emergency equipment, operations, or the daytime testing of emergency equipment. Local Codes or the Washington Administrative Code (WAC) shown in Table 1 should be followed where applicable.

The noise limits in Table 1 shall be reduced by 5 dBA if the noise has pure tones or contains an audible screech, whine, or hum or contains information content such as music or public address (PA) system announcements. If the existing noise level (L_{eq}) is greater than the limits in Table 1 for continuous noise, higher noise limits can be applied. Intermittent noise is defined as a noise that lasts for a cumulative period of less than 10 minutes every hour. In no case shall the noise from the ancillary equipment result in an increase in the existing L_{dn} of more than 3 dBA.

Table 1: Noise from Transit System Ancillary Facilities – 1-hour L_{eq} (dBA)

District of Sound Source	District of Receiving Property (daytime/nighttime)[1]		
	Residential (dBA)	Commercial (dBA)	Industrial (dBA)
Residential	55/45	57	60
Commercial	57/47	60	65
Industrial	60/50	65	70

Notes:

[1]The Residential noise level limits are presented for (daytime)/(nighttime). Nighttime is between 10 PM to 7 AM weekdays, and 10 PM to 9 AM weekends and holidays.

This table should be used where local codes do not exist.

For intermittent noise sources add 10 dB.

Source: Sound Transit Link Design Criteria Manual, March 2016, Revision 4 – Chapter 3, Noise and Vibration.

2.3.2 Park-and-Ride Noise Levels

Noise impacts that may be associated with Park-and-Ride facilities are generally associated with noise from bus traffic on the Park-and-Ride site. The Park-and-Ride facilities were designed in accordance with the guidance provided by the FTA Transit Noise and Vibration Impact Assessment guide such that the noise level does not exceed the FTA noise limits and also meets any local noise standards. The principal noise control measure is the use of walls when the location of bus traffic is close enough to sensitive receptors that it exceeds the applicable limit. Impacts that cannot be mitigated with the use of walls may require the installation of residential insulation improvements.

The land-use noise limits as indicated in Table 1 are applicable for the Park-and-Ride noise emissions. Since the Park-and-Ride facilities are assumed to be commercial uses operating during nighttime hours and the majority of the properties surrounding the facilities are residential use, the property line noise limit is 47 dBA for Park-and-Ride noise events.

2.3.3 Station Noise Control

Noise limits for various station noise sources are summarized in Table 3-7 of the DCM. Table 2 provides selections from Table 3-7 of the DCM which are applicable to the unenclosed stations. The principal noise control measure for public spaces of unenclosed stations is the use of walls or partial enclosures to block the line-of-sight path to the sound. In some cases, careful placement of acoustical absorption treatment will help reduce noise exposure.

A noise limit of a maximum hourly L_{eq} of 72 dBA is the goal for external traffic noise within public spaces in unenclosed stations. If the 72 dBA hourly L_{eq} cannot be met due to higher ambient noise levels, then a 78 dBA 15-minute L_{eq} on the platforms is acceptable.

As specified in the DCM, acoustical absorption treatments are required at enclosed passageways, enclosed mezzanines, and mechanical and electrical rooms. At-grade and above ground stations that are only partially enclosed will not generally require acoustical treatment. Fully enclosed spaces require treatment with a minimum Noise Reduction Coefficient (NRC) rating of 0.6 and shall cover a minimum of 35% of walls and ceiling area. This shall include at least 50% of the ceiling area.

Table 2: Design Criteria for Patron Noise Exposure in Stations

Condition	Lmax (dBA)
On Platform, Trains Entering and Leaving	
At-grade/above ground, tie and ballast track	80
At-grade/above ground, concrete trackbed	83
On Platform, Trains Stationary	
At-grade/above ground	68
On Platform or in Enclosed Public Areas	
Ancillary Systems Operation	55[1]
Emergency Ventilation Systems operating	75[1]
Escalators	
5 feet above tread, at entrance combs	55
Elevators	
In cab, 5 feet above floor, 1 foot for more from wall, continuous noise	55
In cab, 5 feet above floor, 1 foot for more from wall, intermittent noise, peak	62
3 feet or more from elevator equipment, continuous noise	55
3 feet or more from elevator equipment, intermittent noise	62
Door operation, 3 feet or more from door	62
Noise From Other External Sources (Without Train Pass by)	
Traffic noise	Hourly Leq = 72[3] 15 min Leq = 78
Other intermittent sources	Leq = 78
Noise in Mechanical Equipment Rooms	Lmax = 85[2]

Notes:

[1] Community noise from station ancillary systems covered in sub-chapter 3.7 of the DCM.

[2] Maximum levels using the Slow meter setting on a standard sound level meter.

[3] Highest traffic noise hourly Leq.

Source: Sound Transit Link Design Criteria Manual, March 2016, Revision 4 – Chapter 3 Noise and Vibration.

2.3.4 Speech Intelligibility

The National Fire Alarm Code, NFPA72 – Annex A, recommends that the minimum speech intelligibility performance of a PA system serving public spaces shall be a Common Intelligibility Scale (CIS) rating of 0.70. A CIS rating of 0.70 is considered to correspond subjectively to Fair intelligibility according to International Electrotechnical Commission (IEC) Standard 60268-16[1]. A CIS rating of 0.80 would be subjectively considered Good intelligibility, and anything above 0.88 would be considered Excellent.

The speech intelligibility can be measured and confirmed based on the Speech Intelligibility Index (STI) metric which is included in IEC 60268-16. STI for PA systems (STIPA) is also covered in IEC 60268-16. STI can be measured in the field or modeled with computer modeling programs and converted to CIS. The CIS is related to the STI by the formula CIS = 1 + LOG_{10} (STI).

[1] International Standard IEC 602068-16: Sound system equipment – Part 16: Objective rating of speech intelligibility by speech transmission index

The ambient noise environment will affect speech intelligibility. The higher the ambient noise, the less intelligible PA announcements will be for a given PA sound level.

2.4 Washington Administrative Code

The Washington Administrative Code (WAC) Chapter 173-60-40 provides maximum permissible environmental noise levels for different property usage, called Environmental Designation for Noise Abatement (EDNA). These limits are shown in Table 3.

Table 3: Washington State Noise Control Regulation

EDNA OF NOISE SOURCE	EDNA OF RECEIVING PROPERTY (Maximum allowable noise level)		
	Class A: Residential	Class B: Commercial	Class C: Industrial
Class A: Residential	55 dBA	57 dBA	60 dBA
Class B: Commercial	57 dBA	60 dBA	65 dBA
Class C: Industrial	60 dBA	65 dBA	70 dBA

Between 10 pm and 7 am, the levels given above are reduced by 10 dBA in Class A EDNAs.

The WAC contains short-term exemptions to the property line noise standards based on the minutes per hour that the noise limit is exceeded, as indicated in Table 4.

Table 4: WAC Short-Term Noise Exemptions for Property Line Noise Levels

Minutes per hour	Adjustment to Maximum Sound Level
15	+ 5 dBA
5	+10 dBA
1.5	+15 dBA

2.5 City of Seattle

The City of Seattle has maximum permissible environmental noise level requirements that are similar to those contained in the WAC (Seattle Municipal Code [SMC] Chapter 25.08; SMC Section 25.08.410). However, while the WAC does not define a noise descriptor to be used for purposes of applying the limits shown in Table 3 above, the City of Seattle explicitly states that the L_{eq} descriptor be used. In addition, during a measurement interval, maximum noise levels (L_{max}) may exceed the L_{eq} exterior sound level limits shown in Table 3 above by no more than 15 dBA (SMC Section 25.08.410(B)).

The SMC also imposes the following three limitations on the maximum permissible sound level limits, which are more restrictive than the WAC:

- The City of Seattle ordinance extends the 10 dBA reduction in maximum nighttime noise levels to 9:00 am on weekends and legal holidays, while under the WAC the reduction stops at 7:00 am.
- For any source of sound (other than an electrical substation) that has a pure tone, the exterior sound level limits established under SMC Section 25.08.410 are reduced by 5 dBA.

- For any source of sound that is impulsive and not measured with an impulse sound level meter, the exterior sound level limits established under SMC Section 25.08.410 are reduced by 5 dBA.

2.6 City of Shoreline

The City of Shoreline Municipal Code, Chapter 9.05 Public Disturbance Noise does not include quantitative noise limits. Therefore, the property line noise limits listed in the WAC and in Table 3 are assumed to be applicable in the City of Shoreline. The City of Shoreline does not have any regulations that address noise variances.

3.0 EXISTING ENVIRONMENTAL NOISE LEVELS

During the environmental phase of this project, a total of 59 noise measurements were made throughout the corridor to characterize the existing noise environment. These included 45 long term measurements (more than 24 hours) and 14 short term measurements (15 minute samples). The existing environmental noise levels measured in the project corridor, as measured and reported in the Lynnwood Link Extension Final Environmental Impact Statement (FEIS) Noise and Vibration Technical Report dated April 2015, were in the range of 56 to 81 dBA L_{dn} with peak-hour levels of 51 to 78 dBA L_{eq}.

To supplement the data gathered during the environmental phase, additional noise measurements were conducted along the alignment. A total of 17 noise measurements were made, including 6 long term measurements and 11 short term measurements. The existing environmental noise levels measured ranged from 63 to 80 dBA L_{dn} with peak-hour levels of 59 to 78 dBA L_{eq}. The recent measurements are in good agreement with those measured during the environmental phase; therefore, this report operates under the assumption that the existing noise levels measured during the environmental phase are substantially correct and unchanged.

The noise levels at the first and second row of homes adjacent to I-5 are generally in excess of 70 dBA L_{dn}. As such, the ambient noise levels at the residences closest to the LRV will be significantly greater than the baseline noise criteria put forth in the WAC in many cases. None of the city noise ordinances described above take into account the existing noise environment and present only absolute noise level limits.

4.0 NOISE IMPACT ANALYSIS APPROACH

4.1 LRV and Traffic Analyses

The basic approach to noise impact analysis was to estimate the level of noise the project will produce, compare that prediction with impact criteria, and then, where necessary, select noise mitigation measures that will eliminate the impact. For the LLE project, the FTA guidelines were used to design noise walls for mitigation of LRV operations, however, WSDOT noise policy comes into play where existing traffic noise walls will be altered or any highway road segment is significantly altered. These two major noise sources in the corridor come with different impact criteria and modeling methodologies, and therefore were approached separately. In areas of

the corridor where there are no existing highway noise walls, the FTA methodology was applied. In areas of corridor involving existing highway noise walls, new walls serving to mitigate both highway and LRV noise were designed to meet the more restrictive of FTA and WSDOT criteria.

Potential future noise wall locations were identified in coordination with the civil, track, and structures disciplines as well as the GC/CM team. Noise walls are most effective when located close to either the source or receptor. In general, where the trackway is elevated, the noise wall was located at the edge of the guideway or fill wall. Where the trackway is at-grade or in a cut/trench, the wall was located above the retaining wall.

The LRV wayside noise predictions were based on a spreadsheet model that follows the FTA detailed noise analysis methodology described in Chapter 6 of the FTA manual. The reference passby noise level was based on the speed-dependent sound exposure level (SEL) for 4-car trains measured during reference measurements conducted in June 2016 for at-grade track and elevated guideways. The data from the June 2016 measurements were compared with data collected previously to determine the final reference noise levels.

The traffic noise modeling analysis consisted of several steps. The first step was to create and validate a traffic noise model for the Lynnwood Link corridor based on measured noise levels and actual corresponding traffic counts taken during the measurement periods. Once the model was validated, the existing conditions were modeled at selected receptors potentially affected by noise wall relocation. These existing condition models were previously prepared and validated for the PE submittal. Next, future build conditions for the study area were modeled, and the location and height of the replacement noise walls were optimized to achieve the stated design criteria. In some cases, the replacement walls are located on top of retaining walls that will be constructed as part of the project; in those cases, the combined structure (retaining wall and noise wall) was analyzed against the design criteria because the retaining walls may also abate traffic noise in these situations.

4.1.1 LRV Noise Model Input (FTA)

- LRV reference passby noise levels determined by direct measurement. The passby reference levels were the same as those used in the FEIS and for East Link. The reference test performed in June 2016 revealed nearly identical noise levels to those measured three years prior. The reference level is 2 dB higher than the generic level recommended by FTA.
- LRV noise source location derived from track alignment and trackway structure designs. Noise source position was modeled at 1 foot above top of rail on track centerline. Generally, noise generation is concentrated at the wheel/rail interface although the wheels can also radiate noise. With 26” diameter wheels and skirts on the Sound Transit LRV fleet, a source height of 1 foot is more appropriate and slightly conservative for noise wall design

- Wayside noise receptor locations were determined from geographic information systems (GIS) data. Noise receptor positions were modeled as 5 feet above ground level at the building exterior closest point between building footprint and track centerline. For upper levels of apartment buildings, each floor is modeled as a separate receiver with appropriate elevation estimated at the center of the windows (similar to FEIS/PE analysis). Mitigation was designed to eliminate impacts at all receptors, including upper floors
- Train speeds were determined from a maximum speed of 55 mph, stated speed limits in curves determined by the track designers, and an acceleration/deceleration rate of 3 mph/sec at the stations
- At special trackwork (crossover frogs), +10 dB is added for receptors within 50 ft of the frog
- Existing ambient noise levels at receptor location as determined primarily by survey measurements obtained for PE design
- Selection of absorptive or non-absorptive noise wall
- Noise wall heights varied by 1 foot increments were evaluated in determining final height needed for mitigation

4.1.2 Traffic Noise Model (TNM) input (WSDOT/FHWA)

- Wayside noise receptor locations determined from geographic information systems (GIS) data (all potentially impacted receptors were included)
- I-5 traffic lane locations and terrain details determined from GIS data
- Traffic volume data including truck mix (Year 2035 Peak Hour)
- Locations and heights of intervening structures for the existing and future (build) models
- Short term ambient noise measurements with associated live traffic counts for validation of models
- Noise wall heights varied by 1 foot increments were evaluated in determining final height needed for mitigation

4.2 Station and Park & Ride Noise Analyses

The station modeling analyses began with the standard FTA methodology to determine light rail impacts and mitigation (height of guideway noise wall). Then, the mitigated light rail noise exposure was combined with projected Park & Ride vehicle noise to determine total noise exposure in the vicinity of each station for determination of FTA impacts in terms of the L_{dn}. In addition, the predicted peak hour (6-7 a.m.) Park & Ride noise level (hourly L_{eq}) at each receptor was compared to the WAC criteria in Table 3.

The basic assumptions for FTA noise analyses of the LRV and Park & Ride are listed below. Both analyses assume that the existing highway noise walls will be replaced in kind to its current configuration or relocated and redesigned to provide equivalent highway noise mitigation.

4.2.1 Light Rail Noise Analysis Input:

- All receptors in land use category 2 (residential).
- Existing noise levels based on measurements taken during Preliminary Engineering phase.
- Sound Transit 2035 ridership model with 4 car trains on 4 minute headways during peak service.
- Assume flat ground source/receiver relationship from Figure 6-5 in FTA manual.
- Ground type: Soft.
- Northbound (NB) Near track distance calculated from point on receptor building setback relative to track centerline.
- 35%-65% gaps in first row receivers.
- Standard FTA source and receiver heights, source 1 foot above top of rail (T/R) and receiver 5 feet above ground.
- Noise wall heights defined relative to T/R.
- Noise wall type 2; absorptive noise wall within 10 feet of track centerline per Sound Transit standard specification for elevated guideway noise walls.

4.2.2 Park & Ride Noise Analysis Input:

- Directly measured reference noise levels for diesel buses and cars in existing Park & Ride: SEL of 74 dBA for moving buses, SEL 83 dBA for idling, SEL 74 dBA for cars at 50 feet.
- 15 mph bus and car speed in Park & Ride (P&R).
- Bus and car volume provided by HNTB|Jacobs traffic team and bus schedule from KCM.
- Standard FTA source and receiver heights, 3 feet for moving bus, 8 feet for idling bus, and 5 feet at receiver.
- Buses shut down completely during layover (no idling).
- Buses idle for an average period of 75 seconds for passenger loading and unloading.
- Buses idle for an average period of 30 seconds at P&R exit.
- Buses and cars modeled only while moving or idling within the P&R site; vehicles occupying public streets were excluded from the noise model.

5.0 ANALYSIS RESULTS AND RECOMMENDATIONS

5.1 LRV Modeling Results

Calculations for LRV noise impacts were conducted along the entire alignment. Because of the large number of properties analyzed, only a summary of the results is provided. A summary of noise calculations at each receptor is provided in Appendix A.

Modeling the LRV noise for the alignment indicated a total of 252 impacts before mitigation is applied, with 159 Moderate Impacts and 93 Severe Impacts. Projected impacted parcels are shown in Figures 2 through 4. Mitigation in the form of noise walls is expected to remove impacts from all but six of the parcels. These residual noise impacts are listed in Table 5, and may be candidates for additional mitigation in the form of residential sound insulation.

Table 5: Contract L200 Residual Impacts due to LRV Noise

Project Parcel	Address	Distance from Track (ft)	Track Type	Moderate Impact Criteria (dBA)	Severe Impact Criteria (dBA)	Predicted L_{dn} without Mitigation (dBA)	Predicted L_{dn} with Mitigation (dBA)
LL106	308 NE 117th Street	39	Direct Fixation	59	65	**75**	**60**
LL108	11710 3rd Avenue NE	23	Direct Fixation	59	65	**77**	**62**
LL116	12027 5th Avenue NE	32	Direct Fixation	61	66	**76**	**61**
LL167.1	15121 3rd Avenue NE	50	Ballast & Tie	63	68	**81**	**66**
LL264.1	719 NE 189th Street	80	Ballast & Tie	60	65	**75**	**61**
LL267.16	814 NE 194th Street	55	Ballast & Tie	60	66	**68**	**68**

5.2 LRV and Traffic Recommendations

The calculations performed by the FTA spreadsheet model result in predicted noise exposure levels produced by LRV operations in terms of the L_{dn} or hourly L_{eq}. Similarly, TNM produces traffic noise level predictions at each selected receptor in terms of the peak hour L_{eq}. In both models, noise walls were included and their location and height varied to achieve the desired noise level reduction.

The models were used to generate Table 6, which provides noise wall heights above top of rail as the alignment varies with the civil station. The table also indicates the basic type of wall in terms of being absorptive or non-absorptive and its location (elevated guideway, at-grade, retained fill or retained cut/trench). All wall heights are specified for the east side of the alignment. In general, absorptive wall assemblies are specified for walls located close to the trains such as on elevated guideway and some retained fill sections. The absorptive or non-absorptive components are described in Sound Transit's standard specifications for noise walls. The recommended noise walls are consistent with Sound Transit's existing specifications. Any proposed deviation from the existing specifications will be substantiated and supported by adequate justification.

Figure 2: Contract L200 LRV Impact Map (City of Seattle)

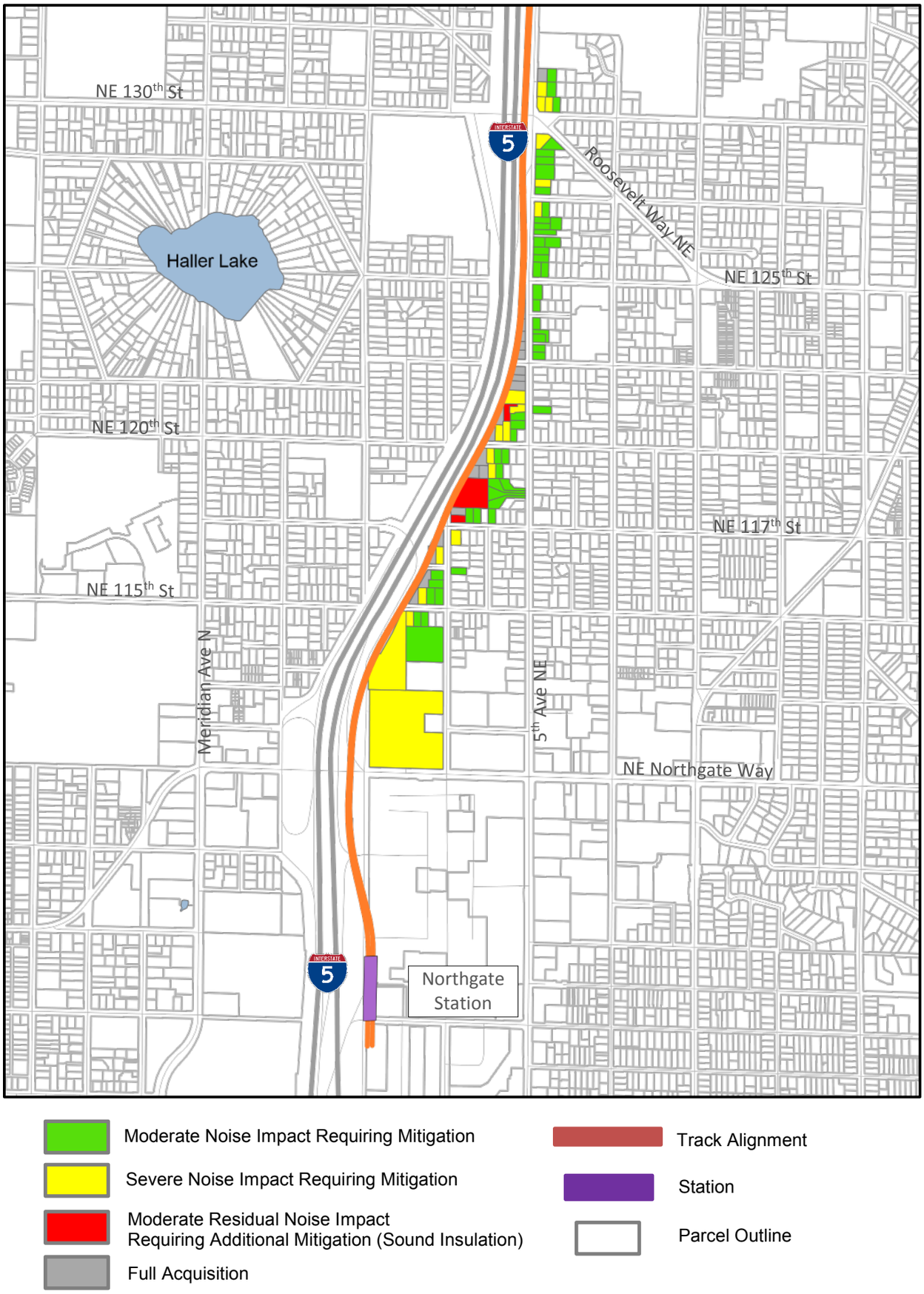


Figure 3: Contract L200 LRV Impact Map (City of Shoreline)

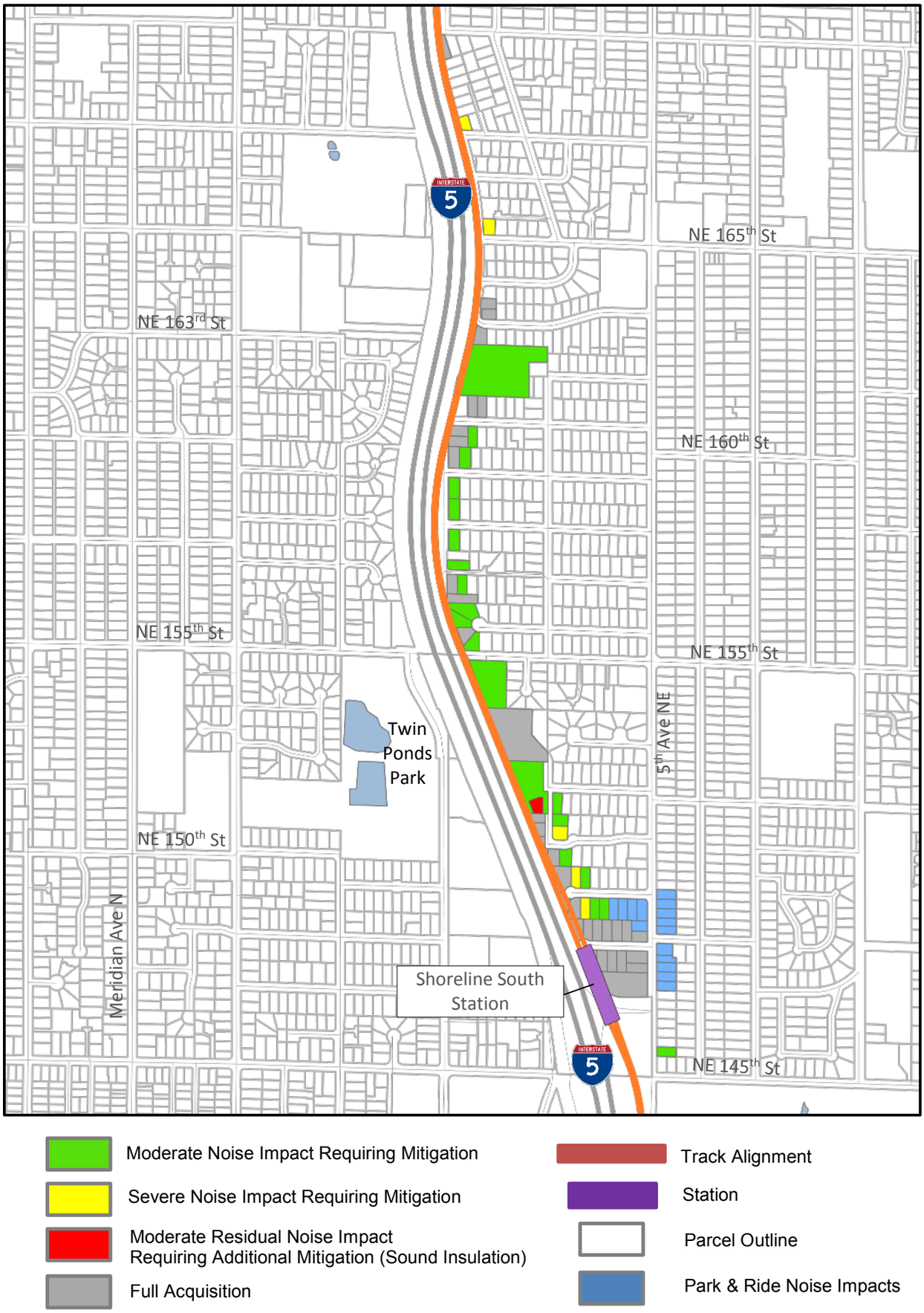


Figure 4: Contract L200 LRV Impact Map (City of Shoreline)

Table 6: Contract L200 Noise Wall Design Recommendations Minimum Wall Heights Above Top-of-Rail (East)

(Noise wall height can include retaining wall – except where indicated by note [2])

NB Station #		Length (ft)	Height (ft)	Receptor or Cross Street	Track Type	Wall Type	Dominant Source
Begin	End						
1437+00	1445+90	890	None [1]	Northgate Mall parking lot	Aerial	N/A	N/A
1445+90	1453+00	710	4	Northgate Apartments	Aerial	Absorptive	LRV
1453+00	1459+50	650	4	Citigate Apartments	Aerial	Absorptive	LRV
1459+50	1463+75	425	4	Citigate Apartments	Retained Fill	Absorptive	LRV
1463+75	1471+00	725	14	NE 116th St	At Grade	Non-absorptive	LRV
1471+00	1473+00	200	14 [2]	Latvian Church	At Grade	Non-absorptive	Highway
1473+00	1474+80	180	14	Latvian Church	At Grade	Non-absorptive	Highway
1474+80	1476+25	145	6	NE 120th St	At Grade	Non-absorptive	LRV
1476+25	1481+25	500	9	NE 122nd St	At Grade	Non-absorptive	LRV
1481+25	1482+75	150	8	NE 122nd St	At Grade	Non-absorptive	LRV
1482+75	1485+80	305	5	NE 123rd St	At Grade	Non-absorptive	LRV
1485+80	1488+80	300	8	NE 123rd St	At Grade	Non-absorptive	Highway
1488+80	1489+80	100	6	NE 124th St	Retained Fill	Absorptive	Highway
1489+80	1492+50	270	4	NE 125th St	Retained Fill	Absorptive	Highway
1492+50	1501+00	850	4	NE 126th St	Aerial	Absorptive	LRV
1501+00	1506+00	500	6	NE 130th St	Aerial	Absorptive	LRV/crossover
1506+00	1511+00	500	4	NE 131st St - golf course	Aerial	Absorptive	LRV
1511+00	1541+00	3000	None [1]	Jackson Park Golf Course	Aerial	N/A	N/A
1541+00	1559+25	1825	4	NE 145th St Station	Aerial	Absorptive	LRV
1559+25	1571+25	1200	4	NE 151st St	Retained Fill	Absorptive	LRV/crossover
1571+25	1572+50	125	4	NE 155th St	Aerial	Absorptive	LRV
1572+50	1582+25	975	4	NE 157th St	Retained Fill	Absorptive	LRV
1582+25	1588+75	650	5	NE 159th St	Retained Fill	Absorptive	LRV
1588+75	1590+50	175	4	Ridgecrest Park	At Grade	Non-absorptive	LRV
1590+50	1591+00	50	6	Ridgecrest Park	At Grade	Non-absorptive	LRV
1591+00	1591+50	50	9	Ridgecrest Park	At Grade	Non-absorptive	LRV
1591+50	1592+50	100	11	Ridgecrest Park	At Grade	Non-absorptive	LRV
1592+50	1595+00	250	10 [2]	Ridgecrest Park	Retained Cut	Non-absorptive	Highway
1595+00	1596+50	150	13 [2]	NE 163rd St	At Grade	Non-absorptive	Highway
1596+60	1605+00	840	None [3]	NE 163rd St - NE 164th St	Retained Cut	Existing Wall	Highway
1605+00	1608+00	300	9 [2]	NE 167th St	Retained Cut	Non-absorptive	Highway
1608+00	1611+00	300	12 [2]	NE 167th St	Retained Cut	Non-absorptive	Highway

NB Station #		Length (ft)	Height (ft)	Receptor or Cross Street	Track Type	Wall Type	Dominant Source
Begin	End						
1611+00	1616+00	500	7 [2]	NE 170th St	Retained Cut	Non-absorptive	Highway
1616+00	1618+70	270	9 [2]	NE 170th St	Retained Cut	Non-absorptive	Highway
1618+70	1619+70	100	10 [2]	1st Ave NE	At Grade	Non-absorptive	Highway
1619+70	1620+70	100	9 [2]	1st Ave NE	At Grade	Non-absorptive	Highway
1620+70	1624+20	350	4	NE 174th St	Retained Fill	Absorptive	Highway
1624+20	1633+00	880	4	NE 175th St	Aerial	Absorptive	LRV
1633+25	1636+75	350	4	NE 178th St	Retained Fill	Absorptive	LRV
1636+75	1639+20	245	6	NE 178th St	Retained Cut	Non-absorptive	LRV
1639+20	1640+20	100	15 [2]	NE 178th St	At Grade	Non-absorptive	Highway
1640+20	1642+20	200	16 [2]	NE 180th St	At Grade	Non-absorptive	Highway
1642+20	1643+60	140	14 [2]	NE 180th St	At Grade	Non-absorptive	Highway
1643+60	1646+60	300	11 [2]	NE 181st St	At Grade	Non-absorptive	Highway
1646+60	1648+10	150	18 [2]	NE 182nd St	At Grade	Non-absorptive	Highway
1648+10	1650+75	265	12 [2]	NE 183rd St	At Grade	Non-absorptive	Highway
1650+75	1652+75	200	8	NE 183rd St	At Grade	Non-absorptive	LRV
1652+75	1656+00	325	4	NE 185th St	Retained Cut	Non-absorptive	LRV
1656+00	1661+50	550	Station [6]	NE 185th St Station	Retained Cut	N/A	N/A
1661+50	1669+00	750	16 [4]	NE 188th St	At Grade	Non-absorptive	LRV
1669+00	1672+50	350	11	NE 190th St	At Grade	Non-absorptive	LRV
1672+50	1674+00	150	9	NE 190th St	At Grade	Non-absorptive	LRV
1674+00	1694+00	2000	None [3] [5]	NE 194th St - NE198th St	Retained Cut	Existing Wall	Highway

Notes:

[1] Not considered noise-sensitive receivers (per FTA)

[2] These wall heights are specified as above current topography 7' right of NB centerline, NOT above top of rail

[3] LRV noise mitigated by retaining wall or existing highway noise wall

[4] This wall not sufficient to eliminate impact. Residential sound insulation needed

[5] The existing highway wall is not sufficient to eliminate LRV impact for second story rooms. Residential sound insulation on upper floors may be needed

[6] Does not include noise wall on west side of station to shield platform from I-5 highway noise; this wall should replace in-kind the existing noise wall. East side wall may be dependent on final station design

5.3 Traction Power Substations (TPSS) Noise

Three TPSS units and three signal houses will be located along the alignment in Contract L200. The main noise generating source for TPSS and signal houses is a Heating, Ventilation and Air-Conditioning (HVAC) unit for temperature control. A noise analysis of TPSS and signal house operation, based on measured reference noise levels produced by an existing facility, resulted in no noise impacts. Modeled sound levels were compared to the WAC nighttime limit of 47 dBA at residential property lines.

Where possible, the TPSS and signal houses were sited so that the HVAC unit faces away from nearby residences. The unit itself then provides an effective noise barrier. Barrier walls are proposed for locations where this option is not available. Table 7 outlines the mitigation features for each site, and Figures 5 through 8 show each site graphically.

Table 7: TPSS and Signal House Mitigation Summary

Site Name	Mitigation
TPSS 1	HVAC units on west side, away from residences
130th Signal House	HVACAC units on west side, away from residences
TPSS 2	10 ft tall solid CMU wall surrounding site
151st Signal House	10 ft tall solid CMU wall surrounding site
TPSS 3	10 ft tall solid CMU wall surrounding site
Shoreline North Station Signal House	HVAC units on west side, away from residences

Figure 5: TPSS 1 Site Plan

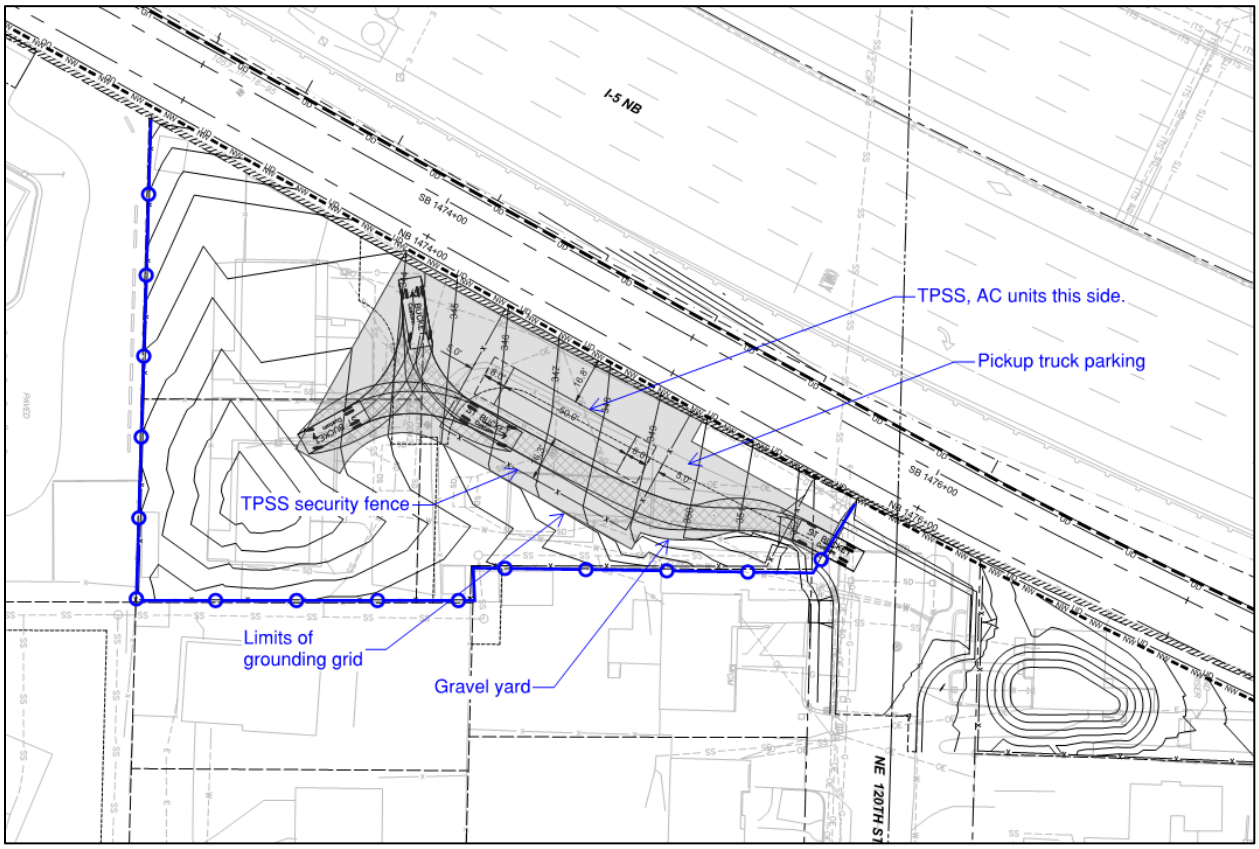


Figure 6: 130th Signal House Site Plan

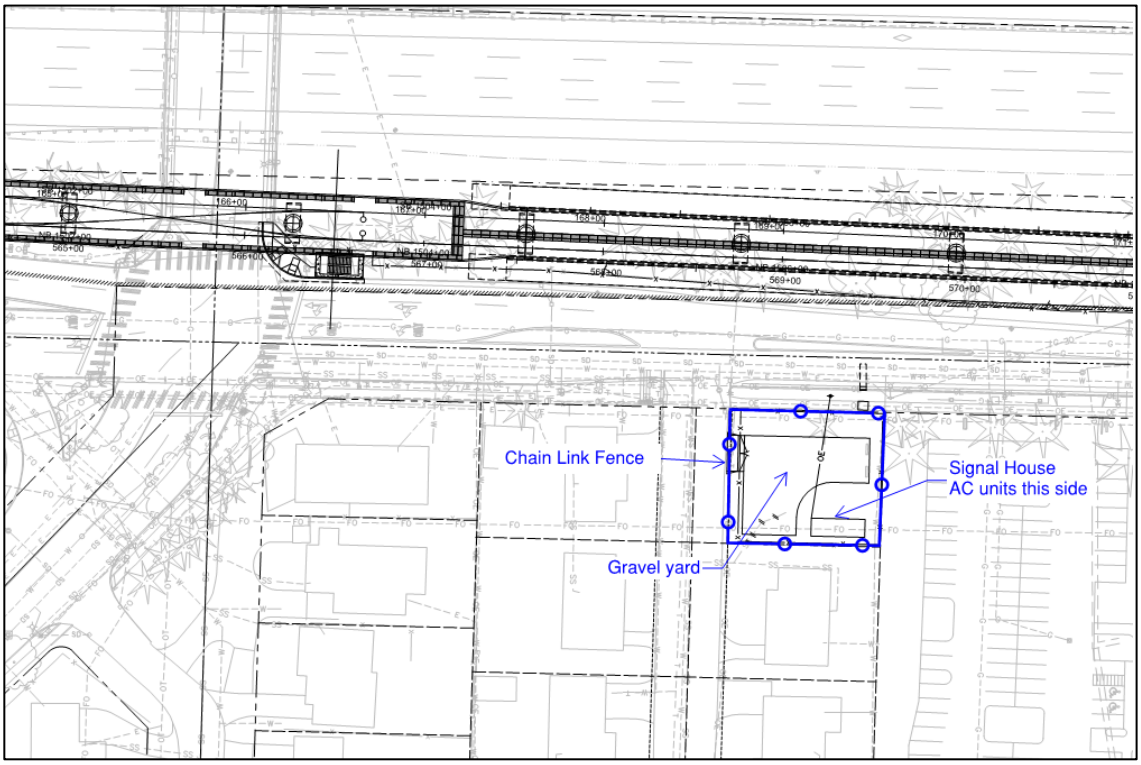


Figure 7: TPSS 2 and 151st Signal House Site Plan

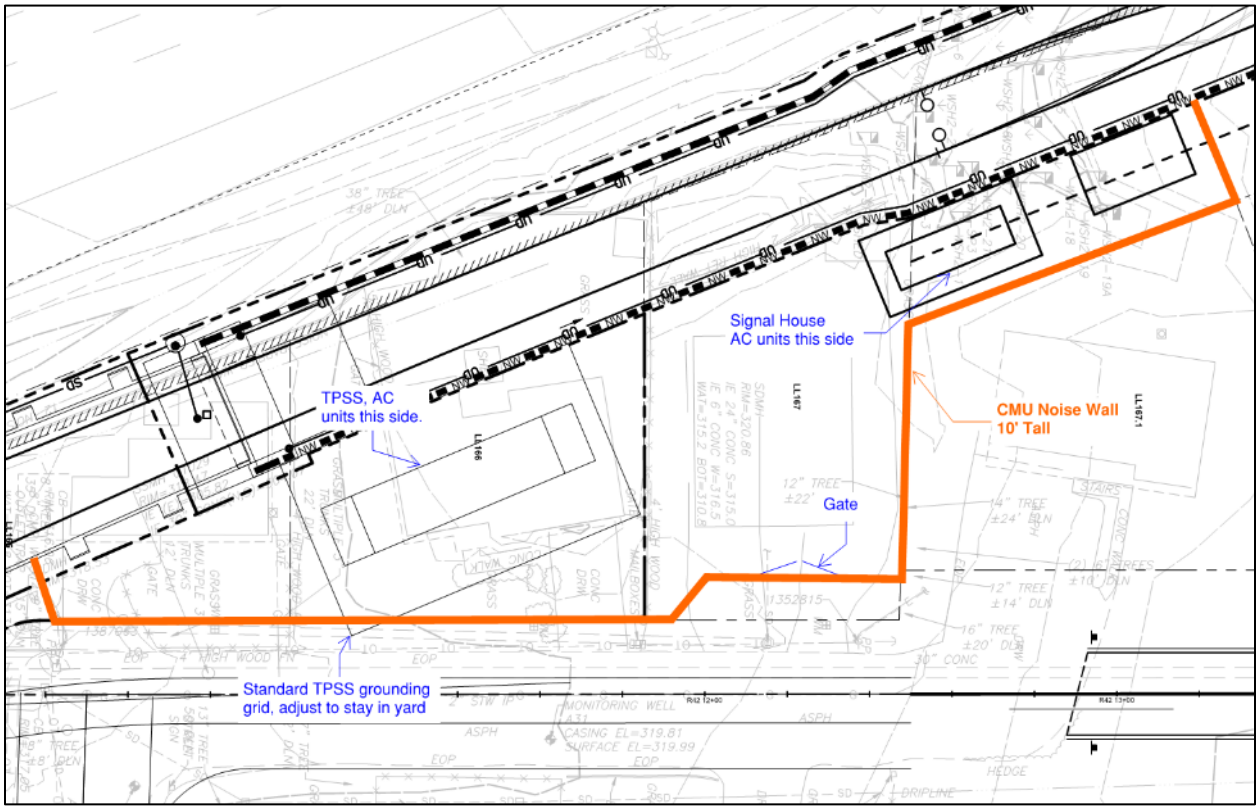
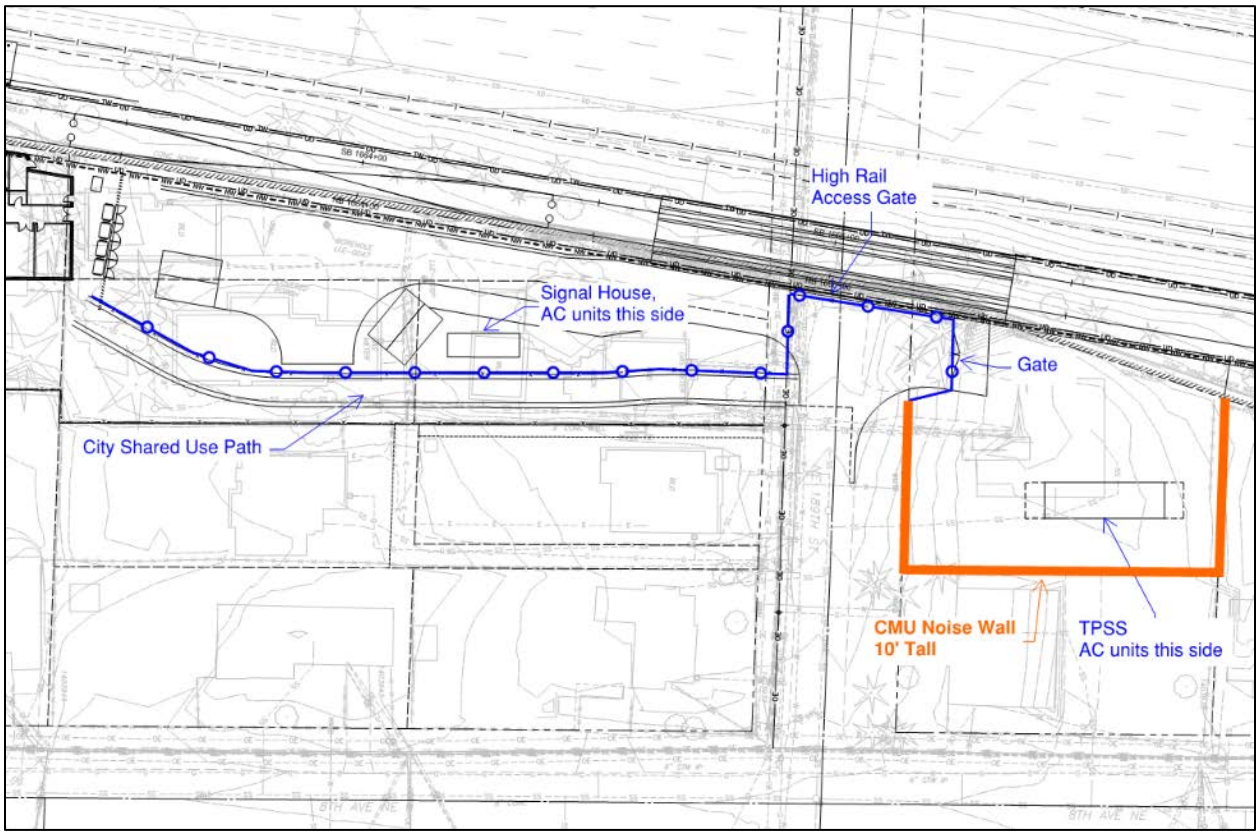


Figure 8: TPSS 3 and Shoreline North Station Signal House Site Plan



5.4 Track Lubrication

The Sound Transit Design Criteria Manual outlines specific requirements for track lubrication. Curves with radius of 600 feet or less are required to have lubrication. Curves with radius of 600 to 1250 feet need to be made "lubrication ready", meaning that power and plumbing for the lubrication system must be included in the design in case lubrication is needed (wheel squeal may or may not develop). Lubrication is not required for curves greater than 1250 foot radius.

In Contract L200, there is one curve (156) just south of the NE Shoreline South Station (approx. NB STA 1541+00) with radii of 1000 feet (Northbound track) and 1300 feet (Southbound track). That curve should be made "lubrication ready".

5.5 Station and Park & Ride Modeling Results

5.5.1 Shoreline South/145th Station

An FTA analysis of cars and buses moving and idling in the Park & Ride, based on the measured reference noise levels produced by current vehicles, resulted in no noise impacts in terms of the L_{dn}. The analysis was repeated based on the peak hour volume of 18 buses between 6 a.m. and 7 a.m. which was used to calculate an hourly L_{eq}. This model predicts 17 WAC impacts associated with the Park & Ride. A noise wall 10 feet in height and approximately 500 feet in length is recommended along the north edge of the site in order to eliminate noise impacts at the seven receptors along NE 149th Street. The predicted Park & Ride impacts with LRV mitigation are provided in Table 8 (impacts bolded), and wall extents are shown in Figure 9.

Table 8: Shoreline South Park and Ride Impact Summary

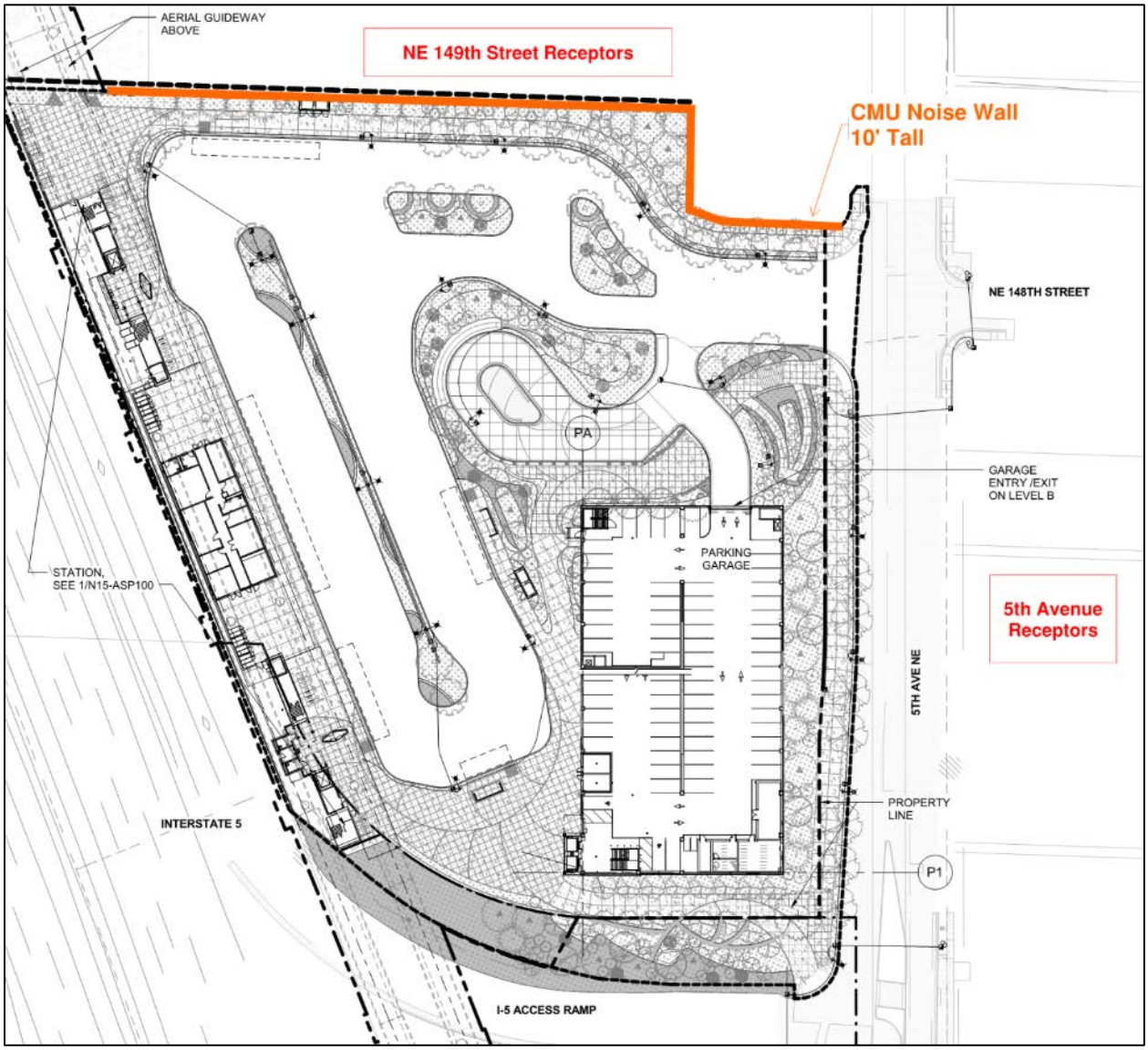
Project Parcel	Address	L_{eq} Projected Noise Before Mitigation (dBA)	L_{eq} Projected Noise After Mitigation (dBA)
LL157.11	357 NE 149th Street	**51**	45
LL161.6	351 NE 149th Street	**51**	45
LL161.5	345 NE 149th Street	**51**	45
LL161.4	339 NE 149th Street	**51**	45
LL161.3	333 NE 149th Street	**51**	45
LL161.2	327 NE 149th Street	**51**	45
LL161.1	321 NE 149th Street	**51**	45
LL157.7	14802 5th Avenue NE	**50**	**50**
LL157.8	14808 5th Avenue NE	**49**	**49**
N/A	14812 5th Avenue NE	**48**	**48**
N/A	14818 5th Avenue NE	**48**	**48**
N/A	14902 5th Avenue NE	**47**	**47**
LL157.6	14578 5th Avenue NE	**51**	**51**
LL157.5	14574 5th Avenue NE	**50**	**50**
LL157.4	14570 5th Avenue NE	**50**	**50**
LL157.3	14560 5th Avenue NE	**48**	**48**
LL157.2	14556 5th Avenue NE	**47**	**47**

Residual WAC noise impacts would remain at 10 receptors on 5th Avenue NE. Since most of these receptors have driveways on 5th Avenue NE, a noise wall will not be effective because it would have to be segmented to accommodate the driveways. Impacts inside the residences could be eliminated with residential sound insulation improvements, and should be evaluated on an individual basis. Supplemental interior and exterior noise measurements should be performed at these receptors to verify the potential for noise impact from the Park & Ride, and to evaluate the sound transmission loss of the existing buildings. It is expected that the hourly noise levels produced by buses may be lower than the existing ambient noise produced by the traffic on I-5.

Applying Sound Transit's Noise Mitigation Policy (2004) criteria for Residential Sound Insulation, "implement residential sound insulation as a noise mitigation measure when justified by the scope of an identified impact that cannot be reduced or eliminated through source control or other operational measures. Residential sound insulation shall be used only when the use of source or path treatments, such as noise barriers is ineffective, unreasonable, and/or infeasible."

In addition, "Unless otherwise required, sound insulation will use the Housing and Urban Development (HUD) interior 45 dBA L_{dn} as the reference value for interior noise level reduction of light rail impacts and WSDOT's 51 dBA peak hour L_{eq} criteria as the reference value for traffic noise impacts. For those locations where both light rail and traffic noise impacts are identified, the interior noise levels will meet whichever criterion achieves the greatest level of noise reduction."

Figure 9: Shoreline South/145th Station Park & Ride Noise Wall Recommendations



5.5.2 Shoreline North/185th Station

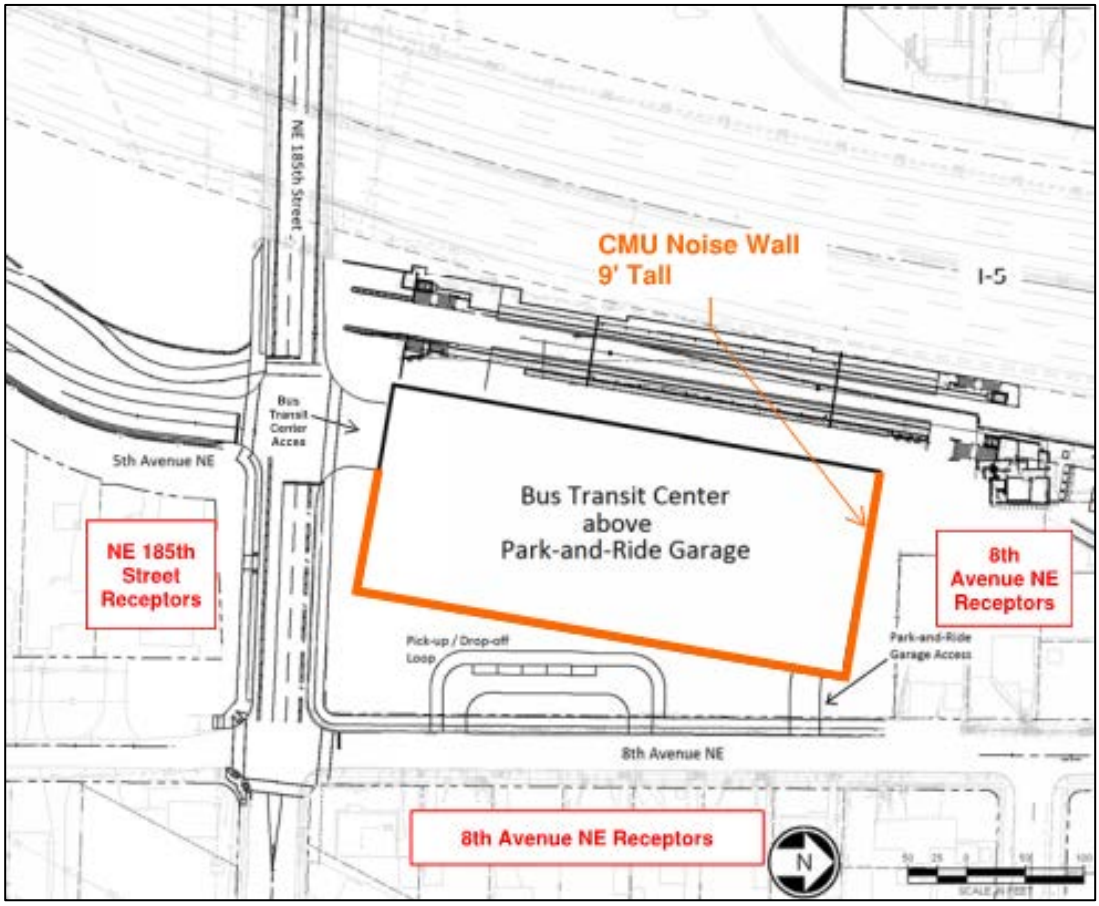
The bus transit center will be located on the roof level of a parking garage with bus access (entry and exit) from NE 185th Street. An FTA analysis of cars and buses moving and idling in the Park & Ride, based on the measured reference noise levels produced by current vehicles, resulted in no noise impacts in terms of the L_{dn}. The analysis was repeated based on the peak hour volume of 32 buses between 6 a.m. and 7 a.m. which was used to calculate an hourly L_{eq}. This model predicts 13 WAC impacts associated with the Park & Ride. Impacts resulting from buses in the Park & Ride can be fully mitigated in the form of a parapet noise wall, 9 feet in height above the road surface and approximately 700 feet long, on three sides of the parking garage. The predicted Park & Ride impacts with LRV mitigation are listed in Table 9, and wall extents are shown in Figure 10.

Table 9: Shoreline North/185th Station Impact Summary

Project Parcel	Address	L_{eq} Projected Noise Before Mitigation (dBA)	L_{eq} Projected Noise After Mitigation (dBA)
LL261.1	18559 8th Avenue NE	**50**	44
LL260.1	18553 8th Avenue NE	**53**	42
LL244.4	731 NE 185th Street	**49**	43
LL244.5	721 NE 185th Street	**49**	43
LL244.8	18342 8th Avenue NE	**47**	42
LL264.9	18554 8th Avenue NE	**49**	44
LL258.1	18540 8th Avenue NE	**50**	44
LL257.1	18534 8th Avenue NE	**49**	44
LL255.1	18528 8th Avenue NE	**49**	43
LL253.1	18522 8th Avenue NE	**49**	43
LL251.1	18516 8th Avenue NE	**49**	42
LL249.1	18510 8th Avenue NE	**48**	42
LL247.1	18504 8th Avenue NE	**48**	42

If such a wall is deemed to have an unacceptable visual impact, sound insulation can be considered for the 13 impacted residences. Impacts should be evaluated on an individual basis. Supplemental interior and exterior noise measurements should be performed at these receptors to verify the potential for noise impact from the Park & Ride, and to evaluate the sound transmission loss of the existing buildings. It is expected that the hourly noise levels produced by buses may be lower than the existing ambient noise produced by the traffic on I-5.

Figure 10: Shoreline North/185th Station Park & Ride Noise Wall Recommendations



6.0 STATION ACOUSTICS RECOMMENDATIONS

The following summarizes the acoustic treatment recommendations for the two Stations located within Contract L200.

6.1 Shoreline South/145th Station:

1. Provide a sound barrier wall on the edge of the guideway closest to I-5. Wall should extend past the edge of the platform on both ends. Height of wall to be determined.
2. The mechanical and electrical rooms will require acoustical treatment per Sound Transit DCM. A material with a minimum NRC-0.60 is required per the Design Criteria.
    a. Treatment could be a spray applied material such as Pyrok Acoustement 40 (1" thickness), or approved equal.
    b. Alternately duct liner batts or similar bonded fiberglass batts or mineral wool batts would be acceptable (R-6 or 1.5" thick batts). A perforated metal panel may be desired to cover the batts for damage protection.

3. The communications room should be treated with acoustical absorption. A lay-in tile ceiling with a minimum NRC-0.65 rating will be sufficient.

   These recommendations apply to the baseline station design and the three station alternatives dated 30 July 2016.

6.2 Shoreline North/185th Station:

1. The mechanical and electrical rooms will require acoustical treatment per Sound Transit DCM. A material with a minimum NRC-0.60 is required per the Criteria.
   a. Per the Design Criteria, treatment shall cover a minimum of 35% of the wall and ceiling area. This shall include at least 50% of the ceiling area.
2. The communications room should be treated with acoustical absorption. A lay-in tile ceiling with a NRC-0.65 rating may be sufficient.
   a. Per the Design Criteria, treatment shall cover a minimum of 35% of the wall and ceiling area. This shall include at least 50% of the ceiling area.

Following are our recommendations for acoustical treatment and noise control at the platform level:

3. Maintain the sound wall at the platform level as currently indicated in the drawings. The wall should extend past the edge of the platform and entry plaza to the north, and terminate at the 185th Street overpass/South entry plaza as drawn.
   a. The top of the sound wall should be at least 15’ above the platform level elevation.
   b. The sound wall should extend at least 30’ north of column line 15.
   c. The sound wall should be of solid continuous construction without gaps, except for minimal openings allowing for drainage at the bottom. The wall should have a surface weight of at least 4 lbs/sq. ft.
   d. The use of visually transparent materials are acceptable provided that they meet the surface weight requirements.
   e. Acoustically absorptive material should make up approximately 40% of the surface area of the wall facing the station platform. This acoustic treatment should be evenly distributed along the length of the wall.

4. Provide acoustical absorption at underside of the platform canopy for further traffic noise control. Perforated metal panels with 2" thick mineral wool batt backing may be sufficient. A rigid insulation board, expanding foam insulation, or similar products may not provide the same acoustical absorption as a batt material. Mineral wool is weather resistant.

    a. A product such as Thermafiber RainBarrier is recommended (http://www.thermafiber.com/products/commercial/rainbarrier-continuous-insulation/).

    b. Alternately an acoustically insulated metal roof deck would be applicable, such as Epic Metals roof decks (https://www.epicmetals.com/).

These recommendations apply to the baseline station design dated 28 January 2018.

PART 2: VIBRATION

1.0 INTRODUCTION

The goals of final design for project vibration control were to incorporate design changes relative to the 60% design and cost savings analysis, refine predictions by introducing more detail in the vibration models, and reduce conservatism in the analysis. This report outlines the vibration impact criteria, describes the assumptions and vibration analysis approach, summarizes the potential vibration impacts and provides vibration mitigation design concepts. Groundborne noise was considered for first row receivers with finished basements and for apartment buildings or condominiums.

The Lynnwood Link Extension includes vibration and groundborne noise mitigation for the light rail vehicle (LRV) guideway as determined by Federal Transit Administration (FTA) guidelines for preventing impacts from future LRV operations.

2.0 IMPACT CRITERIA

2.1 Light Rail Vibration Criteria

Vibration impacts were assessed using the FTA manual *Transit Noise and Vibration Impact Assessment* (May 2006). Information regarding source vibration levels from operations was based on vibration measurements of Sound Transit vehicles.

Vibration propagation data from measurements conducted during Preliminary Engineering and from new measurements were combined with vehicle source data to develop a vibration model to predict project-related vibration for nearby sensitive receptors, including high-sensitivity uses such as hospitals, residential uses, and institutional uses. The predicted vibration were compared to the FTA criteria to determine locations where vibration or ground-borne noise impacts would occur. Where potential vibration impacts were identified, mitigation measures were developed.

The FTA groundborne vibration impact criteria are based on land use and the number of trains per day. Because the Lynnwood Link Extension Project would have *frequent* train service throughout the corridor, defined as more than 70 trains per day, only the criteria for frequent train operations are presented. The criteria for most land uses are shown in Table 10. The FTA vibration criteria are applied primarily to residential (including hotels and other places where people sleep) and institutional land uses. Commercial land uses are only considered when they contain vibration-sensitive uses, such as medical offices or sensitive manufacturing equipment. The criterion applied to these locations is dependent on the sensitivity of the use. Some buildings, such as concert halls, recording studios, and theaters, are particularly sensitive to vibration and groundborne noise, but do not fit into any of the three categories listed in Table 10. Due to their sensitivity, these buildings warrant special attention during the impact

assessment. Table 11 gives criteria for acceptable levels of groundborne vibration for various types of special buildings.

Table 10: Groundborne Vibration and Noise Impact Criteria for Frequent Events[1]

Land Use Category	Groundborne Vibration Impact Levels (VdB re 1 micro-inch/sec)	Groundborne Noise Impact Levels (dB re 20 micro-Pascals)
Category 1: Buildings where low ambient vibration is essential for interior operations	65 VdB[2]	N/A[3]
Category 2: Residences and buildings where people normally sleep	72 VdB	35 dBA
Category 3: Institutional land uses with primarily daytime use	75 VdB	40 dBA

Notes:

[1] "Frequent Events" are defined as more than 70 vibration events of the same source per day; most rapid transit projects fall into this category.

[2] This criterion is based on levels that are acceptable for most moderately sensitive equipment, such as optical microscopes. Vibration-sensitive manufacturing or research requires detailed evaluation to define the acceptable vibration levels.

[3] Not applicable. Most vibration-sensitive equipment is generally not sensitive to groundborne noise.

Table 11: Groundborne Vibration and Noise Impact Criteria for Special Buildings

Type of Building or Room[1]	Frequent Events[2]	
	Groundborne Vibration Impact Levels (VdB re 1 micro-inch/sec)	Groundborne Noise Impact Levels (dB re 20 micro-Pascals)
Concert Halls	65 VdB	25 dBA
TV Studios	65 VdB	25 dBA
Recording Studios	65 VdB	25 dBA
Auditoriums	72 VdB	30 dBA
Theaters	72 VdB	35 dBA

Notes:

[1] If the building will rarely be occupied when trains are operating, then there is no need to consider impact.

[2] "Frequent Events" are defined as more than 70 vibration events per day; most transit projects fall into this category.

Table 12 provides vibration criteria for a detailed vibration analysis, such as the analysis for final engineering. The criteria in Table 12 are based on exceedance of the 1/3 octave-band vibration level limits over the frequency range 8 to 80 Hertz (Hz). The criteria are also shown graphically in Figure 11. These detailed criteria were used to assess vibration impact at vibration sensitive receptors adjacent to the future alignment.

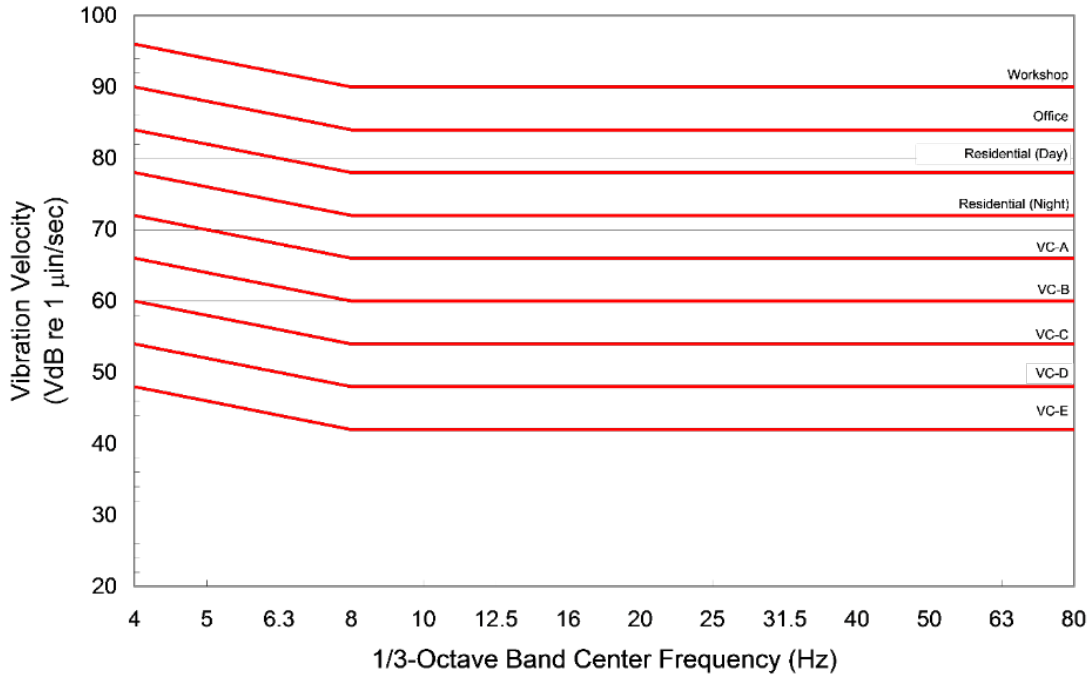
Table 12: Vibration Criteria for Detailed Analysis

Criterion Curve	Maximum Lv During Train Passage (VdB)[1]	Description of Use
Workshop	90	Distinctly detectable vibration; appropriate to workshops and nonsensitive areas
Office	84	Detectable vibration; appropriate to offices and nonsensitive areas
Residential day	78	Barely detectable vibration; adequate for computer equipment and low-power optical microscopes (up to 20X)
Residential night, operating rooms/ sensitive hospital equipment	72	Vibration not detectable, but groundborne noise might be audible inside quiet rooms; suitable for medium-power optical microscopes (100X) and other equipment of low sensitivity
VC-A	66	Adequate for medium- to high-power optical microscopes (400X), microbalances, optical balances, and similar specialized equipment
VC-B	60	Adequate for high-power optical microscopes (1,000X) and inspection and lithography equipment up to 3 micron-line widths
VC-C	54	Appropriate for most lithography and inspection equipment to 1 micron detail size
VC-D	48	Suitable in most instances for the most demanding equipment, including electron microscopes operating to the limits of their capability
VC-E	42	The most demanding criterion for extremely vibration-sensitive equipment

Notes:

[1] As measured in one-third-octave bands of frequency over the frequency range 8 to 80 Hz.

Figure 11: Vibration Criteria for Detailed Analysis



Recently, a concern was raised regarding a property at 156 NE 116th St in the City of Seattle. The property is reported by the resident to have a recording studio, and the occupant is concerned that vibration from construction and train operations would have an adverse impact. Referring to Table 12, a maximum 1/3 octave band level of 72 VdB was used as the criterion for estimating the vibration impact at the property until the status of the studio can be investigated and confirmed

2.2 Light Rail Groundborne Noise Criteria

Most sensitive receptors along the alignment are exposed to such high levels of exterior noise from I-5 that groundborne noise from Sound Transit trains will likely be indistinguishable from highway traffic noise within the receivers. Groundborne noise was considered for apartment buildings or condominiums where it would be possible to have residential units shielded from the airborne noise from the highway. Groundborne noise was also considered for first row receivers that have finished basements. For single family residences without finished basements, the airborne path of noise is assumed to dominate and is addressed in the noise analysis. The FTA criterion for groundborne noise in residential receptors is a maximum A-weighted sound pressure level of 35 dBA re 20 micro-Pascals.

Historically, groundborne noise for above ground light rail systems have been neglected based on the assumption that the airborne noise component of a passing train dominate the groundborne component. This assumption was stated in the FEIS. However, in some situations such as homes with sleeping quarters shielded from the airborne noise, the groundborne noise may become significant. This may be the case when the bedroom is in a finished based or on the side of the house facing away from the LRV alignment. In addition to the calculations, the need for mitigation may also depend on the configuration of individual receptors.

3.0 ASSUMPTIONS

The basic assumptions applied to the vibration modeling effort include:

- Vibration measurements made during the PE phase are substantially correct and unchanged. Supplemental vibration measurements were made to verify and refine the levels in selected areas. Previous and new vibration data served as the basis for assessing LRV vibration impact and vibration mitigation design.
- Vibration predictions were based on Sound Transit's 2035 ridership model for Link light rail. During peak revenue service, the model assumed four car trains operating on 4-minute headways.
- Project does not involve any modifications to the I-5 freeway.
- Train speeds were determined based on a maximum speed of 55 mph, civil speed limits in curves as determined by the track designers, and an acceleration/deceleration rate of 3 mph/sec between changes in speed, including curves and approaching or departing the stations.

- The most recent LRV passby reference vibration levels measured in June 2016 served as reference vibration levels in the vibration model. Unlike previous tests, the June 2016 tests were made using a four-car test train. Data from vibration propagation tests conducted by ATS Consulting at the test locations in 2013 and by Wilson Ihrig at the same test locations in 2017 were used to determine reference vibration levels.

4.0 VIBRATION IMPACT ANALYSIS APPROACH

4.1 Light Rail Vibration

The vibration analysis followed the approach described in the FTA guidance manual, *Transit Noise and Vibration Impact Assessment*, Chapter 11, "Detailed Vibration Analysis" (FTA 2006). The projected vibration level (L_v) at each vibration-sensitive receptor was determined by the dynamic forces generated by the transit vehicle (Force Density Level [FDL]), the line-source transfer mobility from the tracks to the receptor (Line-Source Transfer Mobility [TM_{line}]), and adjustments to account for the dynamic response of the building as the vibration progagates through it (Building Vibration Response [BVR]). The BVR accounts for attenuation due to soil/foundation interaction and for amplification due to floor resonance. Additional adjustments were made to account for increased vibration due to special track work such as crossovers and any vibration impact mitigation incorporated into the track design. The above components were used to calculate the 1/3-octave vibration level as follows:

$$L_v \text{ (VdB)} = \text{FDL} + TM_{line} + \text{BVR} + \text{Adjust.}$$

where:
- L_v = vibration velocity level due to trains (VdB re: 1 micro-inch/second)
- FDL = train force density level (dB re: 1 $lb/ft^{1/2}$)
- TM_{line} = soil line-source transfer mobility [dB re: (1 micro-inch/s)/($lb/ft^{1/2}$)]
- BVR = building vibration response (relative dB)
- Adjust. = adjustment to account for crossovers and/or mitigation (relative dB)

4.2 Force Density Level (FDL)

The Force Density Level (FDL) was based upon reference vibration level testing conducted by Wilson Ihrig at three sites on the existing LRV system, representing three track structures:

- SITE 1: 14257/14261 Macadam Road S, Tukwila (north of S.144th St, west side of I-5)
  - Track: Direct Fixation in retained cut; SB track used for tests
- SITE 2: 12670 Macadam Road S, Tukwila (at intersection with S 128th St)
  - Track: Direct Fixation on aerial guideway, SB track used for tests
- SITE 3: 9700 Martin Luther King S, Seattle
  - Track: At-grade Ballast & Tie, NB track used for tests

The FDL was determined from the above vibration measurements using the following formula:

$$\text{FDL} = L_v - TM_{line}$$

Where L_v is the vibration velocity level measured within each 1/3 octave band during train passbys and TM_{line} is the 1/3 octave band line-source transfer mobility at the test location.

In June 2016, Wilson Ihrig conducted ground vibration measurements at multiple distances from the track centerline at each of the above locations as a four-car test train passed the transducer array at test speeds ranging from 25 to 55 mph (6 to 10 passbys each). The energy average vibration velocity level ($L_{v,eq}$) was calculated for each 1/3 octave band between the 3-dB down points of the overall vibration level during the passby. The vibration spectra from the multiple passbys at a given speed for each measurement location were then energy averaged to obtain the reference spectrum for that speed.

The precision of the FDL, indicated by the similarity of FDLs calculated at different distances from the track, is dependent upon the transducers being at the same locations for the train passby measurements and the transfer mobility measurements. Ideally, the passby vibration and transfer mobility are measured on the same day, using the identical measurement set up. Due to schedule, and equipment and test train availability, the transfer mobility was not measured during the June 2016 reference vibration measurements. Initial estimates of the FDL, and subsequent vibration projections, were based upon the June 2016 reference vibration measurements and transfer mobility testing conducted by ATS Consulting in March/April 2013. The FDL was further refined after Wilson Ihrig returned to the test sites to conduct transfer mobility testing using measurement locations that were essentially the same as the June 2016 train vibration measurements.

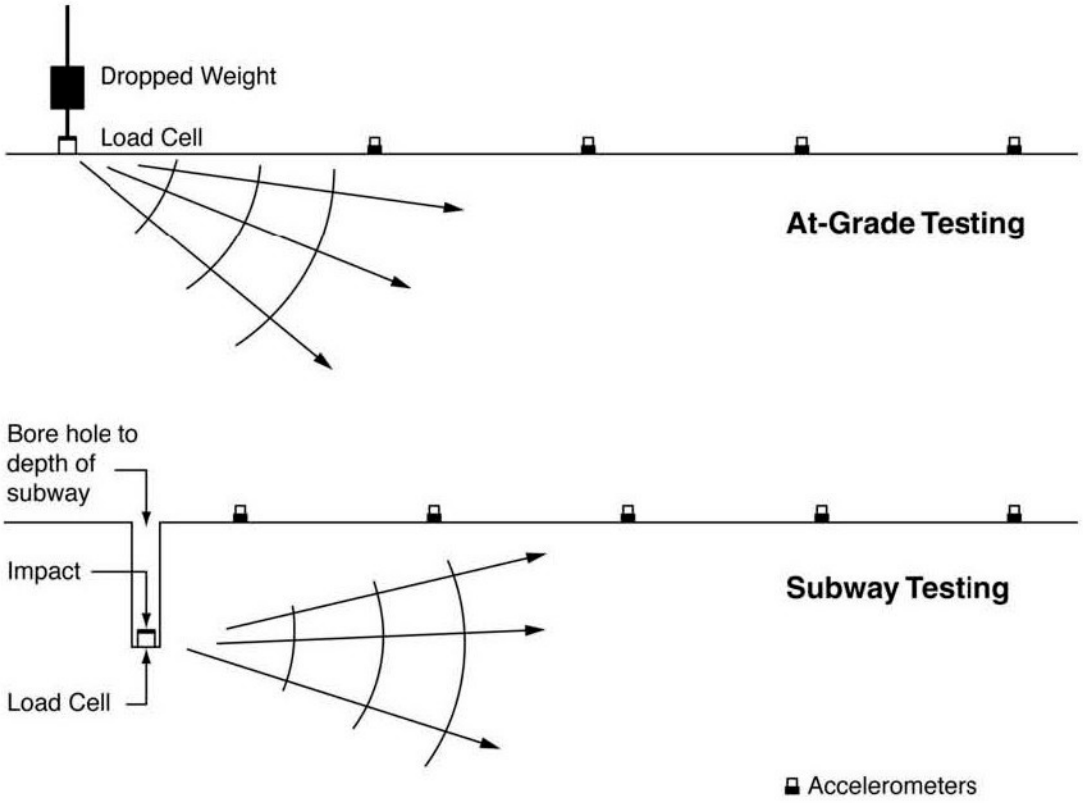
The transfer mobility testing conducted by ATS Consulting and by Wilson Ihrig involves impacting on the ballast at the ballast-and-tie track and impacting on the concrete invert in the retain cut. The line-source transfer mobility tests, described below, for locations along the future alignment typically involve impacting on bare soil. Therefore, the FDLs determined from the test sites above should be corrected for differences between impacting on the ballast/invert versus soil. The corrections are based on a conservative envelope of comparisons between transfer mobilities calculated or measured from the top of a concrete slab to those calculated without the concrete slab or measured on bare soil adjacent to the slab.

4.3 Line-Source Transfer Mobility (TM_{line})

The Line-source Transfer Mobility (TM_{line}) represents the response of the ground to vertical forces incoherently distributed over the length of the train. To develop the transfer mobility, the vibration propagation characteristics of the soil are determined by producing an impulsive force on or below the ground surface and measuring the vibration response in each 1/3-octave band (typically from 4 to 160 Hz) at geophones located over a range of distances. The transfer mobilities between each impact and geophone location is calculated from the measured data. The Point Source Response (PSR) is the level in dB of the transfer mobility magnitude. The line-source transfer mobility is calculated by integrating the square of the 1/3-octave PSR over the length of the train. Details of this analysis procedure may be found in the FTA *Transit Noise and Vibration Impact Analysis* manual.

The vibration propagation test procedure and transducer layout are shown schematically in Figure 12. As shown at the top of Figure 12, a weight is dropped from a height of 4 – 6 feet onto a load cell placed against the ground to generate a dynamic impact force. The measurement equipment includes a load cell to measure the force produced by the weight, high-sensitivity geophones, amplifiers, and a multi-channel digital data recorder. Geophones produce an analog electrical signal that is proportional to the vertical vibration velocity of the ground surface to which they are attached. The geophones are adhered with wax to paved surfaces, concrete curbs, or aluminum stakes that have been driven into soil.

Figure 12: Test Configuration for Measuring Transfer Mobility



For each impact location, a minimum of 30 impacts are typically made to provide an adequate signal-to-noise ratio for the measurement. Analog data are digitally recorded continuously for each set of impacts.

For subways and segments within deep cuts, the force must be located at the approximate depth of the subway or cut. This is done by drilling a borehole and locating the force transducer at the bottom of the hole. The tests are usually performed at the same time that the boreholes are drilled. This allows using the soil-sampling equipment on the drill rig for the transfer mobility testing. The force transducer is attached to the bottom of the drill string and lowered to the bottom of the hole. A standard soil sampling hammer, which is usually a 140-pound weight dropped 18 inches onto a collar attached to the drill string, is used to impact the ground.

The physical property of *reciprocity* states that the locations of the force impact and the geophones can be switched and the measured transfer mobilities will be the same. Therefore, sometimes an array of accelerometers or geophones is lowered into the hole and the ground surface is impacted at multiple distances from the hole. The test is often repeated at multiple depths to address varying depth of the rail along the alignment.

Data are then analyzed with digital signal processing software to calculate the auto- and cross-spectral components from which the transfer mobility and coherence between each impact and geophone location are computed as functions of frequency. Coherence is a measure of the signal-to-noise ratio of the test as a function of frequency. The basic analysis steps taken are as follows (see the FTA guidance manual *Transit Noise and Vibration Impact Assessment* and associated references for additional, detailed information):

- Linear averages of auto- and cross-spectral components are computed for each source-receiver location.
- Transfer mobilities and coherence functions for each source-receiver pair are computed from the auto- and cross-spectral components.
- The narrowband squared transfer mobility magnitudes are averaged over each 1/3-octave band and the result was expressed as the PSR in decibels.
- The PSR levels are plotted with respect to the logarithm of distance from the impacts and a polynomial curve is fitted to the data by the method of least squares for each 1/3-octave band using the following formula to obtain the PSR as a function of distance:

$$PSR(D) = A_0 + A_1 \cdot \log_{10}(D) + A_2 \cdot \log_{10}^2(D) + A_3 \cdot \log_{10}^3(D)$$

  where: PSR = Point Source Response in dB

  A_0, A_1, A_2 and A_3 = regression coefficients

  D = distance (feet) between the source and the receiver

- The TM_{line} at each test site is calculated by integrating the 1/3-octave PSR energy at specific distances over the length of a four-car train (380 feet) using the regression coefficients determined above.

Where access and space permits, the line-source transfer mobility to specific distances (i.e., where the geophones are located) can be also be measured by impacting along a line parallel with and adjacent to the rail alignment, at multiple, equally-spaced points, typically 5 to 25 feet apart, over the length of a train. In this case, the line-source transfer mobility is calculated from the individual point-source mobilities using the following equation (a numerical integration):

$$TM_{line}(D) = 10 \cdot \log(10^{PSR1(D)/10} + 10^{PSR2(D)/10} + \ldots + 10^{PSRn(D)/10}) + 10 \cdot \log(\Delta x)$$

where: n = number of impact locations

Δx = distance, in feet, between impact locations and
D = the perpendicular distance from the line of impacts to the response measurement location.

A polynomial curve fit, as described for the PSR above, may then be utilized to determine TM_{line} at arbitrary distances to vibration sensitive receptors along the alignment as follows:

$$TM_{line}(D) = A_0 + A_1 \cdot \log_{10}(D) + A_2 \cdot \log_{10}^2(D) + A_3 \cdot \log_{10}^3(D)$$

where: A_0, A_1, A_2 and A_3 = the regression coefficients

D = the perpendicular distance (feet) between the line-source and the receiver.

Transfer mobilities have been measured previously at a total of fourteen sites near the proposed alignment during Preliminary Engineering. Transfer mobilities at an additional twelve sites were measured and incorporated into the analysis, including four sites where measurements were conducted in a borehole. Test sites were based on a review of aerial photographs, geological information available online from the Washington State Geological Survey, and supplemented by a visual land-use survey. The test sites were selected to represent a range of soil conditions in areas along the project corridor near sensitive land uses. The test sites were located in the municipalities of Seattle, Shoreline, Mountlake Terrace, and Lynnwood.

A vibration model has been developed using the transfer mobilities measured at the locations discussed above. Due to time and budget constraints, it was not possible to measure the transfer mobilities at all vibration sensitive receivers along the alignment. Therefore, assumptions had to be made regarding the appropriate transfer mobility data to utilize for individual receptors. In addition, all previous transfer mobility measurements were conducted on the surface only. For this analysis, additional transfer mobility measurements were conducted to refine the vibration model at locations where previous analyses indicated potential vibration impact, including transfer mobilities from boreholes drilled to the future depth of the track at locations where the alignment will be in retained cuts.

4.4 Building Vibration Response (BVR)

The mechanical responses of various parts of building structures either reduce or increase the interior vibration levels. Composite building vibration responses were derived to represent the response of the foundation to incident ground vibration, floor-to-floor attenuation, and resonance amplification of floors. These building vibration responses are added to the predicted ground surface vibration levels to arrive at the final predicted indoor floor vibration levels.

Vibration is reduced as it travels from the soil into the building because of the mass of the building, stiffness of the foundation, and reflections of the vibration from the foundation. These combined effects are referred to as the *foundation coupling loss*. The FTA guidance manual provides foundation coupling losses for a variety of buildings. As the FTA manual states, the floor resonance amplification varies greatly; therefore, the manual suggests adding +6 dB to floor vibration velocity levels in the frequency range of the fundamental resonance in the floor: from 15 to 20 Hz for wood-frame residential structures and 20 to 30 Hz for a reinforced-concrete slab floor in modern buildings (*Chapter 11: Detailed Vibration Analysis*, page 11-11). The combined frequency range for both types of buildings includes the 1/3-octave bands from

16 to 31.5 Hz. For the Lynnwood Link Extension vibration analysis, this adjustment was extended to all bands above 31.5 Hz and an adjustment was also added at frequencies below 16Hz. Table 13 lists these adjustments.

Table 13: Adjustment for Floor Resonance Amplification (dB)

	1/3-Octave Band Center Frequency (Hz)														
	6.3	**8**	**10**	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
Adjustment	2	3	4	5	6	6	6	6	6	6	6	6	6	6	6

Because the majority of sensitive land uses along the project corridor are single-family residential structures, the predictions herein are for the first floor, and no floor-to-floor attenuation factor has been included.

Where access was granted, a vibration propagation measurement from outside to inside residential buildings was made during the fieldwork for measuring transfer mobilities. These data were used to develop site-specific BVRs. BVRs used previously for Sound Transit University Link and Northgate Link Extension are listed in Table 14 along with LLE-specific values determined from field measurements. The BVR assigned to each receptor building was based on observation of the building type along the alignment which were predominantly wood frame over crawlspace.

Table 14: Building Vibration Response (dB) (Including Adjustment for Floor Resonance Amplification)

Structure	1/3-Octave Band Center Frequency (Hz)														
	6.3	8	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Single Family	2	2	2	2	2	1	1	1	1	1	1	1	1	1	2
1-2 Story Residential	2	1	-1	-1	-1	-2	-2	-2	-3	-3	-3	-3	-2	-2	-1
2-4 Story Masonry on Spread Footings	-1	-2	-3	-4	-4	-5	-6	-7	-8	-8	-8	-6	-6	-5	-4
Large Masonry on Pile Foundation	-2	-2	-1	0	0	-1	-2	-3	-3	-4	-5	-6	-7	-8	-8
Large Masonry on Spread Footings	-6	-7	-6	-6	-6	-7	-8	-8	-8	-8	-8	-8	-8	-7	-6
Slab on Grade Floor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood Floor Over Crawlspace	7	5	5	6	7	6	8	8	4	2	-2	-3	-2	1	2
Multi-Family Residential Home	4	4	3	4	4	1	-2	-3	-3	1	3	1	5	9	7

4.5 Groundborne Noise Adjustment

Interior groundborne noise levels were derived from the building vibration levels in keeping with FTA methodology. To estimate the interior groundborne noise levels associated with ground vibration, the predicted floor vibration velocity spectra were A-weighted and then a 5 dB factor was subtracted to account for acoustical absorption in the room. The resulting A-weighted noise level was compared with groundborne noise criteria (35 dBA typically) to assess impact.

4.6 Additional Adjustments

Wheel impacts at crossovers (also known as *special trackwork)* increase vibration relative to smooth running rail. The vibration generated by special trackwork propagates as a point source since the impact occurs at the crossover frog. Therefore, the adjustment depends strongly upon the proximity of the receptor to the crossover. To account for the increased vibration from crossovers, the following empirically-based adjustment was applied:

+11 dB	D < 20 ft
$11 + 20 \cdot \log_{10}(20/D)$ dB	20 ft ≤ D ≤ 70 ft
0 dB	D > 70 ft
where:	D = the distance in feet between the receiver and the closest extent of any crossover.

The above adjustment is based upon ground vibration measurements conducted adjacent to crossovers on other transit systems and is identical to the adjustment that was applied to the University Link Extension and Northgate Link Extension.

Vibration adjacent to tracks on embankments or retained fill has been observed to be lower than vibration from similar track at grade level. This difference is likely due to the increased path length from the track to the receivers and possible additional damping provided by the filled soil relative to the native soil and/or the interface between the fill and the native soil. Therefore, the empirically-derivedadjustments indicated in Table 15 were applied at receivers adjacent to embankments or retain fill with an elevation greater than 6 feet above the existing grade level.

Table 15: Adjustment for Track on Embankment Relative to At-Grade (dB)

	1/3-Octave Band Center Frequency (Hz)														
	6.3	**8**	**10**	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
Adjustment	0	0	0	0	0	-0.3	-2.4	-4.3	-5	-5	-5	-5	-5	-5	-5

5.0 VIBRATION MITIGATION DESIGN

The calculations predict vibration levels produced by LRV operations in terms of the maximum velocity level (L_v) during a train passby, VdB. Where vibration impacts are projected without mitigation, the model was used to assess the most cost effective mitigation approaches at each impact location, as well as the minimum extents (i.e. the distances to either side of the receiver) required to mitigate impact. The following FTA approved vibration isolation provisions were considered:

- Ballast Mat
- Isolation Slab Track (IST)

5.1 Ballast Mat

A ballast mat consists of a rubber (or other type of elastomer) pad that is placed under the ballast. The mat generally must be placed on a concrete pad to be effective. Ballast mat will not be as effective if placed directly on the soil or the sub-ballast. Therefore, areas recommended for ballast mat assume that the ballast mat will be on a concrete slab or invert. Typical ballast mat installations include a concrete slab or invert that is 8 to 16 inches thick, 2-inch thickness (typical) ballast mat, and 12 to 18 inches of ballast. For this analysis, the empirically based insertion losses relative to ballast-and-tie track provided in Table 16 were used to assess whether ballast mat would adequately mitigate vibration impacts. The insertion losses for ballast mat are based upon the best estimate of the most effective ballast mat products currently available. A ballast mat on-grade concept is shown in Figure 13.

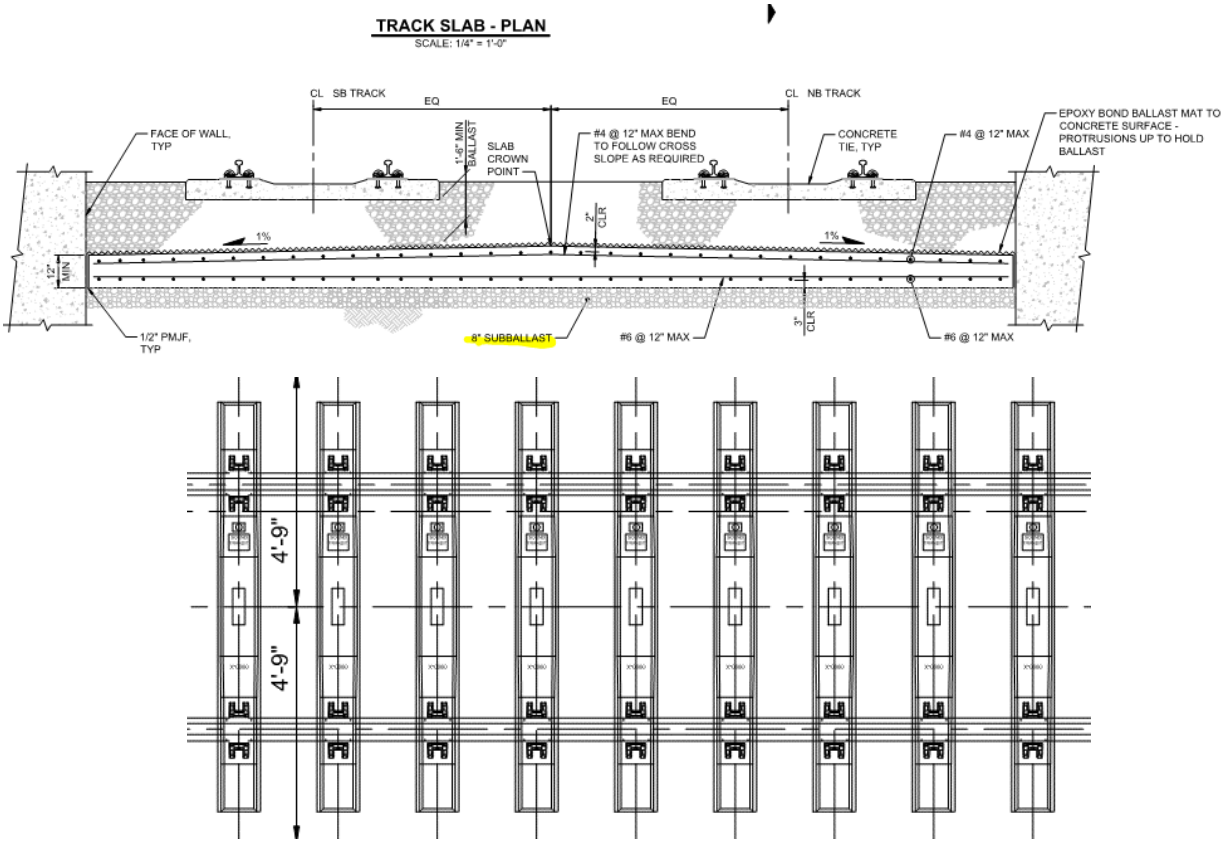
Table 16: Adjustment (insertion gain, dB) for Vibration Mitigation

Mitigation	1/3-Octave Band Center Frequency (Hz)														
	6.3	8	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Ballast Mat[1]	0	0	0	-0.5	0.2	0.2	-4	-6	-4	-5	-10	-10	-10	-10	-10
16 Hz Isolation Slab Track[1]	0	0	0	2	3	-3	-7	-10	-12	-13	-14	-16	-18	-20	-22

Notes:

[1]Relative to Ballast-and-Tie Track

Figure 13: Ballast Mat On Grade Concept

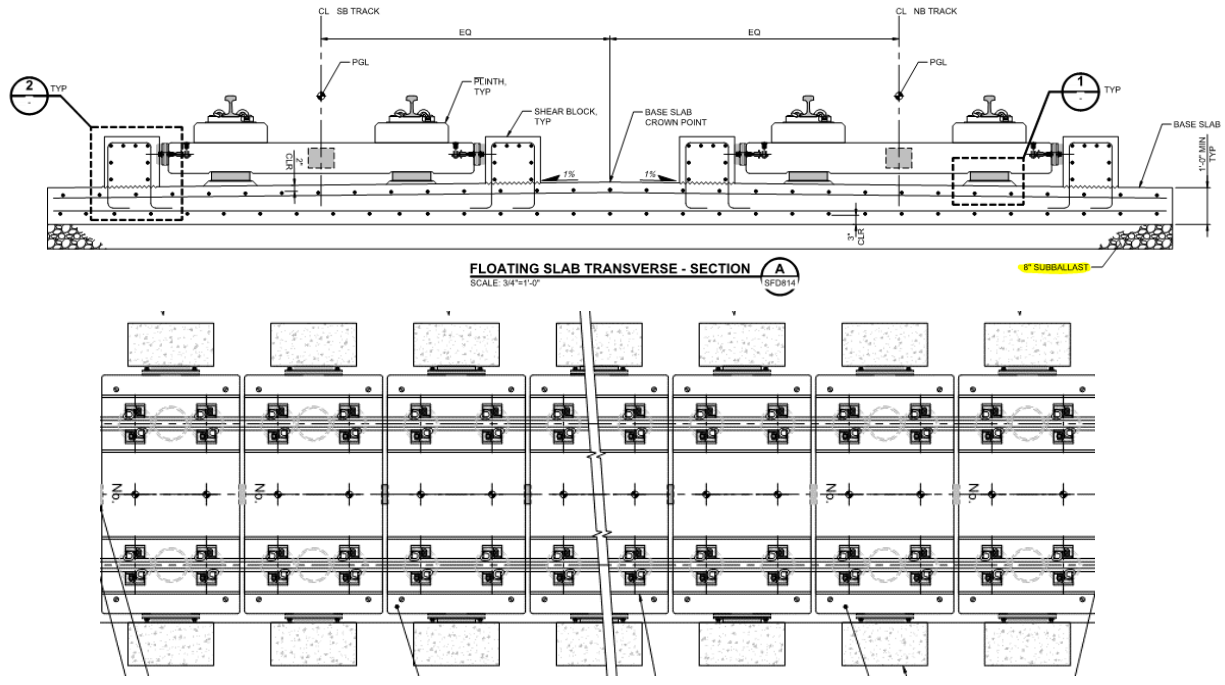


5.2 Isolation Slab Track (IST)

With an IST system, the rails would be fixed to either a continuous or segmented concrete slab that would be resiliently supported by natural rubber pads. A key feature in the design of an IST system is the natural or resonance frequency of the slab considered as a single-degree-of-freedom oscillator, or spring-mass system. Vibration transmitted to the soil would be reduced at frequencies above the natural frequency, whereas there would be a slight amplification at frequencies near or at the natural frequency and no reduction below the natural frequency. The range of natural frequency for typical IST systems is 8 to 16 Hz. IST generally becomes more effective with a lower natural frequency, but it also becomes more expensive and difficult to construct. The effects of a 16 Hz IST was assessed. Empirically based adjustments for replacing ballast-and-tie track with a 16 Hz IST are listed above in Table 16. An isolation slab track concept is shown in Figure 14.

Wayside noise along the IST would be higher relative to noise at ballast-and-tie track due to the lack of acoustical absorption normally associated with ballast-and-tie tracks. Such increases in noise adjacent to the IST will be accounted for in the noise analysis.

Figure 14: 16 Hz Isolation Slab Track Concept



5.3 Rail Maintenance

Rail grinding and wheel truing are assumed to be standard maintenance provisions for the Lynnwood Link. Poorly maintained rail and wheels will counteract the benefits of vibration isolation provisions and may cause vibration to exceed the predicted levels.

6.0 VIBRATION IMPACT RESULTS

A detailed vibration assessment has been completed for the Lynnwood Link Extension (LLE) Segment L200 based upon the data and methods described above. The summary of vibration calculations at each receptor is listed in Appendix B, and calculations for groundborne noise at each receptor are listed in Appendix C. This section summarizes vibration mitigation recommendations, including mitigation types and locations, to achieve the vibration design goals of the project.

The majority of vibration sensitive receptors along the L200 segment are residences. Therefore, the vibration criterion for all sensitive receptors along the L200 segment is a maximum 1/3 octave band vibration velocity level of 72 VdB re 1 micro-inch/second (about 4000 micro-inch/second RMS velocity), per the Federal Transit Administration guidance manual, "Transit Noise and Vibration Impact Assessment" (May 2006). A 3 dB uncertainty factor was added to the predicted vibration levels for comparison with the 72 VdB criterion. . A total of 16 potential vibration impacts and eight groundborne noise impacts were identified.

For groundborne noise, there are some receptors requiring further evaluation to determine impact. Calculations show levels slightly over the 35 dBA criterion, but no vibration impact is predicted and airborne noise levels may dominate the groundborne component. The evaluation of the borderline cases should consider, if possible, the presence of finished basements and the location of sleeping quarters relative to the track alignment.

6.1 Vibration Mitigation Recommendations

Table 17 lists the potentially vibration impacted receivers and summarizes the projected vibration velocity levels without mitigation and with the recommended mitigation. Table 18 lists the potentially groundborne noise impacted receivers and summarizes the projected sound levels without mitigation and with the recommended mitigation. Many, not to say most, of the receivers that are potentially impacted by vibration are also potentially impacted by groundborne noise, so much of the recommended mitigation in Tables 17 and 18 are overlapping. Table 19 collates and summarizes the vibration and groundborne noise mitigation recommendations for the Contract L200 Segment of the Lynnwood Link Extension based on the results shown in Tables 17 and 18. The recommendations are indicated for individual "Impact Groups" based on proximity of the impacted receivers and type of mitigation recommended. The recommendations for each Impact Group are discussed below.

6.1.1 Impact Group 1

This impact group consists of two receivers where ballast mat is recommended to mitigate vibration impacts. The recommended extent of the ballast mat at Impact Group 1 is from STA 1464+50 to STA 1468+00 for a total length of 350 feet (both tracks). The ballast mat will transition to a 16 Hz Isolation Track, as discussed in Impact Group 2.

6.1.2 Impact Group 2

A 16 Hz Isolation Slab Track design is recommended for Impact Group 2. The requirement for IST is driven by three receivers out of a total of five receivers in the area requiring vibration mitigation, including the Latvian Community Church. The recommended extent of the IST is from STA 1468+00 to 1482+00 for a total length of 1,400 feet (both tracks)

6.1.3 Impact Group 3

This group consists of two receivers located immediately north of the NE 145th Street passenger station, along an elevated section of the alignment. While vibration impacts are predicted for these receivers, the exceedance over the criterion is less than 1 VdB at both locations. Because of the fractional exceedance and the 3 dB uncertainty factor added to the predictions, it is unlikely that these residences will experience any impacts. No mitigation is recommended.

6.1.4 Impact Group 4

This Impact Group includes seven receivers adjacent to a shallow retained cut section of the alignment, including one vibration impact and six groundborne noise impacts. A 1,350 foot length of ballast mat, STA 1594+00 to STA 1607+50 (both tracks), is recommended in order to mitigate impacts at these locations.

6.1.5 Impact Group 5

This Impact Group includes a single receiver adjacent to a section transitioning from at-grade to retained fill. Ballast mat is recommended to mitigate the vibration impact. The recommended extent of ballast mat is from STA 1633+00 to STA 1637+00 (both tracks), for a total of 400 feet.

6.1.6 Impact Group 6

This Impact Group includes five receivers located near the rerouted 5th Avenue NE in Shoreline. Ballast mat is recommended to mitigate vibration impacts at these locations. The recommended extent is from STA 1641+50 to STA 1652+00, for a total length of 1,050 feet (both tracks).

6.1.7 Impact Group 7

Ballast mat is recommended for a single receiver at STA 1665+50. Ballast mat is recommended to mitigate the vibration impact at this location. The recommended extent is from STA 1662+50 to STA 1667+50, for a total length of 500 feet (both tracks).

6.1.8 Impact Group 8

This impact group consists of a single receiver at STA 1686+00. Ballast mat is recommended to mitigate the groundborne noise impact at this location. The recommended extent is from STA 1684+50 to STA 1688+25, for a total length of 375 feet (both tracks).

Table 17: Projected Maximum 1/3 Octave Band Vibration Velocity Levels

(VdB re 1 micro-inch/second) at Potentially Vibration Impacted Receivers (72 VdB criteria)

Vibration Impacted Receiver Information						No Mitigation		With Mitigation		
Street Address	Project Parcel	Track Type	Speed (mph)	Horiz Dist. (ft)	Depth (ft)	Max 1/3 OB	VdB	Mitigation Type	Max 1/3 OB	VdB
156 NE 116th Street	LL104	Ballast	55	45	0	40	**72**	Ballast Mat	40	68
308 NE 117th Street	LL106	Ballast	55	40	0	40	**73**	Ballast Mat	40	69
11710 3rd Avenue NE	LL108	Ballast	55	24	0	63	**82**	16Hz Iso Track	40	65
338 NE 120th Street	LL114	Ballast	55	37	0	40	**75**	Ballast Mat	40	71
12027 5th Avenue NE	LL116	Ballast	55	33	0	31.5	**81**	16Hz Iso Track	31.5	67
12035 5th Avenue NE	LL117	Ballast	55	26	1.1	31.5	**82**	16Hz Iso Track	31.5	68
321 NE 149th Street	LL161.1	Elevated	49.5	74	0	12.5	**73**	None	12.5	**73**
314 NE 149th Street	LL163.1	Elevated	55	84	0	12.5	**73**	None	12.5	**73**
126 NE 165th Street	LL186	Ballast	55	40	9	63	**73**	Ballast Mat	63	69
17803 3rd Avenue NE	LL218.1	Ballast	55	63	0	31.5	**74**	Ballast Mat	40	70
344 NE 180th Street	LL223.1	Ballast	55	94	0	31.5	**72**	Ballast Mat	31.5	67
18023 5th Avenue NE	LL225	Ballast	55	63	5.3	31.5	**74**	Ballast Mat	40	70
504 NE 182nd Court	LL232	Ballast	55	85	5.7	31.5	**73**	Ballast Mat	31.5	68
18210 5th Avenue NE	LL233	Ballast	55	83	6.7	31.5	**73**	Ballast Mat	31.5	68
514 NE 183rd Court	LL237	Ballast	42.9	68	0.7	31.5	**75**	Ballast Mat	31.5	70
719 NE 189th Street	LL264.1	Ballast	49.5	64	7	31.5	**72**	Ballast Mat	31.5	67

Table 18: Projected Groundborne Noise Levels at Additional Potentially Impacted Receivers (no vibration impact)

Groundborne Noise Impacted Receiver Information						Without Mitigation	With Mitigation	
Street Address	Project Parcel	Track Type	Speed (mph)	Horiz Dist. (ft)	Depth (ft)	dBA	Mitigation Type	dBA
331 NE 120th Street	LL112	Ballast	55	53	0	**48**	Ballast Mat	40
127 NE 164th Street	LL184	Ballast	55	57	20	**42**	Ballast Mat	32
132 NE 164th Street	LL184.2	Ballast	55	52	10	**48**	Ballast Mat	39
127 NE 165th Street	LL185	Ballast	55	49	11	**49**	Ballast Mat	39
124 NE 165th Place	LL187	Ballast	55	42	16	**44**	Ballast Mat	34
119 NE 166th Street	LL188	Ballast	55	39	27	**42**	Ballast Mat	32
114 NE 167th Street	LL189	Ballast	55	16	29	**44**	Ballast Mat	34
19705 10th Avenue NE	LL268	Ballast	55	44	25	**43**	Ballast Mat	33

Table 19: Summary of Contract L200 Vibration and Groundborne Noise Mitigation Recommendations

Impacted Receiver Information						
Impact Group	**Street Address**	**Project Parcel**	**Mitigation Type**	**Mitigation Start**	**Mitigation End**	**Length (ft)**
Impact Group 1	156 NE 116th Street	LL104	Ballast Mat	1464+50	1468+00	350
	308 NE 117th Street	LL106				
Impact Group 2	11710 3rd Avenue NE	LL108	16 Hz Isolation Track	1468+00	1482+00	1400
	331 NE 120th Street	LL112				
	338 NE 120th Street	LL114				
	12027 5th Avenue NE	LL116				
	12035 5th Avenue NE	LL117				
Impact Group 3	321 NE 149th Street	LL161.1	None	Possible residual impacts		
	314 NE 149th Street	LL163.1				
Impact Group 4	127 NE 164th Street	LL184	Ballast Mat	1594+00	1607+50	1350
	132 NE 164th Street	LL184.2				
	127 NE 165th Street	LL185				
	126 NE 165th Street	LL186				
	124 NE 165th Place	LL187				
	119 NE 166th Street	LL188				
	114 NE 167th Street	LL189				
Impact Group 5	17803 3rd Avenue NE	LL218.1	Ballast Mat	1633+00	1637+00	400
Impact Group 6	344 NE 180th Street	LL223.1	Ballast Mat	1641+50	1652+00	1050
	18023 5th Avenue NE	LL225				
	504 NE 182nd Court	LL232				
	18210 5th Avenue NE	LL233				
	514 NE 183rd Court	LL237				
Impact Group 7	719 NE 189th Street	LL264.1	Ballast Mat	1662+50	1667+50	500
Impact Group 8	19705 10th Avenue NE	LL268	Ballast Mat	1684+50	1688+25	375

APPENDIX A: NOISE IMPACT CALCULATIONS SUMMARY

CITY OF SEATTLE NOISE IMPACT TABLE																						
Receiver Information								Impact Analysis												Mitigation			
Street Address	Parcel	Civil Station	Description	# Units	Row	FTA CAT	Existing Ldn (dB)	Near Track Distance(ft)	Track Type	Speed (mph)	Special Track	LRV Noise Level (dB)	Type	Moderate Impact Limit (dB)	Severe Impact Limit (dB)	Moderate Impacts	Severe Impacts	Wall Type	Height Above TOR (ft)	Mitigated LRV Ldn (dB)	Residual Impacts
11200 1st Ave Ne	2926049011	1453+00	Southern F. line ground level Apts. on 1st Ave.	8	1	2	72	158	Elevated	55	No	66.8	Ldn	65.0	70.9	8	0	Absorptive	4	58.0	0
11200 1st Ave Ne	2926049011	1453+00	Southern F. line 2nd floor Apts. on 1st Ave.	4	1	2	72	158	Elevated	55	No	67.3	Ldn	65.0	70.9	4	0	Absorptive	4	59.1	0
11200 1st Ave Ne	2926049011	1453+00	Northern F. line ground level Apts. on 1st Ave.	8	1	2	72	82	Elevated	55	No	70.7	Ldn	65.0	70.9	8	0	Absorptive	4	59.2	0
11200 1st Ave Ne	2926049011	1453+00	Northern F. line 2nd floor Apts. on 1st Ave.	8	1	2	72	82	Elevated	55	No	71.0	Ldn	65.0	70.9	0	8	Absorptive	4	59.8	0
11200 1st Ave Ne	2926049011	1453+00	Front line Apts. on Northgate Way	1	1	2	72	162	Elevated	55	No	66.4	Ldn	65.0	70.9	1	0	Absorptive	4	58.4	0
11200 1st Ave Ne	2926049011	1453+00	Second line Apts. on Northgate Way	4	2	2	72	182	Elevated	55	No	62.7	Ldn	65.0	70.9	0	0	Absorptive	4	55.2	0
11200 1st Ave Ne	2926049011	1453+00	Third line Apts. on Northgate Way	5	3	2	72	295	Elevated	55	No	58.2	Ldn	65.0	70.9	0	0	Absorptive	4	52.6	0
11200 1st Ave Ne	2926049011	1453+00	Southern 2nd line ground level Apts. on 1st Ave.	4	2	2	65	233	Elevated	55	No	61.4	Ldn	60.8	66.2	4	0	Absorptive	4	54.4	0
11200 1st Ave Ne	2926049011	1453+00	Southern 2nd line 2nd floor Apts. on 1st Ave.	4	2	2	65	233	Elevated	55	No	62.0	Ldn	60.8	66.2	4	0	Absorptive	4	55.4	0
11200 1st Ave Ne	2926049011	1453+00	Northern 2nd line ground level Apts. on 1st Ave.	8	2	2	65	196	Elevated	55	No	62.7	Ldn	60.8	66.2	8	0	Absorptive	4	54.3	0
11200 1st Ave Ne	2926049011	1453+00	Northern 2nd line 2nd floor Apts. on 1st Ave.	4	2	2	65	196	Elevated	55	No	63.3	Ldn	60.8	66.2	4	0	Absorptive	4	55.2	0
11200 1st Ave Ne	2926049011	1453+00	Southern 3rd line ground level Apts. on 1st Ave.	4	3	2	63	293	Elevated	55	No	58.5	Ldn	59.6	65.0	0	0	Absorptive	4	52.4	0
11200 1st Ave Ne	2926049011	1453+00	Southern 3rd line 2nd floor Apts. on 1st Ave.	4	3	2	63	293	Elevated	55	No	59.2	Ldn	59.6	65.0	0	0	Absorptive	4	53.3	0
11200 1st Ave Ne	2926049011	1453+00	Northern 3rd line ground level Apts. on 1st Ave.	8	3	2	63	216	Elevated	55	No	60.7	Ldn	59.6	65.0	8	0	Absorptive	4	52.7	0
11200 1st Ave Ne	2926049011	1453+00	Northern 3rd line 2nd floor Apts. on 1st Ave.	8	3	2	63	216	Elevated	55	No	61.3	Ldn	59.6	65.0	8	0	Absorptive	4	53.5	0
11200 1st Ave Ne	2926049011	1453+00	Southern 4th line ground level Apts. on 1st Ave.	10	4	2	63	367	Elevated	55	No	55.6	Ldn	59.6	65.0	0	0	Absorptive	4	50.4	0
11200 1st Ave Ne	2926049011	1453+00	Southern 4th line 2nd floor Apts. on 1st Ave.	4	4	2	63	367	Elevated	55	No	56.4	Ldn	59.6	65.0	0	0	Absorptive	4	51.1	0
11200 1st Ave Ne	2926049011	1453+00	Northern 4th line ground level Apts. on 1st Ave.	11	4	2	63	282	Elevated	55	No	57.6	Ldn	59.6	65.0	0	0	Absorptive	4	50.6	0
11200 1st Ave Ne	2926049011	1453+00	Northern 4th line 2nd floor Apts. on 1st Ave.	11	4	2	63	282	Elevated	55	No	58.3	Ldn	59.6	65.0	0	0	Absorptive	4	51.4	0
11200 1st Ave Ne	2926049011	1453+00	Southern ground level Apts. E of 2nd Ave.	10	5	2	63	459	Elevated	55	No	52.7	Ldn	59.6	65.0	0	0	Absorptive	4	48.3	0
11200 1st Ave Ne	2926049011	1453+00	Southern 2nd floor Apts. E of 2nd Ave.	10	5	2	63	459	Elevated	55	No	53.7	Ldn	59.6	65.0	0	0	Absorptive	4	49.0	0
11200 1st Ave Ne	2926049011	1453+00	Northern ground level Apts. E of 2nd Ave.	6	5	2	63	351	Elevated	55	No	54.8	Ldn	59.6	65.0	0	0	Absorptive	4	48.7	0
11200 1st Ave Ne	2926049011	1453+00	Northern 2nd floor Apts. E of 2nd Ave.	6	5	2	63	351	Elevated	55	No	55.6	Ldn	59.6	65.0	0	0	Absorptive	4	49.4	0
11300 1st Ave Ne	6174800000	1454+75	Front line ground level condos on 1st Ave. courtyard	11	1	2	74	60	Elevated	55	No	72.6	Ldn	65.0	72.4	0	11	Absorptive	4	60.2	0
11300 1st Ave Ne	6174800000	1454+75	Front line 2nd floor condos on 1st Ave. courtyard	11	1	2	74	60	Elevated	55	No	72.8	Ldn	65.0	72.4	0	11	Absorptive	4	60.9	0

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11300 1st Ave Ne	6174800000	1454+75	Front line 3rd floor condos on 1st Ave. courtyard	11	1	2	74	60	Elevated	55	No	72.9	Ldn	65.0	72.4	0	11	Absorptive	4	62.9	0
11300 1st Ave Ne	6174800000	1454+75	Front line ground level condos on south side	5	1	2	74	48	Elevated	55	No	73.7	Ldn	65.0	72.4	0	5	Absorptive	4	60.9	0
11300 1st Ave Ne	6174800000	1454+75	Front line 2nd floor condos on south side	5	1	2	74	48	Elevated	55	No	73.8	Ldn	65.0	72.4	0	5	Absorptive	4	61.7	0
11300 1st Ave Ne	6174800000	1454+75	Front line 3rd floor condos on south side	5	1	2	74	48	Elevated	55	No	73.9	Ldn	65.0	72.4	0	5	Absorptive	4	64.0	0
11355 3rd Ave Ne	2926049050	1458+25	1st Floor Citigate Apts.- 2nd line - -Bldg. E	4	2	2	66	115	Elevated	55	No	65.5	Ldn	61.5	66.8	4	0	Absorptive	4	55.9	0
11355 3rd Ave Ne	2926049050	1458+25	2nd Floor at Citigate Apts. -Bldg. E	4	2	2	66	115	Elevated	55	No	65.9	Ldn	61.5	66.8	4	0	Absorptive	4	57.2	0
11355 3rd Ave Ne	2926049050	1458+25	3rd Floor at Citigate Apts. -Bldg. E	4	2	2	66	115	Elevated	55	No	66.3	Ldn	61.5	66.8	4	0	Absorptive	4	59.3	0
11355 3rd Ave Ne	2926049050	1458+25	1st Floor Citigate Apts.- 2nd line	2	4	2	63	233	Elevated	55	No	58.2	Ldn	59.6	65.0	0	0	Absorptive	4	51.6	0
11355 3rd Ave Ne	2926049050	1458+25	2nd Floor at Citigate Apts. - 2nd line	2	4	2	63	233	Elevated	55	No	58.9	Ldn	59.6	65.0	0	0	Absorptive	4	52.6	0
11355 3rd Ave Ne	2926049050	1458+25	3rd Floor at Citigate Apts. - 2nd line	2	4	2	63	233	Elevated	55	No	59.6	Ldn	59.6	65.0	2	0	Absorptive	4	54.0	0
133 Ne 115th St	2926049529	1460+75	SF Residence on 115th St.	1	1	2	66	60	Ballast & Tie	55	No	69.8	Ldn	61.5	66.8	0	1	Absorptive	4	60.1	0
139 Ne 115th St	2926049530	1461+25	SF Residence on 115th St.	1	1	2	66	107	Ballast & Tie	55	No	66.5	Ldn	61.5	66.8	1	0	Absorptive	4	60.0	0
145 Ne 115th St	2926049531	1461+50	SF Residence on 115th St.	1	2	2	64	160	Ballast & Tie	55	No	61.3	Ldn	60.2	65.6	1	0	Absorptive	4	56.5	0
151 Ne 115th St	2926049532	1461+75	SF Residence on 115th St.	1	3	2	64	211	Ballast & Tie	55	No	58.2	Ldn	60.2	65.6	0	0	Absorptive	4	54.5	0
157 Ne 115th St	2926049533	1462+00	SF Residence on 115th St.	1	4	2	63	263	Ballast & Tie	55	No	55.4	Ldn	59.6	65.0	0	0	Absorptive	4	52.5	0
303 Ne 115th St	2926049192	1462+75	SF Residence on 115th St.	1	5	2	62	373	Ballast & Tie	55	No	52.4	Ldn	58.9	64.5	0	0	Absorptive	4	49.3	0
11352 3rd Ave	2926049418	1462+25	SF Residence on 3rd Ave.	1	5	2	62	405	Ballast & Tie	55	No	51.9	Ldn	58.9	64.5	0	0	Absorptive	4	49.2	0
315 Ne 115th St	2926049191	1462+75	SF Residence on 115th St.	1	5	2	62	456	Ballast & Tie	55	No	52.0	Ldn	58.9	64.5	0	0	Absorptive	4	48.1	0
142 Ne 115th St	6411600162	1462+75	SF Residence on 115th St.	1	1	2	66	67	Ballast & Tie	55	No	68.9	Ldn	61.5	66.8	0	1	Absorptive	4	58.3	0
148 Ne 115th St	6411600163	1463+00	SF Residence on 115th St.	1	1	2	64	127	Ballast & Tie	55	No	64.8	Ldn	60.2	65.6	1	0	Absorptive	4	58.0	0
154 Ne 115th St	6411600164	1463+50	SF Residence on 115th St.	1	2	2	63	169	Ballast & Tie	55	No	59.8	Ldn	59.6	65.0	1	0	Absorptive	4	54.8	0
11519 3rd Ave Ne	7810300030	1464+25	SF Residence on 3rd Ave.	1	1	2	64	116	Ballast & Tie	55	No	65.0	Ldn	60.2	65.6	1	0	Non-absorptive	14	54.7	0
11523 3rd Ave N	7810300025	1464+75	SF Residence on 3rd Ave.	1	1	2	66	94	Ballast & Tie	55	No	66.4	Ldn	61.5	66.8	1	0	Non-absorptive	14	55.8	0
156 Ne 116th St	6411600147	1466+50	SF Residence on 116th St.	1	1	2	64	44	Ballast & Tie	55	No	71.4	Ldn	60.2	65.6	0	1	Non-absorptive	14	59.9	0
11622 3rd Ave Ne	6411600186	1468+25	SF Residence on 3rd Ave.	1	1	2	62	96	Direct Fix	55	No	68.0	Ldn	58.9	64.5	0	1	Non-absorptive	14	55.6	0

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11610 3rd Ave Ne	6411600185	1467+50	SF Residence on 3rd Ave.	1	1	2	62	143	Ballast & Tie	55	No	52.8	Ldn	58.9	64.5	0	0	Non-absorptive	14	53.2	0
11606 3rd Ave Ne	6411600182	1466+75	SF Residence on 3rd Ave.	1	2	2	62	162	Ballast & Tie	55	No	49.0	Ldn	58.9	64.5	0	0	Non-absorptive	14	49.7	0
11600 3rd Ave Ne	6411600188	1466+25	SF Residence on 3rd Ave.	1	1	2	62	187	Ballast & Tie	55	No	54.7	Ldn	58.9	64.5	0	0	Non-absorptive	14	52.8	0
11526 3rd Ave Ne	6411600172	1465+75	SF Residence on 3rd Ave.	1	1	2	62	207	Ballast & Tie	55	No	62.2	Ldn	58.9	64.5	1	0	Non-absorptive	14	52.2	0
11522 3rd Ave Ne	6411600170	1465+25	SF Residence on 3rd Ave.	1	2	2	62	237	Ballast & Tie	55	No	58.6	Ldn	58.9	64.5	0	0	Non-absorptive	14	48.9	0
11514 3rd Ave Ne	6161000031	1464+75	SF Residence on 3rd Ave.	1	2	2	62	284	Ballast & Tie	55	No	56.2	Ldn	58.9	64.5	0	0	Non-absorptive	14	44.9	0
11508 3rd Ave Ne	6161000022	1464+25	SF Residence on 3rd Ave.	1	2	2	62	277	Ballast & Tie	55	No	56.3	Ldn	58.9	64.5	0	0	Non-absorptive	14	44.9	0
304 3rd Ave Ne	6161000021	1463+75	SF Residence on 3rd Ave.	1	3	2	62	338	Ballast & Tie	55	No	53.7	Ldn	58.9	64.5	0	0	Non-absorptive	4	48.1	0
316 Ne 115th St	6411600173	1464+25	SF Residence on 115th St.	1	3	2	62	420	Ballast & Tie	55	No	53.8	Ldn	58.9	64.5	0	0	Non-absorptive	14	43.1	0
322 Ne 115th St	6411600171	1464+75	SF Residence on 115th St.	1	3	2	62	479	Ballast & Tie	55	No	53.2	Ldn	58.9	64.5	0	0	Non-absorptive	14	42.5	0
11515 4th Ave Ne	6161000015	1465+25	SF Residence on 4th Ave.	1	3	2	62	409	Ballast & Tie	55	No	56.1	Ldn	58.9	64.5	0	0	Non-absorptive	14	46.2	0
11519 4th Ave Ne	6161000010	1465+50	SF Residence on 4th Ave.	1	3	2	62	390	Ballast & Tie	55	No	56.9	Ldn	58.9	64.5	0	0	Non-absorptive	14	46.4	0
11527 4th Ave Ne	6161000005	1466+25	SF Residence on 4th Ave.	1	2	2	62	372	Ballast & Tie	55	No	50.4	Ldn	58.9	64.5	0	0	Non-absorptive	14	48.1	0
11533 4th Ave Ne	6161000035	1466+75	SF Residence on 4th Ave.	1	2	2	62	311	Ballast & Tie	55	No	47.6	Ldn	58.9	64.5	0	0	Non-absorptive	14	48.8	0
11539 4th Ave Ne	6411600181	1467+25	SF Residence on 4th Ave.	1	3	2	62	316	Ballast & Tie	55	No	46.0	Ldn	58.9	64.5	0	0	Non-absorptive	14	47.3	0
11545 4th Ave Ne	6411600180	1467+75	SF Residence on 4th Ave.	1	3	2	62	303	Direct Fix	55	No	49.2	Ldn	58.9	64.5	0	0	Non-absorptive	14	47.4	0
325 Ne 117th St	6411600183	1469+00	SF Residence on 117th St.	1	4	2	62	289	Direct Fix	55	No	50.4	Ldn	58.9	64.5	0	0	Non-absorptive	14	46.2	0
321 Ne 117th St	6411600187	1468+75	SF Residence on 117th St.	1	3	2	62	233	Direct Fix	55	No	52.4	Ldn	58.9	64.5	0	0	Non-absorptive	14	48.2	0
311 Ne 117th St	6411600184	1468+75	SF Residence on 117th St.	1	2	2	62	187	Direct Fix	55	No	54.5	Ldn	58.9	64.5	0	0	Non-absorptive	14	50.3	0
401 Ne 117th St	6411600200	1469+50	SF Residence on 117th St.	1	4	2	61	382	Direct Fix	55	No	49.9	Ldn	58.4	63.9	0	0	Non-absorptive	14	45.0	0
11544 4th Ave Ne	6411600198	1468+25	SF Residence on 4th Ave.	1	3	2	61	445	Direct Fix	55	No	51.5	Ldn	58.4	63.9	0	0	Non-absorptive	14	45.8	0
11536 4th Ave Ne	6411600201	1468+00	SF Residence on 4th Ave.	1	3	2	60	471	Direct Fix	55	No	49.4	Ldn	57.8	63.4	0	0	Non-absorptive	14	45.6	0
11532 4th Ave Ne	6411600199	1467+25	SF Residence on 4th Ave.	1	3	2	60	487	Ballast & Tie	55	No	44.8	Ldn	57.8	63.4	0	0	Non-absorptive	14	45.4	0
11524 4th Ave Ne	6411600207	1466+75	SF Residence on 4th Ave.	1	3	2	58	516	Ballast & Tie	55	No	44.5	Ldn	56.7	62.4	0	0	Non-absorptive	14	45.2	0
11516 4th Ave Ne	6411600211	1466+25	SF Residence on 4th Ave.	1	4	2	57	547	Ballast & Tie	55	No	46.2	Ldn	56.2	62.0	0	0	Non-absorptive	14	43.4	0

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11510 4th Ave Ne	6411600209	1465+50	SF Residence on 4th Ave.	1	4	2	57	572	Ballast & Tie	55	No	54.1	Ldn	56.2	62.0	0	0	Non-absorptive	14	43.2	0
11529 5th Ave Ne	6411600213	1467+25	SF Residence on 5th Ave.	1	4	2	57	576	Ballast & Tie	55	No	42.8	Ldn	56.2	62.0	0	0	Non-absorptive	14	43.2	0
11537 5th Ave Ne	6411600195	1468+00	SF Residence on 5th Ave.	1	4	2	57	572	Direct Fix	55	No	47.4	Ldn	56.2	62.0	0	0	Non-absorptive	14	43.2	0
11547 5th Ave Ne	6411600202	1468+50	SF Residence on 5th Ave.	1	3	2	57	506	Direct Fix	55	No	50.4	Ldn	56.2	62.0	0	0	Non-absorptive	14	45.3	0
11545 5th Ave Ne	6411600196	1469+00	SF Residence on 5th Ave.	1	4	2	60	615	Direct Fix	55	No	46.9	Ldn	57.8	63.4	0	0	Non-absorptive	14	41.8	0
11533 5th Ave Ne	6411600203	1468+25	SF Residence on 5th Ave.	1	4	2	60	645	Direct Fix	55	No	48.5	Ldn	57.8	63.4	0	0	Non-absorptive	14	42.7	0
11525 5th Ave Ne	6411600208	1467+25	SF Residence on 5th Ave.	1	4	2	60	686	Ballast & Tie	55	No	42.2	Ldn	57.8	63.4	0	0	Non-absorptive	14	42.5	0
308 Ne 117th St	6411600414	1469+50	SF Residence on 117th St.	1	1	2	62	39	Direct Fix	55	No	75.1	Ldn	58.9	64.5	0	1	Non-absorptive	14	60.2	1
11710 3rd Ave Ne	6411600420	1470+75	Latvian Church caretakers	1	1	2	62	23	Direct Fix	55	No	77.3	Ldn	58.9	64.5	0	1	Non-absorptive	14	62.3	1
11737C 5th Ave Ne	6411600443	1474+50	SF Residence north of the church	1	1	2	62	139	Direct Fix	55	No	66.8	Ldn	58.9	64.5	0	1	Non-absorptive	14	53.9	0
11737 5th Ave Ne	6411600442	1474+75	SF Residence north of the church - Unit B	1	2	2	62	170	Direct Fix	55	No	62.2	Ldn	58.9	64.5	1	0	Non-absorptive	14	49.0	0
11737 5th Ave Ne	6411600441	1475+00	SF Residence north of the church - Unit A	1	4	2	62	223	Direct Fix	55	No	57.4	Ldn	58.9	64.5	0	0	Non-absorptive	6	47.2	0
11743 5th Ave Ne	6411600440	1475+50	SF Residence north of the church	1	5	2	63	306	Direct Fix	55	No	54.1	Ldn	59.6	65.0	0	0	Non-absorptive	6	45.7	0
11729 5th Ave Ne	6411600451	1474+75	SF Residence east of the church	1	3	2	63	372	Direct Fix	55	No	55.3	Ldn	59.6	65.0	0	0	Non-absorptive	14	42.4	0
11727 5th Ave Ne	6411600452	1474+00	SF Residence east of the church	1	2	2	62	274	Direct Fix	55	No	59.1	Ldn	58.9	64.5	1	0	Non-absorptive	14	47.2	0
11725 5th Ave Ne	6411600450	1473+75	SF Residence east of the church	1	1	2	62	224	Direct Fix	55	No	63.5	Ldn	58.9	64.5	1	0	Non-absorptive	14	51.2	0
11723 5th Ave Ne	6411600464	1473+00	SF Residence east of the church	1	1	2	62	226	Direct Fix	55	No	63.8	Ldn	58.9	64.5	1	0	Non-absorptive	14	52.1	0
11721 5th Ave Ne	6411600463	1471+75	SF Residence east of the church	1	1	2	62	298	Direct Fix	55	No	62.0	Ldn	58.9	64.5	1	0	Non-absorptive	14	51.2	0
11719 5th Ave Ne	6411600461	1472+75	SF Residence east of the church	1	4	2	63	289	Direct Fix	55	No	55.9	Ldn	59.6	65.0	0	0	Non-absorptive	14	44.4	0
11715 5th Ave Ne	6411600462	1472+75	SF Residence east of the church	1	4	2	63	446	Direct Fix	55	No	52.6	Ldn	59.6	65.0	0	0	Non-absorptive	14	41.0	0
316 Ne 117th St	6411600412	1470+25	SF Residence east of the church	1	2	2	64	155	Direct Fix	55	No	61.1	Ldn	60.2	65.6	1	0	Non-absorptive	14	50.4	0
322 Ne 117th St	6411600410	1470+75	SF Residence south of the church	1	3	2	64	188	Direct Fix	55	No	61.1	Ldn	60.2	65.6	1	0	Non-absorptive	14	48.8	0
326 Ne 117th St	6411600411	1470+50	SF Residence south of the church	1	3	2	62	257	Direct Fix	55	No	57.2	Ldn	58.9	64.5	0	0	Non-absorptive	14	48.1	0
332 Ne 117th St	6411600471	1471+00	SF Residence south of the church	1	2	2	62	297	Direct Fix	55	No	61.3	Ldn	58.9	64.5	1	0	Non-absorptive	14	49.0	0
336 Ne 117th St	6411600472	1471+50	SF Residence south of the church	1	4	2	62	372	Direct Fix	55	No	54.7	Ldn	58.9	64.5	0	0	Non-absorptive	14	44.8	0

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342 Ne 117th St	6411600473	1471+50	SF Residence south of the church	1	4	2	63	421	Direct Fix	55	No	53.2	Ldn	59.6	65.0	0	0	Non-absorptive	14	42.1	0
11707 5th Ave Ne	6411600470	1472+25	SF Residence south of the church	1	5	2	65	458	Direct Fix	55	No	51.2	Ldn	60.8	66.2	0	0	Non-absorptive	14	40.4	0
11718 5th Ave Ne	6413100228	1474+25	SF Residence south of the church	1	4	2	68	563	Direct Fix	55	No	51.1	Ldn	62.9	68.1	0	0	Non-absorptive	14	38.9	0
11714 5th Ave Ne	6413100229	1474+75	SF Residence south of the church	1	4	2	63	623	Direct Fix	55	No	50.3	Ldn	59.6	65.0	0	0	Non-absorptive	14	38.2	0
11726 5th Ave Ne	6413100241	1475+00	SF Residence south of the church	1	4	2	68	565	Direct Fix	55	No	51.1	Ldn	62.9	68.1	0	0	Non-absorptive	6	42.0	0
11734 5th Ave Ne	6413100240	1475+50	SF Residence south of the church	1	3	2	68	530	Direct Fix	55	No	53.1	Ldn	62.9	68.1	0	0	Non-absorptive	6	44.1	0
331 Ne 120th St	2238000050	1475+50	SF Residence on 120th St.	1	1	2	66	52	Direct Fix	55	No	73.3	Ldn	61.5	66.8	0	1	Non-absorptive	6	59.0	0
337 Ne 120th St	2238000045	1475+75	SF Residence on 120th St.	1	2	2	64	106	Direct Fix	55	No	65.6	Ldn	60.2	65.6	1	0	Non-absorptive	6	54.1	0
343 Ne 120th St	2238000040	1476+00	SF Residence on 120th St.	1	3	2	62	162	Direct Fix	55	No	61.1	Ldn	58.9	64.5	1	0	Non-absorptive	6	50.7	0
349 Ne 120th St	2238000035	1476+00	SF Residence on 120th St.	1	4	2	64	219	Direct Fix	55	No	57.5	Ldn	60.2	65.6	0	0	Non-absorptive	6	47.4	0
11755 5th Ave Ne	2238000030	1476+50	SF Residence on 120th St.	1	4	2	65	275	Direct Fix	55	No	55.9	Ldn	60.8	66.2	0	0	Non-absorptive	9	43.1	0
338 Ne 120th St	6412100097	1477+25	SF Residence on 120th St.	1	1	2	65	36	Direct Fix	55	No	75.3	Ldn	60.8	66.2	0	1	Non-absorptive	9	60.4	0
344 Ne 120th St	6412100092	1477+75	SF Residence on 120th St.	1	1	2	65	86	Direct Fix	55	No	69.9	Ldn	60.8	66.2	0	1	Non-absorptive	9	56.0	0
348 Ne 120th St	6412100095	1477+50	SF Residence on 120th St.	1	2	2	65	153	Direct Fix	55	No	63.0	Ldn	60.8	66.2	1	0	Non-absorptive	9	49.9	0
12001 5th Ave Ne	6412100096	1478+00	SF Residence on 5th Ave.	1	3	2	65	204	Direct Fix	55	No	59.5	Ldn	60.8	66.2	0	0	Non-absorptive	9	46.6	0
12004 5th Ave Ne	2237500025	1478+25	SF Residence on 5th Ave.	1	4	2	66	336	Direct Fix	55	No	54.7	Ldn	61.5	66.8	0	0	Non-absorptive	9	42.3	0
510 Ne 120th St	2237500020	1478+50	SF Residence on 120th St.	1	5	2	66	384	Direct Fix	55	No	52.4	Ldn	61.5	66.8	0	0	Non-absorptive	9	40.1	0
516 Ne 120th St	2237500015	1478+75	SF Residence on 120th St.	1	6	2	65	433	Direct Fix	55	No	50.2	Ldn	60.8	66.2	0	0	Non-absorptive	9	38.0	0
12014 5th Ave Ne	2237500030	1479+00	SF Residence on 120th St.	1	2	2	66	316	Direct Fix	55	No	58.2	Ldn	61.5	66.8	0	0	Non-absorptive	9	45.8	0
12015 5th Ave Ne	6412100090	1478+50	SF Residence on 5th Ave.	1	1	2	66	150	Direct Fix	55	No	66.1	Ldn	61.5	66.8	1	0	Non-absorptive	9	53.3	0
12021 5th Ave Ne	6412100093	1479+00	SF Residence on 5th Ave.	1	1	2	65	149	Direct Fix	55	No	66.2	Ldn	60.8	66.2	1	0	Non-absorptive	9	53.1	0
12016 5th Ave Ne	6413600015	1479+50	SF Residence on 5th Ave.	1	2	2	67	295	Direct Fix	55	No	58.5	Ldn	62.2	67.5	0	0	Non-absorptive	9	46.0	0
12018 5th Ave Ne	6413600005	1480+00	SF Residence on 5th Ave.	1	3	2	65	443	Direct Fix	55	No	54.4	Ldn	60.8	66.2	0	0	Non-absorptive	9	42.2	0
12020 5th Ave Ne	6413600010	1480+50	SF Residence on 5th Ave.	1	2	2	65	416	Direct Fix	55	No	56.4	Ldn	60.8	66.2	0	0	Non-absorptive	9	44.2	0
12022 5th Ave Ne	6413600020	1480+00	SF Residence on 5th Ave.	1	1	2	67	268	Direct Fix	55	No	62.2	Ldn	62.2	67.5	1	0	Non-absorptive	9	49.8	0

CITY OF SEATTLE NOISE IMPACT TABLE																					
Receiver Information								Impact Analysis										Mitigation			
Street Address	Parcel	Civil Station	Description	# Units	Row	FTA CAT	Existing Ldn (dB)	Near Track Distance(ft)	Track Type	Speed (mph)	Special Track	LRV Noise Level (dB)	Type	Moderate Impact Limit (dB)	Severe Impact Limit (dB)	Moderate Impacts	Severe Impacts	Wall Type	Height Above TOR (ft)	Mitigated LRV Ldn (dB)	Residual Impacts
12025 5th Ave Ne	6412100094	1479+50	SF Residence on 5th Ave.	1	1	2	66	87	Direct Fix	55	No	69.8	Ldn	61.5	66.8	0	1	Non-absorptive	9	56.3	0
12027 5th Ave Ne	6412100085	1479+00	SF Residence near noise wall	1	1	2	65	32	Direct Fix	55	No	76.0	Ldn	60.8	66.2	0	1	Non-absorptive	9	61.0	1
12035 5th Ave Ne	6412100080	1479+75	SF Residence on 5th Ave.	1	1	2	67	39	Direct Fix	55	No	75.0	Ldn	62.2	67.5	0	1	Non-absorptive	9	60.4	0
12030 5th Ave Ne	6413600026	1480+50	SF Residence on 5th Ave.	1	2	2	68	255	Direct Fix	55	No	59.7	Ldn	62.9	68.1	0	0	Non-absorptive	9	47.2	0
12032 5th Ave Ne	6413600036	1481+00	SF Residence on 5th Ave.	1	3	2	65	394	Direct Fix	55	No	56.2	Ldn	60.8	66.2	0	0	Non-absorptive	9	44.6	0
12035 8th Ave Ne	6413600072	1481+00	SF Residence on 8th Ave.	1	4	2	65	529	Direct Fix	55	No	51.8	Ldn	60.8	66.2	0	0	Non-absorptive	9	39.8	0
12037 8th Ave Ne	6413600079	1482+00	SF Residence on 8th Ave.	1	4	2	65	495	Ballast & Tie	55	No	49.3	Ldn	60.8	66.2	0	0	Non-absorptive	8	37.7	0
12034 5th Ave Ne	6413600034	1481+50	SF Residence on 5th Ave.	1	3	2	65	371	Ballast & Tie	55	No	52.7	Ldn	60.8	66.2	0	0	Non-absorptive	8	41.1	0
12036 5th Ave Ne	6413600035	1481+25	SF Residence on 5th Ave.	1	2	2	68	235	Direct Fix	55	No	60.2	Ldn	62.9	68.1	0	0	Non-absorptive	9	47.8	0
12042 5th Ave Ne	6413600040	1481+75	SF Residence on 5th Ave.	1	2	2	68	219	Ballast & Tie	55	No	57.6	Ldn	62.9	68.1	0	0	Non-absorptive	8	45.8	0
12044 5th Ave Ne	6413600041	1482+00	SF Residence on 5th Ave.	1	3	2	65	357	Ballast & Tie	55	No	53.0	Ldn	60.8	66.2	0	0	Non-absorptive	8	41.5	0
521 Ne 123rd St	6413600051	1482+75	SF Residence on 123rd	1	4	2	65	335	Ballast & Tie	55	No	51.8	Ldn	60.8	66.2	0	0	Non-absorptive	8	40.1	0
515 Ne 123rd St	6413600052	1483+00	SF Residence on 123rd	1	3	2	66	272	Ballast & Tie	55	No	54.5	Ldn	61.5	66.8	0	0	Non-absorptive	5	47.3	0
12048 5th Ave Ne	6413600045	1482+25	SF Residence on 5th Ave.	1	2	2	68	204	Ballast & Tie	55	No	58.0	Ldn	62.9	68.1	0	0	Non-absorptive	8	46.1	0
12054 5th Ave Ne	6413600050	1482+75	SF Residence on 5th Ave.	1	1	2	68	186	Ballast & Tie	55	No	61.7	Ldn	62.9	68.1	0	0	Non-absorptive	8	49.8	0
12302 5th Ave Ne	6413600339	1484+00	SF Residence on 5th Ave.	1	1	2	68	144	Ballast & Tie	55	No	63.4	Ldn	62.9	68.1	1	0	Non-absorptive	5	56.9	0
510 Ne 123rd St	6413600340	1484+00	SF Residence on 123rd	1	2	2	67	231	Ballast & Tie	55	No	57.3	Ldn	62.2	67.5	0	0	Non-absorptive	5	50.6	0
518 Ne 123rd St	6413600335	1484+25	SF Residence on 123rd	1	3	2	66	282	Ballast & Tie	55	No	54.2	Ldn	61.5	66.8	0	0	Non-absorptive	5	46.9	0
522 Ne 123rd St	6413600338	1484+25	SF Residence on 123rd	1	4	2	66	332	Ballast & Tie	55	No	51.7	Ldn	61.5	66.8	0	0	Non-absorptive	5	44.5	0
12308 5th Ave Ne	6413600337	1484+50	SF Residence on 5th Ave.	1	1	2	68	134	Ballast & Tie	55	No	64.0	Ldn	62.9	68.1	1	0	Non-absorptive	5	57.9	0
12316 5th Ave Ne	6413600345	1485+25	SF Residence on 5th Ave.	1	1	2	68	134	Ballast & Tie	55	No	63.9	Ldn	62.9	68.1	1	0	Non-absorptive	5	57.7	0
12320 5th Ave Ne	6413600343	1485+75	SF Residence on 5th Ave.	1	1	2	68	128	Ballast & Tie	55	No	64.7	Ldn	62.9	68.1	1	0	Non-absorptive	5	62.7	0
12312 5th Ave Ne	6413600347	1485+25	SF Residence on 5th Ave.	1	2	2	67	359	Ballast & Tie	55	No	54.4	Ldn	62.2	67.5	0	0	Non-absorptive	5	47.6	0
12314 5th Ave Ne	6413600346	1485+25	SF Residence on 5th Ave.	1	3	2	66	347	Ballast & Tie	55	No	53.0	Ldn	61.5	66.8	0	0	Non-absorptive	5	46.0	0
521 Ne 124th St	9509900045	1486+50	SF Residence on 124th	1	4	2	66	275	Ballast & Tie	55	No	53.0	Ldn	61.5	66.8	0	0	Non-absorptive	8	41.2	0

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Street Address	Parcel	Civil Station	Description	# Units	Row	FTA CAT	Existing Ldn (dB)	Near Track Distance(ft)	Track Type	Speed (mph)	Special Track	LRV Noise Level (dB)	Type	Moderate Impact Limit (dB)	Severe Impact Limit (dB)	Moderate Impacts	Severe Impacts	Wall Type	Height Above TOR (ft)	Mitigated LRV Ldn (dB)	Residual Impacts
515 Ne 124th St	9509900040	1486+50	SF Residence on 124th	1	3	2	66	217	Ballast & Tie	55	No	56.0	Ldn	61.5	66.8	0	0	Non-absorptive	8	44.0	0
509 Ne 124th St	9509900035	1486+50	SF Residence on 124th	1	2	2	67	155	Ballast & Tie	55	No	59.9	Ldn	62.2	67.5	0	0	Non-absorptive	8	47.8	0
503 Ne 124th St	9509900030	1486+50	SF Residence on corner of 5th and 124th	1	1	2	68	104	Ballast & Tie	55	No	65.8	Ldn	62.9	68.1	1	0	Non-absorptive	8	55.7	0
500 Ne 124th St	9509900005	1487+50	SF Residence on corner of 5th and 124th	1	1	2	68	83	Ballast & Tie	55	No	67.2	Ldn	62.9	68.1	1	0	Non-absorptive	8	55.7	0
508 Ne 124th St	9509900010	1487+50	SF Residence on 124th	1	2	2	68	143	Ballast & Tie	55	No	60.5	Ldn	62.9	68.1	0	0	Non-absorptive	8	47.9	0
514 Ne 124th St	9509900015	1488+00	SF Residence on 124th	1	3	2	68	204	Ballast & Tie	55	No	56.5	Ldn	62.9	68.1	0	0	Non-absorptive	8	43.7	0
520 Ne 124th St	9509900020	1487+75	SF Residence on 124th	1	4	2	67	268	Ballast & Tie	55	No	53.1	Ldn	62.2	67.5	0	0	Non-absorptive	8	40.9	0
527 Ne 125th St	6413600378	1488+75	SF Residence on 125th	1	4	2	66	335	Ballast & Tie	55	No	51.5	Ldn	61.5	66.8	0	0	Absorptive	8	39.0	0
523 Ne 125th St	6413600377	1489+00	SF Residence on 125th	1	3	2	67	248	Ballast & Tie	55	No	55.1	Ldn	62.2	67.5	0	0	Absorptive	6	44.9	0
513 Ne 125th St	6413600376	1488+25	SF Residence on 125th	1	2	2	68	180	Ballast & Tie	55	No	58.8	Ldn	62.9	68.1	0	0	Absorptive	8	46.2	0
505 Ne 125th St	6413600375	1488+75	SF Residence on corner of 5th and 125th	1	1	2	68	94	Ballast & Tie	55	No	66.3	Ldn	62.9	68.1	1	0	Absorptive	8	52.8	0
502 Ne 125th St	6414100010	1490+50	SF Residence on corner of 5th and 124th	1	1	2	68	83	Ballast & Tie	55	No	67.3	Ldn	62.9	68.1	1	0	Absorptive	4	57.1	0
510 Ne 125th St	6414100013	1490+25	SF Residence on 125th	1	1	2	68	143	Ballast & Tie	55	No	63.6	Ldn	62.9	68.1	1	0	Absorptive	4	56.2	0
514 Ne 125th St	6414100012	1490+50	SF Residence on 125th	1	2	2	67	204	Ballast & Tie	55	No	58.2	Ldn	62.2	67.5	0	0	Absorptive	4	51.4	0
516 Ne 125th St	6414100011	1490+25	SF Residence on 125th	1	2	2	67	271	Ballast & Tie	55	No	56.0	Ldn	62.2	67.5	0	0	Absorptive	4	49.9	0
12514 5th Ave Ne	6414100023	1491+75	SF Residence on 5th Ave.	1	2	2	66	260	Ballast & Tie	55	No	56.7	Ldn	61.5	66.8	0	0	Absorptive	4	50.3	0
12512 5th Ave Ne	6414100024	1491+50	SF Residence on 5th Ave.	1	1	2	66	212	Ballast & Tie	55	No	61.1	Ldn	61.5	66.8	0	0	Absorptive	4	54.2	0
12518 5th Ave Ne	6414100021	1491+50	SF Residence on 5th Ave.	1	1	2	68	81	Ballast & Tie	55	No	67.5	Ldn	62.9	68.1	1	0	Absorptive	4	56.4	0
12520 5th Ave Ne	6414100020	1491+75	SF Residence on 5th Ave.	1	1	2	68	86	Ballast & Tie	55	No	67.2	Ldn	62.9	68.1	1	0	Absorptive	4	56.2	0
12528 5th Ave Ne	6414100028	1492+75	SF Residence on 5th Ave.	1	1	2	68	88	Ballast & Tie	55	No	67.2	Ldn	62.9	68.1	1	0	Absorptive	4	55.0	0
12526 5th Ave Ne	6414100025	1492+75	SF Residence on 5th Ave.	1	1	2	66	178	Ballast & Tie	55	No	62.5	Ldn	61.5	66.8	1	0	Absorptive	4	54.6	0
12524 5th Ave Ne	6414100029	1492+50	SF Residence on 5th Ave.	1	2	2	65	304	Ballast & Tie	55	No	55.8	Ldn	60.8	66.2	0	0	Absorptive	4	49.7	0
12532 5th Ave Ne	6414100026	1493+00	SF Residence on 5th Ave.	1	1	2	66	273	Ballast & Tie	55	No	59.6	Ldn	61.5	66.8	0	0	Absorptive	4	53.3	0
12534 5th Ave Ne	6414100027	1493+25	SF Residence on 5th Ave.	1	1	2	68	108	Ballast & Tie	55	No	66.0	Ldn	62.9	68.1	1	0	Absorptive	4	54.7	0
12542 5th Ave Ne	6414100033	1493+50	Empty Lot	1	1	2	68	165	Ballast & Tie	55	No	63.3	Ldn	62.9	68.1	1	0	Absorptive	4	54.5	0

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Street Address	Parcel	Civil Station	Description	# Units	Row	FTA CAT	Existing Ldn (dB)	Near Track Distance(ft)	Track Type	Speed (mph)	Special Track	LRV Noise Level (dB)	Type	Moderate Impact Limit (dB)	Severe Impact Limit (dB)	Moderate Impacts	Severe Impacts	Wall Type	Height Above TOR (ft)	Mitigated LRV Ldn (dB)	Residual Impacts
12542 5th Ave Ne	6414100030	1494+00	SF Residence on 5th Ave.	1	1	2	69	119	Elevated	55	No	68.2	Ldn	63.6	68.8	1	0	Absorptive	4	59.2	0
12546 5th Ave Ne	6414100032	1493+75	SF Residence on 5th Ave. - Unit B	1	1	2	68	213	Elevated	55	No	64.1	Ldn	62.9	68.1	1	0	Absorptive	4	57.6	0
12546 5th Ave Ne	6414100031	1493+75	SF Residence on 5th Ave. - Unit C	1	2	2	68	317	Elevated	55	No	58.5	Ldn	62.9	68.1	0	0	Absorptive	4	53.2	0
527 NE 127th St	6414100039	1495+25	SF Residence on 127th	1	3	2	68	325	Elevated	55	No	57.4	Ldn	62.9	68.1	0	0	Absorptive	4	52.6	0
521 NE 127th St	6414100038	1495+25	SF Residence on 127th	1	3	2	68	265	Elevated	55	No	58.7	Ldn	62.9	68.1	0	0	Absorptive	4	53.1	0
515 NE 127th St	6414100037	1495+25	SF Residence on 127th	1	2	2	69	204	Elevated	55	No	62.0	Ldn	63.6	68.8	0	0	Absorptive	4	55.0	0
509 NE 127th St	6414100036	1495+25	SF Residence on 127th	1	1	2	69	146	Elevated	55	No	67.0	Ldn	63.6	68.8	1	0	Absorptive	4	58.6	0
503 NE 127th St	6414100035	1495+25	SF Residence on corner of 127th and 5th	1	1	2	69	86	Elevated	55	No	70.2	Ldn	63.6	68.8	0	1	Absorptive	4	59.5	0
502 NE 127th St	6414100732	1496+50	SF Residence on corner of 127th and 5th	1	1	2	70	116	Elevated	55	No	68.6	Ldn	64.4	69.5	1	0	Absorptive	4	58.5	0
514 NE 127th St	6414100731	1496+75	SF Residence on 127th	1	1	2	70	225	Elevated	55	No	64.4	Ldn	64.4	69.5	0	0	Absorptive	4	57.8	0
522 NE 127th St	6414100733	1496+75	SF Residence on 127th	1	2	2	69	296	Elevated	55	No	59.5	Ldn	63.6	68.8	0	0	Absorptive	4	54.3	0
12708 5th Ave Ne	6414100730	1497+50	SF Residence on 5th Ave.	1	1	2	71	93	Elevated	55	No	70.3	Ldn	65.0	70.2	0	1	Absorptive	4	59.7	0
12718 5th Ave Ne	6414100740	1497+75	SF Residence on 5th Ave.	1	1	2	72	130	Elevated	55	No	67.9	Ldn	65.0	70.9	1	0	Absorptive	4	58.3	0
12726 5th Ave Ne	6414100751	1499+25	SF Residence on 5th Ave.	1	1	2	73	125	Elevated	55	Yes	69.7	Ldn	65.0	71.7	1	0	Absorptive	4	60.0	0
12732 5th Ave Ne	6414100750	1500+00	SF Residence on 5th Ave.	1	1	2	73	130	Elevated	55	Yes	71.3	Ldn	65.0	71.7	1	0	Absorptive	4	61.8	0
12740 5th Ave Ne	6414100759	1500+50	SF Residence on 5th Ave.	1	1	2	74	122	Elevated	55	Yes	74.6	Ldn	65.0	72.4	0	1	Absorptive	4	64.5	0
12759 Roosevelt Way Ne	6414100760	1500+75	SF Residence on Roosevelt Way	1	1	2	73	195	Elevated	55	Yes	68.6	Ldn	65.0	71.7	1	0	Absorptive	4	60.9	0
12749 Roosevelt Way Ne	6414100752	1499+75	SF Residence on Roosevelt Way	1	1	2	72	248	Elevated	55	No	63.9	Ldn	65.0	70.9	0	0	Absorptive	4	57.4	0
12745 Roosevelt Way Ne	6414100753	1499+25	SF Residence on Roosevelt Way	1	1	2	73	267	Elevated	55	No	63.3	Ldn	65.0	71.7	0	0	Absorptive	4	57.4	0
502 Ne 130th St	1854700005	1504+00	SF Residence on 130th	1	1	2	74	113	Elevated	55	Yes	76.3	Ldn	65.0	72.4	0	1	Absorptive	6	64.8	0
510 Ne 130th St	1854700010	1503+50	SF Residence on 130th	1	1	2	74	150	Elevated	55	Yes	72.6	Ldn	65.0	72.4	0	1	Absorptive	6	62.1	0
516 Ne 130th St	1854700015	1503+75	SF Residence on 130th	1	2	2	73	205	Elevated	55	Yes	65.4	Ldn	65.0	71.7	1	0	Absorptive	6	56.0	0
519 Ne 131st Pl	1787600096	1505+00	SF Residence on 131st Place	1	2	2	73	226	Elevated	55	Yes	63.3	Ldn	65.0	71.7	0	0	Absorptive	6	53.8	0
511 Ne 131st Pl	1787600095	1505+00	SF Residence on 131st Place	1	1	2	74	156	Elevated	55	Yes	70.0	Ldn	65.0	72.4	1	0	Absorptive	6	59.4	0
505 Ne 131st Pl	1787600098	1505+00	SF Residence on 131st Place	1	1	2	74	82	Elevated	55	Yes	76.2	Ldn	65.0	72.4	0	1	Absorptive	6	64.0	0

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510 Ne 131st Pl	1787600094	1506+25	SF Residence on 131st Place	1	1	2	72	157	Elevated	55	No	66.9	Ldn	65.0	70.9	1	0	Absorptive	4	57.9	0
520 Ne 131st Pl	1787600093	1506+25	SF Residence on 131st Place	1	2	2	71	229	Elevated	55	No	61.8	Ldn	65.0	70.2	0	0	Absorptive	4	54.1	0
13130 5th Ave Ne	1787600085	1507+50	Church on 5th Ave.	1	1	2	67	379	Elevated	55	No	62.1	Ldn	62.2	67.5	0	0	Absorptive	4	55.8	0
13130 5th Ave Ne	1787600085	1507+50	Church on 5th Ave.	1	1	3	68	207	Elevated	55	No	62.9	Ldn	67.9	73.1	0	0	Absorptive	4	54.4	0
1000 NE 135th	2026049004	1511+00	Golf Course	1	1	3	70	163	Elevated	55	No	66.0	Ldn	69.4	74.5	0	0	None	0	66.0	0

CITY OF SHORELINE NOISE IMPACT TABLE																				
Receiver Information								Impact Analysis									Mitigation			
Street Address	Parcel	Civil Station	Description	# Units	Row	FTA CAT	Existing Ldn (dB)	Near Track Distance(ft)	Track Type	Speed (mph)	Special Track	LRV Noise Level (dB)	Type	Moderate Impact Limit (dB)	Severe Impact Limit (dB)	Moderate Impacts	Severe Impacts	Wall Type	Height Above TOR (ft)	Mitigated LRV Ldn (dB)	Residual Impacts
14512 5th Ave Ne	7568700785	154350	SF Residence on 5th Ave.	1	1	2	74	190	Elevated	40	No	66.1	Ldn	65.0	72.4	1	0	Absorptive	4	57.8	0
14518 5th Ave Ne	7568700790	154400	SF Residence on 5th Ave.	1	1	2	73	211	Elevated	40	No	64.9	Ldn	65.0	71.7	0	0	Absorptive	4	56.8	0
14526 5th Ave Ne	7568700795	154450	SF Residence on 5th Ave.	1	1	2	73	262	Elevated	40	No	63.0	Ldn	65.0	71.7	0	0	Absorptive	4	57.0	0
14532 5th Ave Ne	7568700800	154500	SF Residence on 5th Ave.	1	1	2	73	259	Elevated	40	No	62.8	Ldn	65.0	71.7	0	0	Absorptive	4	57.0	0
14540 5th Ave Ne	7568700805	154575	SF Residence on 5th Ave.	1	1	2	73	255	Elevated	40	No	63.4	Ldn	65.0	71.7	0	0	Absorptive	4	56.8	0
14544 5th Ave Ne	7568700810	154625	SF Residence on 5th Ave.	1	1	2	73	296	Elevated	40	No	62.1	Ldn	65.0	71.7	0	0	Absorptive	4	56.9	0
14552 5th Ave Ne	7568700815	154700	SF Residence on 5th Ave.	1	1	2	73	360	Elevated	40	No	60.8	Ldn	65.0	71.7	0	0	Absorptive	4	56.4	0
14556 5th Ave Ne	7568700820	154750	SF Residence on 5th Ave.	1	1	2	73	339	Elevated	40	No	61.2	Ldn	65.0	71.7	0	0	Absorptive	4	56.5	0
14560 5th Ave Ne	7568700825	154775	SF Residence on 5th Ave.	1	1	2	72	380	Elevated	40	No	59.9	Ldn	65.0	70.9	0	0	Absorptive	4	55.0	0
14570 5th Ave Ne	7568700830	154825	SF Residence on 5th Ave.	1	1	2	68	416	Elevated	40	No	59.3	Ldn	62.9	68.1	0	0	Absorptive	4	54.6	0
14574 5th Ave Ne	7568700835	154900	SF Residence on 5th Ave.	1	1	2	65	398	Elevated	40	No	59.5	Ldn	60.8	66.2	0	0	Absorptive	4	54.6	0
14578 5th Ave Ne	7568700836	154950	SF Residence on 5th Ave.	1	1	2	65	442	Elevated	40	No	58.2	Ldn	60.8	66.2	0	0	Absorptive	4	52.9	0
516 Ne 145th St	7568700770	154250	SF Residence on 145th	1	1	2	73	271	Elevated	40	No	63.3	Ldn	65.0	71.7	0	0	Absorptive	4	56.4	0
522 Ne 145th St	7568700765	154250	SF Residence on 145th	1	2	2	72	327	Elevated	40	No	59.2	Ldn	65.0	70.9	0	0	Absorptive	4	53.0	0
14515 6th Ave Ne	7568700760	154300	SF Residence on 6th Ave.	1	1	2	69	349	Elevated	40	No	61.3	Ldn	63.6	68.8	0	0	Absorptive	4	56.2	0
14521 6th Ave Ne	7568700755	154350	SF Residence on 6th Ave.	1	1	2	66	362	Elevated	40	No	60.7	Ldn	61.5	66.8	0	0	Absorptive	4	56.3	0
14525 6th Ave Ne	7568700745	154425	SF Residence on 6th Ave.	1	1	2	65	388	Elevated	40	No	60.3	Ldn	60.8	66.2	0	0	Absorptive	4	56.0	0
14535 6th Ave Ne	7568700740	154475	SF Residence on 6th Ave.	1	1	2	64	417	Elevated	40	No	59.4	Ldn	60.2	65.6	0	0	Absorptive	4	54.9	0
14541 6th Ave Ne	7568700734	154550	SF Residence on 6th Ave.	1	1	2	63	442	Elevated	40	No	58.9	Ldn	59.6	65.0	0	0	Absorptive	4	54.5	0
14549 6th Ave Ne	7568700730	154625	SF Residence on 6th Ave.	1	1	2	63	458	Elevated	40	No	58.6	Ldn	59.6	65.0	0	0	Absorptive	4	54.2	0
14555 6th Ave Ne	7568700725	154675	SF Residence on 6th Ave.	1	1	2	62	472	Elevated	40	No	58.4	Ldn	58.9	64.5	0	0	Absorptive	4	54.0	0
14565 6th Ave Ne	7568700720	154725	SF Residence on 6th Ave.	1	2	2	61	495	Elevated	40	No	54.6	Ldn	58.4	63.9	0	0	Absorptive	4	49.8	0
14567 6th Ave Ne	7568700715	154775	SF Residence on 6th Ave.	1	2	2	60	527	Elevated	40	No	53.8	Ldn	57.8	63.4	0	0	Absorptive	4	48.4	0
14579 6th Ave Ne	7568700705	154850	SF Residence on 6th Ave.	1	2	2	60	562	Elevated	40	No	53.2	Ldn	57.8	63.4	0	0	Absorptive	4	47.9	0
515 NE 148th St.	7568700710	154850	SF Residence on 6th Ave.	1	2	2	62	516	Elevated	40	No	54.0	Ldn	58.9	64.5	0	0	Absorptive	4	48.8	0

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14572 6th Ave Ne	7568700695	154775	SF Residence on 6th Ave.	1	2	2	62	692	Elevated	40	No	51.6	Ldn	58.9	64.5	0	0	Absorptive	4	45.7	0
14566 6th Ave Ne	7568700690	154725	SF Residence on 6th Ave.	1	2	2	62	696	Elevated	40	No	51.6	Ldn	58.9	64.5	0	0	Absorptive	4	46.4	0
14562 6th Ave Ne	7568700685	154675	SF Residence on 6th Ave.	1	2	2	63	693	Elevated	40	No	51.7	Ldn	59.6	65.0	0	0	Absorptive	4	46.5	0
14550 6th Ave Ne	7568700680	154600	SF Residence on 6th Ave.	1	2	2	63	625	Elevated	40	No	52.7	Ldn	59.6	65.0	0	0	Absorptive	4	47.9	0
14548 6th Ave Ne	7568700675	154550	SF Residence on 6th Ave.	1	2	2	64	605	Elevated	40	No	53.0	Ldn	60.2	65.6	0	0	Absorptive	4	48.2	0
14542 6th Ave Ne	7568700670	154500	SF Residence on 6th Ave.	1	2	2	64	579	Elevated	40	No	53.8	Ldn	60.2	65.6	0	0	Absorptive	4	49.5	0
14528 6th Ave Ne	7568700665	154425	SF Residence on 6th Ave.	1	2	2	65	565	Elevated	40	No	54.0	Ldn	60.8	66.2	0	0	Absorptive	4	49.8	0
14526 6th Ave Ne	7568700660	154400	SF Residence on 6th Ave.	1	2	2	65	544	Elevated	40	No	54.3	Ldn	60.8	66.2	0	0	Absorptive	4	50.0	0
14522 6th Ave Ne	7568700655	154350	SF Residence on 6th Ave.	1	2	2	66	524	Elevated	40	No	54.8	Ldn	61.5	66.8	0	0	Absorptive	4	50.8	0
14518 6th Ave Ne	7568700650	154325	SF Residence on 6th Ave.	1	2	2	66	510	Elevated	40	No	55.2	Ldn	61.5	66.8	0	0	Absorptive	4	51.4	0
14807 5th Ave Ne	8680300005	155150	SF Residence on 5th Ave.	1	2	2	67	354	Elevated	35	No	56.8	Ldn	62.2	67.5	0	0	Absorptive	4	51.3	0
357 Ne 149th St	2004100090	155225	SF Residence on 149th	1	2	2	67	393	Elevated	40.4	No	55.8	Ldn	62.2	67.5	0	0	Absorptive	4	50.1	0
351 Ne 149th St	2004100085	155275	SF Residence on 149th	1	2	2	67	341	Elevated	45.2	No	57.6	Ldn	62.2	67.5	0	0	Absorptive	4	52.1	0
345 Ne 149th St	2004100080	155300	SF Residence on 149th	1	2	2	67	285	Elevated	45.2	No	59.1	Ldn	62.2	67.5	0	0	Absorptive	4	53.4	0
339 Ne 149th St	2004100075	155325	SF Residence on 149th	1	2	2	67	227	Elevated	47.4	No	61.0	Ldn	62.2	67.5	0	0	Absorptive	4	54.7	0
333 Ne 149th St	2004100065	155325	SF Residence on 149th	1	1	2	68	168	Elevated	47.4	No	66.0	Ldn	62.9	68.1	1	0	Absorptive	4	58.6	0
327 Ne 149th St	2004100060	155350	SF Residence on 149th	1	1	2	69	112	Elevated	49.5	No	68.7	Ldn	63.6	68.8	1	0	Absorptive	4	58.9	0
321 Ne 149th St	2004100055	155375	SF Residence on 149th	1	1	2	70	62	Elevated	49.5	No	72.2	Ldn	64.4	69.5	0	1	Absorptive	4	60.3	0
314 Ne 149th St	2004100040	155575	SF Residence on 149th	1	1	2	70	73	Elevated	55	No	71.2	Ldn	64.4	69.5	0	1	Absorptive	4	59.8	0
320 Ne 149th St	2004100035	155525	SF Residence on 149th	1	1	2	70	123	Elevated	55	No	68.1	Ldn	64.4	69.5	1	0	Absorptive	4	58.7	0
326 Ne 149th St	2004100030	155500	SF Residence on 149th	1	2	2	68	185	Elevated	55	No	62.4	Ldn	62.9	68.1	0	0	Absorptive	4	55.4	0
332 Ne 149th St	2004100025	155475	SF Residence on 149th	1	2	2	68	233	Elevated	55	No	60.6	Ldn	62.9	68.1	0	0	Absorptive	4	54.3	0
338 Ne 149th St	2004100020	155450	SF Residence on 149th	1	3	2	67	296	Elevated	55	No	57.3	Ldn	62.2	67.5	0	0	Absorptive	4	51.5	0
14802 5th Ave Ne	7568700355	155075	SF Residence on 5th Ave.	1	2	2	65	539	Elevated	35	No	53.3	Ldn	60.8	66.2	0	0	Absorptive	4	47.1	0
14808 5th Ave Ne	7568700360	155100	SF Residence on 5th Ave.	1	2	2	65	539	Elevated	35	No	53.3	Ldn	60.8	66.2	0	0	Absorptive	4	46.9	0

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14812 5th Ave Ne	7568700365	155150	SF Residence on 5th Ave.	1	2	2	64	544	Elevated	37.8	No	53.3	Ldn	60.2	65.6	0	0	Absorptive	4	47.1	0
14818 5th Ave Ne	7568700370	155200	SF Residence on 5th Ave.	1	2	2	64	562	Elevated	37.8	No	53.1	Ldn	60.2	65.6	0	0	Absorptive	4	47.2	0
14902 5th Ave Ne	7568700375	155250	SF Residence on 5th Ave.	1	2	2	63	580	Elevated	42.9	No	52.9	Ldn	59.6	65.0	0	0	Absorptive	4	47.1	0
14910 5th Ave Ne	7568700380	155300	SF Residence on 5th Ave.	1	2	2	63	591	Elevated	47.4	No	53.1	Ldn	59.6	65.0	0	0	Absorptive	4	47.1	0
14916 5th Ave Ne	7568700385	155350	SF Residence on 5th Ave.	1	2	2	62	613	Elevated	49.5	No	53.2	Ldn	58.9	64.5	0	0	Absorptive	4	47.6	0
14922 5th Ave Ne	7568700390	155425	SF Residence on 5th Ave.	1	2	2	62	626	Elevated	55	No	53.1	Ldn	58.9	64.5	0	0	Absorptive	4	47.5	0
14928 5th Ave Ne	7568700395	155475	SF Residence on 5th Ave.	1	2	2	62	661	Elevated	55	No	52.4	Ldn	58.9	64.5	0	0	Absorptive	4	46.6	0
14934 5th Ave Ne	7568700400	155500	SF Residence on 5th Ave.	1	2	2	62	684	Elevated	55	No	52.2	Ldn	58.9	64.5	0	0	Absorptive	4	46.4	0
15100 5th Ave Ne	7568700405	155600	SF Residence on 5th Ave.	1	2	2	62	712	Elevated	55	No	52.8	Ldn	58.9	64.5	0	0	Absorptive	4	47.6	0
15108 5th Ave Ne	7568700410	155650	SF Residence on 5th Ave.	1	2	2	62	732	Elevated	55	No	53.2	Ldn	58.9	64.5	0	0	Absorptive	4	48.2	0
15114 5th Ave Ne	7568700415	155725	SF Residence on 5th Ave.	1	2	2	62	751	Elevated	55	No	53.5	Ldn	58.9	64.5	0	0	Absorptive	4	48.8	0
15124 5th Ave Ne	7568700420	155750	SF Residence on 5th Ave.	1	2	2	62	837	Elevated	55	No	53.1	Ldn	58.9	64.5	0	0	Absorptive	4	48.5	0
307 Ne 151st St	3222200040	155750	SF Residence on 151st	1	1	2	70	86	Ballast & Tie	55	No	67.6	Ldn	64.4	69.5	1	0	Absorptive	4	56.9	0
313 Ne 151st St	3222200050	155725	SF Residence on 151st	1	1	2	70	153	Ballast & Tie	55	No	64.0	Ldn	64.4	69.5	0	0	Absorptive	4	56.1	0
321 Ne 151st St	8022900040	155725	SF Residence on 151st	1	2	2	68	214	Ballast & Tie	55	No	58.3	Ldn	62.9	68.1	0	0	Absorptive	4	51.7	0
327 Ne 151st St	8022900041	155675	SF Residence on 151st	1	2	2	68	326	Ballast & Tie	55	No	55.1	Ldn	62.9	68.1	0	0	Absorptive	4	49.4	0
335 Ne 151st St	8022900050	155650	SF Residence on 151st	1	2	2	68	336	Ballast & Tie	55	No	54.7	Ldn	62.9	68.1	0	0	Absorptive	4	48.9	0
347 Ne 151st St	8022900055	155600	SF Residence on 151st	1	2	2	67	404	Ballast & Tie	55	No	53.2	Ldn	62.2	67.5	0	0	Absorptive	4	47.4	0
15121 3rd Ave Ne	2881700311	156100	SF Residence on 3rd Ave.	1	1	2	68	50	Direct Fixation	55	Yes	80.6	Ldn	62.9	68.1	0	1	Absorptive	4	69.1	1
225 Ne 152nd St	2881700310	156200	Church at end of 152nd St.	1	1	3	70	98	Direct Fixation	55	Yes	71.8	Leq	69.4	74.5	1	0	Absorptive	4	62.9	0
304 Ne 152nd St	2634500055	156225	SF Residence on 152nd St.	1	1	2	70	240	Direct Fixation	55	Yes	62.5	Ldn	64.4	69.5	0	0	Absorptive	4	56.2	0
310 Ne 152nd St	2634500060	156200	SF Residence on 152nd St.	1	1	2	70	285	Direct Fixation	55	Yes	59.7	Ldn	64.4	69.5	0	0	Absorptive	4	55.1	0
316 Ne 152nd St	2634500065	156200	SF Residence on 152nd St.	1	2	2	69	352	Direct Fixation	55	No	54.2	Ldn	63.6	68.8	0	0	Absorptive	4	48.0	0
322 Ne 152nd St	2634500070	156150	SF Residence on 152nd St.	1	2	2	69	405	Direct Fixation	55	No	53.2	Ldn	63.6	68.8	0	0	Absorptive	4	46.9	0
323 Ne 152nd St	2634500035	156000	SF Residence on 152nd St.	1	2	2	69	338	Direct Fixation	55	No	54.5	Ldn	63.6	68.8	0	0	Absorptive	4	48.5	0

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317 Ne 152nd St	2634500040	156025	SF Residence on 152nd St.	1	2	2	69	274	Direct Fixation	55	Yes	56.8	Ldn	63.6	68.8	0	0	Absorptive	4	50.8	0
311 Ne 152nd St	2634500045	156075	SF Residence on 152nd St.	1	1	2	70	239	Direct Fixation	55	Yes	62.8	Ldn	64.4	69.5	0	0	Absorptive	4	56.5	0
305 Ne 152nd St	2634500050	156100	SF Residence on 152nd St.	1	1	2	70	181	Direct Fixation	55	Yes	67.3	Ldn	64.4	69.5	1	0	Absorptive	4	60.2	0
15112 3rd Ave Ne	3222200010	155950	SF Residence on 3rd Ave.	1	1	2	70	147	Direct Fixation	55	Yes	68.3	Ldn	64.4	69.5	1	0	Absorptive	4	60.3	0
306 Ne 151st St	3222200020	155900	SF Residence on 151st	1	1	2	70	104	Ballast & Tie	55	Yes	69.8	Ldn	64.4	69.5	0	1	Absorptive	4	60.3	0
316 Ne 151st St	8022900035	155950	SF Residence on 151st	1	1	2	70	217	Ballast & Tie	55	Yes	62.3	Ldn	64.4	69.5	0	0	Absorptive	4	55.7	0
324 Ne 151st St	8022900030	155875	SF Residence on 151st	1	2	2	69	284	Ballast & Tie	55	No	56.1	Ldn	63.6	68.8	0	0	Absorptive	4	50.1	0
411 Ne 153rd St	5027800130	156300	SF Residence on 153rd St.	1	1	2	69	377	Direct Fixation	55	No	57.1	Ldn	63.6	68.8	0	0	Absorptive	4	51.9	0
407 Ne 153rd St	5027800120	156375	SF Residence on 153rd St.	1	1	2	70	328	Ballast & Tie	55	No	57.6	Ldn	64.4	69.5	0	0	Absorptive	4	51.9	0
405 Ne 153rd St	5027800110	156450	SF Residence on 153rd St.	1	1	2	70	328	Ballast & Tie	55	No	57.8	Ldn	64.4	69.5	0	0	Absorptive	4	52.5	0
403 Ne 153rd St	5027800100	156500	SF Residence on 153rd St.	1	1	2	70	355	Ballast & Tie	55	No	57.8	Ldn	64.4	69.5	0	0	Absorptive	4	53.1	0
401 Ne 153rd St	5027800090	156575	SF Residence on 153rd St.	1	1	2	70	405	Ballast & Tie	55	No	56.5	Ldn	64.4	69.5	0	0	Absorptive	4	51.2	0
15240 3rd Ave Ne	2881700300	156600	SF Residence on 3rd Ave.	1	1	2	71	297	Ballast & Tie	55	No	58.4	Ldn	65.0	70.2	0	0	Absorptive	4	52.0	0
15451 4th Ave Ne	2807600030	156650	SF Residence on 4th Ave.	1	1	2	70	365	Ballast & Tie	55	No	56.9	Ldn	64.4	69.5	0	0	Absorptive	4	51.3	0
301 Ne 155th St	411100005	156900	SF Residence on 4th Ave.	1	3	2	70	387	Ballast & Tie	55	No	52.5	Ldn	64.4	69.5	0	0	Absorptive	4	47.4	0
15420 2nd Ave Ne	411100010	156850	SF Residence on 4th Ave.	1	2	2	70	381	Ballast & Tie	55	No	53.8	Ldn	64.4	69.5	0	0	Absorptive	4	48.5	0
15414 2nd Ave Ne	411100015	156775	SF Residence on 4th Ave.	1	2	2	70	369	Ballast & Tie	55	No	54.3	Ldn	64.4	69.5	0	0	Absorptive	4	49.3	0
15408 2nd Ave Ne	411100020	156750	SF Residence on 2rd Ave.	1	2	2	71	314	Ballast & Tie	55	No	55.0	Ldn	65.0	70.2	0	0	Absorptive	4	49.2	0
15404 2nd Ave Ne	411100025	156750	SF Residence on 2rd Ave.	1	1	2	72	261	Ballast & Tie	55	No	59.3	Ldn	65.0	70.9	0	0	Absorptive	4	52.9	0
15401 2nd Ave Ne	411100030	156750	SF Residence on 2rd Ave.	1	1	2	73	201	Ballast & Tie	55	No	61.1	Ldn	65.0	71.7	0	0	Absorptive	4	54.7	0
15407 2nd Ave Ne	411100035	156825	SF Residence on 2rd Ave.	1	1	2	73	172	Ballast & Tie	55	No	62.2	Ldn	65.0	71.7	0	0	Absorptive	4	55.6	0
15419 2nd Ave Ne	411100040	156875	SF Residence on 2rd Ave.	1	2	2	70	182	Ballast & Tie	55	No	58.9	Ldn	64.4	69.5	0	0	Absorptive	4	52.2	0
15425 2nd Ave Ne	411100045	156950	SF Residence on 2rd Ave.	1	2	2	70	218	Ballast & Tie	55	No	57.5	Ldn	64.4	69.5	0	0	Absorptive	4	51.2	0
165 Ne 155th St	411100050	156975	SF Residence on 155th St.	1	2	2	71	246	Ballast & Tie	55	No	56.7	Ldn	65.0	70.2	0	0	Absorptive	4	50.3	0
145 Ne 155th St	411100055	156975	Fire Station	1	1	2	76	66	Ballast & Tie	55	No	68.9	Ldn	65.0	74.0	1	0	Absorptive	4	58.3	0

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Receiver Information								Impact Analysis									Mitigation			
Street Address	Parcel	Civil Station	Description	# Units	Row	FTA CAT	Existing Ldn (dB)	Near Track Distance(ft)	Track Type	Speed (mph)	Special Track	LRV Noise Level (dB)	Type	Moderate Impact Limit (dB)	Severe Impact Limit (dB)	Moderate Impacts	Severe Impacts	Wall Type	Height Above TOR (ft)	Mitigated LRV Ldn (dB)	Residual Impacts
157 Ne 156th St	2241700075	157075	SF Residence on 156th St.	1	1	2	68	429	Ballast & Tie	55	No	56.3	Ldn	62.9	68.1	0	0	Absorptive	4	51.3	0
151 Ne 156th St	2241700070	157125	SF Residence on 156th St.	1	1	2	70	377	Ballast & Tie	55	No	57.0	Ldn	64.4	69.5	0	0	Absorptive	4	51.8	0
143 Ne 156th St	2241700065	157125	SF Residence on 156th St.	1	1	2	71	315	Ballast & Tie	55	No	58.4	Ldn	65.0	70.2	0	0	Absorptive	4	53.6	0
137 Ne 156th St	2241700060	157150	SF Residence on 156th St.	1	1	2	72	259	Ballast & Tie	55	No	59.3	Ldn	65.0	70.9	0	0	Absorptive	4	53.7	0
132 Ne 155th St	2241700055	157175	SF Residence on 155th St.	1	2	2	73	198	Ballast & Tie	55	No	58.2	Ldn	65.0	71.7	0	0	Absorptive	4	52.0	0
125 Ne 156th St	2241700050	157225	SF Residence on 156th St.	1	1	2	74	128	Ballast & Tie	55	No	64.2	Ldn	65.0	72.4	0	0	Absorptive	4	57.8	0
110 Ne 155th St	2241700045	157225	SF Residence on 155th St.	1	1	2	75	60	Ballast & Tie	55	No	69.7	Ldn	65.0	73.2	1	0	Absorptive	4	62.8	0
104 Ne 156th St	2241700040	157375	SF Residence on 156th St.	1	1	2	75	59	Ballast & Tie	55	No	69.7	Ldn	65.0	73.2	1	0	Absorptive	4	63.6	0
108 Ne 156th St	2241700035	157425	SF Residence on 156th St.	1	1	2	73	114	Ballast & Tie	55	No	65.0	Ldn	65.0	71.7	1	0	Absorptive	4	57.9	0
122 Ne 156th St	2241700030	157400	SF Residence on 156th St.	1	1	2	70	175	Ballast & Tie	55	No	62.1	Ldn	64.4	69.5	0	0	Absorptive	4	55.6	0
130 Ne 156th St	2241700025	157325	SF Residence on 156th St.	1	2	2	70	227	Ballast & Tie	55	No	57.3	Ldn	64.4	69.5	0	0	Absorptive	4	50.8	0
136 Ne 156th St	2241700020	157300	SF Residence on 156th St.	1	2	2	69	295	Ballast & Tie	55	No	55.4	Ldn	63.6	68.8	0	0	Absorptive	4	49.3	0
142 Ne 156th St	2241700015	157275	SF Residence on 156th St.	1	2	2	68	365	Ballast & Tie	55	No	53.9	Ldn	62.9	68.1	0	0	Absorptive	4	47.9	0
148 Ne 156th St	2241700010	157250	SF Residence on 156th St.	1	2	2	67	426	Ballast & Tie	55	No	52.9	Ldn	62.2	67.5	0	0	Absorptive	4	47.2	0
156 Ne 156th St	2241700005	157200	SF Residence on 156th St.	1	2	2	66	488	Ballast & Tie	55	No	52.0	Ldn	61.5	66.8	0	0	Absorptive	4	46.3	0
15615 3rd Ave Ne	2881700233	157325	SF Residence on 3rd Ave.	1	2	2	65	523	Ballast & Tie	55	No	51.9	Ldn	60.8	66.2	0	0	Absorptive	4	46.5	0
15621 3rd Ave Ne	2881700234	157425	SF Residence on 3rd Ave.	1	2	2	65	530	Ballast & Tie	55	No	52.2	Ldn	60.8	66.2	0	0	Absorptive	4	47.3	0
15625 3rd Ave Ne	2881700232	157475	SF Residence on 3rd Ave.	1	2	2	65	549	Ballast & Tie	55	No	51.9	Ldn	60.8	66.2	0	0	Absorptive	4	46.9	0
241 Ne 157th St	2881700239	157525	SF Residence on 157th St.	1	3	2	66	460	Ballast & Tie	55	No	50.9	Ldn	61.5	66.8	0	0	Absorptive	4	45.4	0
235 Ne 157th St	2881700229	157550	SF Residence on 157th St.	1	3	2	67	390	Ballast & Tie	55	No	51.9	Ldn	62.2	67.5	0	0	Absorptive	4	46.2	0
229 Ne 157th St	2881700226	157550	SF Residence on 157th St.	1	2	2	68	338	Ballast & Tie	55	No	54.4	Ldn	62.9	68.1	0	0	Absorptive	4	48.8	0
223 Ne 157th St	2881700224	157550	SF Residence on 157th St.	1	2	2	68	273	Ballast & Tie	55	No	56.1	Ldn	62.9	68.1	0	0	Absorptive	4	51.0	0
125 Ne 157th St	2881700225	157550	SF Residence on 157th	1	1	2	69	211	Ballast & Tie	55	No	60.7	Ldn	63.6	68.8	0	0	Absorptive	4	55.4	0
117 Ne 157th St	2881700219	157550	SF Residence on 157th St.	1	1	2	69	154	Ballast & Tie	55	No	63.2	Ldn	63.6	68.8	0	0	Absorptive	4	59.8	0
111 Ne 157th St	2881700220	157525	SF Residence on 157th St.	1	1	2	71	77	Ballast & Tie	55	No	67.7	Ldn	65.0	70.2	1	0	Absorptive	4	59.8	0

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Street Address	Parcel	Civil Station	Description	# Units	Row	FTA CAT	Existing Ldn (dB)	Near Track Distance(ft)	Track Type	Speed (mph)	Special Track	LRV Noise Level (dB)	Type	Moderate Impact Limit (dB)	Severe Impact Limit (dB)	Moderate Impacts	Severe Impacts	Wall Type	Height Above TOR (ft)	Mitigated LRV Ldn (dB)	Residual Impacts
108 Ne 157th St	2881700227	157725	SF Residence on 157th St.	1	1	2	71	113	Ballast & Tie	55	No	65.2	Ldn	65.0	70.2	1	0	Absorptive	4	57.5	0
15710 1st Ave Ne	2881700218	157825	SF Residence on 1st Ave.	1	1	2	71	147	Ballast & Tie	55	No	63.4	Ldn	65.0	70.2	0	0	Absorptive	4	56.3	0
105 Ne 158th St	8142000180	157950	SF Residence on 158th St.	1	1	2	71	89	Ballast & Tie	55	No	66.8	Ldn	65.0	70.2	1	0	Absorptive	4	62.6	0
111 Ne 158th St	8142000170	157950	SF Residence on 158th St.	1	1	2	70	151	Ballast & Tie	55	No	63.1	Ldn	64.4	69.5	0	0	Absorptive	4	58.2	0
116 Ne 157th St	2881700222	157775	SF Residence on 157th St.	1	2	2	68	198	Ballast & Tie	55	No	58.3	Ldn	62.9	68.1	0	0	Absorptive	4	51.7	0
126 Ne 157th St	2881700221	157800	SF Residence on 157th St.	1	2	2	68	267	Ballast & Tie	55	No	56.1	Ldn	62.9	68.1	0	0	Absorptive	4	49.8	0
132 Ne 157th St	2881700231	157725	SF Residence on 157th St.	1	2	2	68	362	Ballast & Tie	55	No	54.0	Ldn	62.9	68.1	0	0	Absorptive	4	48.0	0
117 Ne 158th St	8142000160	157950	SF Residence on 158th St.	1	2	2	68	220	Ballast & Tie	55	No	57.7	Ldn	62.9	68.1	0	0	Absorptive	4	53.2	0
123 Ne 158th St	8142000150	157925	SF Residence on 158th St.	1	2	2	68	289	Ballast & Tie	55	No	55.9	Ldn	62.9	68.1	0	0	Absorptive	4	51.0	0
104 Ne 158th St	8142000090	158125	SF Residence on 158th St.	1	1	2	71	91	Ballast & Tie	55	No	66.6	Ldn	65.0	70.2	1	0	Absorptive	4	62.4	0
110 Ne 158th St	8142000080	158125	SF Residence on 158th St.	1	2	2	70	157	Ballast & Tie	55	No	59.8	Ldn	64.4	69.5	0	0	Absorptive	4	54.1	0
116 Ne 158th St	8142000070	158125	SF Residence on 158th St.	1	3	2	68	221	Ballast & Tie	55	No	56.1	Ldn	62.9	68.1	0	0	Absorptive	4	51.1	0
122 Ne 158th St	8142000060	158125	SF Residence on 158th St.	1	3	2	68	295	Ballast & Tie	55	No	54.4	Ldn	62.9	68.1	0	0	Absorptive	4	49.7	0
117 Ne 159th St	6159400080	158350	SF Residence on 159th St.	1	3	2	68	208	Ballast & Tie	55	No	56.9	Ldn	62.9	68.1	0	0	Absorptive	5	51.3	0
125 Ne 159th St	6159400075	158350	SF Residence on 158th St.	1	3	2	68	270	Ballast & Tie	55	No	55.4	Ldn	62.9	68.1	0	0	Absorptive	5	49.8	0
113 Ne 159th St	6159400085	158325	SF Residence on 159th St.	1	2	2	70	138	Ballast & Tie	55	No	60.7	Ldn	64.4	69.5	0	0	Absorptive	5	52.7	0
105 Ne 159th St	6159400090	158325	SF Residence on 159th St.	1	1	2	71	64	Ballast & Tie	55	No	69.0	Ldn	65.0	70.2	1	0	Absorptive	5	58.0	0
114 Ne 159th St	6159400037	158475	SF Residence on 159th St.	1	1	2	70	127	Ballast & Tie	55	No	64.9	Ldn	64.4	69.5	1	0	Absorptive	5	62.8	0
118 Ne 159th St	6159400035	158500	SF Residence on 159th St.	1	2	2	68	184	Ballast & Tie	55	No	59.5	Ldn	62.9	68.1	0	0	Absorptive	5	55.7	0
124 Ne 159th St	6159400030	158500	SF Residence on 159th St.	1	3	2	68	253	Ballast & Tie	55	No	56.1	Ldn	62.9	68.1	0	0	Absorptive	5	51.4	0
130 Ne 159th St	6159400025	158575	SF Residence on 159th St.	1	3	2	68	306	Ballast & Tie	55	No	55.1	Ldn	62.9	68.1	0	0	Absorptive	5	50.2	0
129 Ne 161st St	2111600080	158700	SF Residence on 159th St.	1	3	2	68	234	Ballast & Tie	55	No	57.4	Ldn	62.9	68.1	0	0	Absorptive	5	55.3	0
139 Ne 161st St	2111600075	158725	SF Residence on 159th St.	1	3	2	68	296	Ballast & Tie	55	No	56.5	Ldn	62.9	68.1	0	0	Absorptive	5	54.1	0
123 Ne 161st St	2111600085	158675	SF Residence on 161st St.	1	2	2	68	176	Ballast & Tie	55	No	59.9	Ldn	62.9	68.1	0	0	Absorptive	5	56.4	0
115 Ne 161st St	2111600090	158675	SF Residence on 161st St.	1	1	2	70	119	Ballast & Tie	55	No	65.2	Ldn	64.4	69.5	1	0	Absorptive	5	63.0	0

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108 Ne 161st St	2881700193	159000	Ridgecrest Park	1	1	3	62	64	Ballast & Tie	55	No	66.3	Leq	63.9	69.5	1	0	Absorptive	4	57.1	0
128 Ne 161st St	2111600030	158825	SF Residence on 161st St.	1	2	2	68	198	Ballast & Tie	55	No	58.5	Ldn	62.9	68.1	0	0	Absorptive	5	52.5	0
134 Ne 161st St	2111600025	158875	SF Residence on 161st St.	1	3	2	68	254	Ballast & Tie	55	No	56.0	Ldn	62.9	68.1	0	0	Absorptive	5	51.2	0
303 Ne 163rd St	7301300295	159325	SF Residence on 163rd St.	1	2	2	66	144	Ballast & Tie	55	No	49.1	Ldn	61.5	66.8	0	0	Non-absorptive	30	49.1	0
129 Ne 163rd St	7301400110	159325	SF Residence on 163rd St.	1	1	2	66	90	Ballast & Tie	55	No	54.0	Ldn	61.5	66.8	0	0	Non-absorptive	30	54.0	0
304 Ne 163rd St	7301300130	159450	SF Residence on 163rd St.	1	2	2	66	127	Ballast & Tie	55	No	49.2	Ldn	61.5	66.8	0	0	Non-absorptive	26	49.6	0
310 Ne 163rd St	7301300135	159450	SF Residence on 163rd St.	1	3	2	66	192	Ballast & Tie	55	No	46.1	Ldn	61.5	66.8	0	0	Non-absorptive	26	46.4	0
139 Ne 164th St	7301300120	159575	SF Residence on 164th St.	1	3	2	68	172	Ballast & Tie	55	No	46.5	Ldn	62.9	68.1	0	0	Non-absorptive	24	46.5	0
135 Ne 164th St	7301300125	159575	SF Residence on 164th St.	1	2	2	68	115	Ballast & Tie	55	No	49.7	Ldn	62.9	68.1	0	0	Non-absorptive	25	49.7	0
127 Ne 164th St	7301400200	159550	SF Residence on 164th St.	1	1	2	68	56	Ballast & Tie	55	No	55.7	Ldn	62.9	68.1	0	0	Non-absorptive	25	55.7	0
132 Ne 164th St	7301400060	159700	SF Residence on 164th St.	1	1	2	68	51	Ballast & Tie	55	No	59.7	Ldn	62.9	68.1	0	0	Non-absorptive	13	58.8	0
134 Ne 164th St	7301400040	159700	SF Residence on 164th St.	1	2	2	68	106	Ballast & Tie	55	No	49.5	Ldn	62.9	68.1	0	0	Non-absorptive	13	49.1	0
140 Ne 164th St	7301400046	159700	SF Residence on 164th St.	1	3	2	68	166	Ballast & Tie	55	No	45.5	Ldn	62.9	68.1	0	0	Non-absorptive	13	45.2	0
141 Ne 165th St	7301300030	159800	SF Residence on 165th St.	1	3	2	68	169	Ballast & Tie	55	No	45.3	Ldn	62.9	68.1	0	0	Non-absorptive	14	45.1	0
135 Ne 165th St	7301300035	159800	SF Residence on 165th St.	1	2	2	68	105	Ballast & Tie	55	No	49.6	Ldn	62.9	68.1	0	0	Non-absorptive	14	48.9	0
127 Ne 165th St	7301400050	159800	SF Residence on 165th St.	1	1	2	68	48	Ballast & Tie	55	No	58.4	Ldn	62.9	68.1	0	0	Non-absorptive	14	56.8	0
126 Ne 165th St	5727500330	159950	SF Residence on 165th St.	1	1	2	68	39	Ballast & Tie	55	No	68.4	Ldn	62.9	68.1	0	1	Non-absorptive	17	59.8	0
127 Ne 165th St	7307000050	160050	SF Residence on 165th Place	1	1	2	68	41	Ballast & Tie	55	No	58.5	Ldn	62.9	68.1	0	0	Non-absorptive	26	57.0	0
119 Ne 166th St	5727500355	160175	SF Residence on 166th St.	1	1	2	68	38	Ballast & Tie	55	No	59.7	Ldn	62.9	68.1	0	0	Non-absorptive	34	57.4	0
123 Ne 166th St	5727500350	160175	SF Residence on 166th St.	1	2	2	68	93	Ballast & Tie	55	No	50.8	Ldn	62.9	68.1	0	0	Non-absorptive	34	50.8	0
134 Ne 165th Pl	7307000040	160050	SF Residence on 165th Place	1	2	2	68	134	Ballast & Tie	55	No	48.4	Ldn	62.9	68.1	0	0	Non-absorptive	26	49.3	0
132 Ne 165th St	7301500010	159925	SF Residence on 165th St.	1	2	2	68	115	Ballast & Tie	55	No	49.1	Ldn	62.9	68.1	0	0	Non-absorptive	17	48.9	0
140 Ne 165th St	7301500020	159925	SF Residence on 165th St.	1	3	2	66	178	Ballast & Tie	55	No	46.1	Ldn	61.5	66.8	0	0	Non-absorptive	17	45.7	0
140 Ne 165th Pl	7307000030	160050	SF Residence on 165th Place	1	3	2	66	200	Ballast & Tie	55	No	44.9	Ldn	61.5	66.8	0	0	Non-absorptive	26	46.1	0
131 Ne 166th St	5727500300	160175	SF Residence on 166th St.	1	3	2	66	156	Ballast & Tie	55	No	47.2	Ldn	61.5	66.8	0	0	Non-absorptive	34	47.2	0

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120 Ne 166th St	5727500363	160325	SF Residence on 166th St.	1	1	2	68	51	Ballast & Tie	55	No	56.3	Ldn	62.9	68.1	0	0	Non-absorptive	37	56.3	0
111 Ne 167th St	9235900015	160450	SF Residence on 167th St.	1	1	2	68	53	Ballast & Tie	55	No	56.1	Ldn	62.9	68.1	0	0	Non-absorptive	37	56.1	0
117 Ne 167th St	9235900020	160400	SF Residence on 167th St.	1	2	2	68	110	Ballast & Tie	55	No	50.2	Ldn	62.9	68.1	0	0	Non-absorptive	37	50.2	0
123 Ne 167th St	9235900025	160425	SF Residence on 167th St.	1	3	2	66	152	Ballast & Tie	55	No	47.3	Ldn	61.5	66.8	0	0	Non-absorptive	37	47.3	0
130 Ne 166th St	9235900040	160325	SF Residence on 166th St.	1	3	2	66	194	Ballast & Tie	55	No	46.3	Ldn	61.5	66.8	0	0	Non-absorptive	37	46.3	0
124 Ne 166th St	5727500361	160300	SF Residence on 166th St.	1	2	2	68	114	Ballast & Tie	55	No	50.0	Ldn	62.9	68.1	0	0	Non-absorptive	36	50.0	0
114 Ne 167th St	5727500086	160600	SF Residence on 167th St.	1	1	2	68	13	Ballast & Tie	55	No	76.4	Ldn	62.9	68.1	0	1	Non-absorptive	34	61.6	0
16719 2nd Ave Ne	5727500103	160725	SF Residence on 2nd Ave.	1	1	2	68	57	Ballast & Tie	55	No	55.8	Ldn	62.9	68.1	0	0	Non-absorptive	34	55.8	0
16723 2nd Ave Ne	5727500100	160775	SF Residence on 2nd Ave.	1	1	2	68	54	Ballast & Tie	55	No	56.0	Ldn	62.9	68.1	0	0	Non-absorptive	33	56.0	0
16729 2nd Ave Ne	5727500102	160850	SF Residence on 2nd Ave.	1	1	2	68	50	Ballast & Tie	55	No	56.3	Ldn	62.9	68.1	0	0	Non-absorptive	34	56.3	0
16731 2nd Ave Ne	5727500111	160925	SF Residence on 2nd Ave.	1	1	2	68	44	Ballast & Tie	55	No	56.8	Ldn	62.9	68.1	0	0	Non-absorptive	34	56.8	0
16735 2nd Ave Ne	5727500110	160975	SF Residence on 2nd Ave.	1	1	2	68	43	Ballast & Tie	55	No	57.5	Ldn	62.9	68.1	0	0	Non-absorptive	34	56.9	0
16741 2nd Ave Ne	5727500113	161050	SF Residence on 2nd Ave.	1	1	2	68	41	Ballast & Tie	55	No	61.9	Ldn	62.9	68.1	0	0	Non-absorptive	33	57.0	0
119 Ne 170th St	7305900115	161125	SF Residence on 170th St.	1	1	2	68	44	Ballast & Tie	55	No	60.5	Ldn	62.9	68.1	0	0	Non-absorptive	18	56.9	0
121 Ne 170th St	5727500130	161100	SF Residence on 170th St.	1	2	2	68	123	Ballast & Tie	55	No	49.5	Ldn	62.9	68.1	0	0	Non-absorptive	33	49.7	0
16742 2nd Ave Ne	5727500139	161075	SF Residence on 2nd Ave.	1	2	2	68	152	Ballast & Tie	55	No	47.8	Ldn	62.9	68.1	0	0	Non-absorptive	33	48.8	0
16738 2nd Ave Ne	5727500137	160925	SF Residence on 2nd Ave.	1	2	2	68	172	Ballast & Tie	55	No	48.3	Ldn	62.9	68.1	0	0	Non-absorptive	34	48.3	0
16728 2nd Ave Ne	5727500148	160850	SF Residence on 2nd Ave.	1	2	2	68	176	Ballast & Tie	55	No	48.2	Ldn	62.9	68.1	0	0	Non-absorptive	34	48.2	0
16722 2nd Ave Ne	5727500149	160800	SF Residence on 2nd Ave.	1	2	2	68	180	Ballast & Tie	55	No	48.2	Ldn	62.9	68.1	0	0	Non-absorptive	33	48.2	0
16716 2nd Ave Ne	5727500150	160725	SF Residence on 2nd Ave.	1	2	2	68	182	Ballast & Tie	55	No	48.1	Ldn	62.9	68.1	0	0	Non-absorptive	34	48.1	0
126 Ne 167th St	5727500155	160575	SF Residence on 167th St.	1	2	2	68	172	Ballast & Tie	55	No	48.3	Ldn	62.9	68.1	0	0	Non-absorptive	34	48.3	0
118 Ne 167th St	5727500087	160600	SF Residence on 167th St.	1	2	2	68	82	Ballast & Tie	55	No	51.4	Ldn	62.9	68.1	0	0	Non-absorptive	34	51.4	0
132 Ne 167th St	5727500156	160550	SF Residence on 167th St.	1	3	2	66	240	Ballast & Tie	55	No	45.4	Ldn	61.5	66.8	0	0	Non-absorptive	35	45.4	0
136 Ne 167th St	5727500157	160550	SF Residence on 167th St.	1	3	2	66	299	Ballast & Tie	55	No	44.5	Ldn	61.5	66.8	0	0	Non-absorptive	35	44.5	0
16719 3rd Ave Ne	5727500159	160675	SF Residence on 3rd Ave.	1	3	2	66	286	Ballast & Tie	55	No	44.7	Ldn	61.5	66.8	0	0	Non-absorptive	34	44.7	0

CITY OF SHORELINE NOISE IMPACT TABLE																				
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Street Address	Parcel	Civil Station	Description	# Units	Row	FTA CAT	Existing Ldn (dB)	Near Track Distance(ft)	Track Type	Speed (mph)	Special Track	LRV Noise Level (dB)	Type	Moderate Impact Limit (dB)	Severe Impact Limit (dB)	Moderate Impacts	Severe Impacts	Wall Type	Height Above TOR (ft)	Mitigated LRV Ldn (dB)	Residual Impacts
16725 3rd Ave Ne	5727500147	160775	SF Residence on 3rd Ave.	1	3	2	66	291	Ballast & Tie	55	No	44.6	Ldn	61.5	66.8	0	0	Non-absorptive	33	44.6	0
16735 3rd Ave Ne	5727500145	160825	SF Residence on 3rd Ave.	1	3	2	66	282	Ballast & Tie	55	No	44.8	Ldn	61.5	66.8	0	0	Non-absorptive	34	44.8	0
16741 3rd Ave Ne	5727500135	160950	SF Residence on 3rd Ave.	1	3	2	66	265	Ballast & Tie	55	No	45.0	Ldn	61.5	66.8	0	0	Non-absorptive	34	45.0	0
16747 3rd Ave Ne	5727500136	161000	SF Residence on 3rd Ave.	1	3	2	66	215	Ballast & Tie	55	No	44.5	Ldn	61.5	66.8	0	0	Non-absorptive	33	45.9	0
16753 3rd Ave Ne	5727500138	161075	SF Residence on 3rd Ave.	1	3	2	66	257	Ballast & Tie	55	No	43.5	Ldn	61.5	66.8	0	0	Non-absorptive	33	45.1	0
16761 3rd Ave Ne	5727500131	161150	SF Residence on 3rd Ave.	1	2	2	68	218	Ballast & Tie	55	No	45.7	Ldn	62.9	68.1	0	0	Non-absorptive	18	46.1	0
104 Ne 170th St	7305300205	161300	SF Residence on 170th St.	1	1	2	71	96	Ballast & Tie	55	No	53.0	Ldn	65.0	70.2	0	0	Non-absorptive	17	52.9	0
17010 1st Ave Ne	7305300210	161350	SF Residence on 1st Ave.	1	1	2	71	96	Ballast & Tie	55	No	53.3	Ldn	65.0	70.2	0	0	Non-absorptive	22	53.3	0
17016 1st Ave Ne	7305300215	161425	SF Residence on 1st Ave.	1	1	2	71	95	Ballast & Tie	55	No	53.0	Ldn	65.0	70.2	0	0	Non-absorptive	21	53.2	0
17022 1st Ave Ne	7305300220	161500	SF Residence on 1st Ave.	1	1	2	71	93	Ballast & Tie	55	No	52.9	Ldn	65.0	70.2	0	0	Non-absorptive	21	53.3	0
17028 1st Ave Ne	7305300225	161575	SF Residence on 1st Ave.	1	1	2	71	97	Ballast & Tie	55	No	52.6	Ldn	65.0	70.2	0	0	Non-absorptive	20	52.9	0
17034 1st Ave Ne	7305300230	161650	SF Residence on 1st Ave.	1	1	2	71	90	Ballast & Tie	55	No	54.9	Ldn	65.0	70.2	0	0	Non-absorptive	20	53.2	0
17040 1st Ave Ne	7305300235	161700	SF Residence on 1st Ave.	1	1	2	71	88	Ballast & Tie	55	No	58.8	Ldn	65.0	70.2	0	0	Non-absorptive	20	53.2	0
17046 1st Ave Ne	7305300240	161775	SF Residence on 1st Ave.	1	1	2	71	77	Ballast & Tie	55	No	66.5	Ldn	65.0	70.2	1	0	Non-absorptive	11	53.9	0
17052 1st Ave Ne	7305300245	161850	SF Residence on 1st Ave.	1	1	2	71	70	Ballast & Tie	55	No	68.3	Ldn	65.0	70.2	1	0	Non-absorptive	11	53.8	0
111 Ne 174th St	7305300350	162250	SF Residence on 174th St.	1	1	2	71	146	Ballast & Tie	55	No	63.3	Ldn	65.0	70.2	0	0	Absorptive	8	51.8	0
17223 2nd Ave Ne	7305300345	162175	SF Residence on 2nd Ave.	1	1	2	71	128	Ballast & Tie	55	No	64.2	Ldn	65.0	70.2	0	0	Absorptive	8	53.0	0
17217 2nd Ave Ne	7305300340	162150	SF Residence on 2nd Ave.	1	1	2	71	219	Ballast & Tie	55	No	60.7	Ldn	65.0	70.2	0	0	Absorptive	8	50.0	0
17211 2nd Ave Ne	7305300335	162050	SF Residence on 2nd Ave.	1	1	2	71	222	Ballast & Tie	55	No	60.8	Ldn	65.0	70.2	0	0	Absorptive	9	49.4	0
17205 2nd Ave Ne	7305300330	162000	SF Residence on 2nd Ave.	1	1	2	71	239	Ballast & Tie	55	No	60.4	Ldn	65.0	70.2	0	0	Absorptive	9	49.2	0
17059 2nd Ave Ne	7305300325	161925	SF Residence on 2nd Ave.	1	1	2	71	252	Ballast & Tie	55	No	60.4	Ldn	65.0	70.2	0	0	Absorptive	11	48.4	0
17053 2nd Ave Ne	7305300320	161850	SF Residence on 2nd Ave.	1	1	2	71	254	Ballast & Tie	55	No	60.4	Ldn	65.0	70.2	0	0	Non-absorptive	11	47.6	0
17047 2nd Ave Ne	7305300315	161800	SF Residence on 2nd Ave.	1	2	2	69	267	Ballast & Tie	55	No	57.6	Ldn	63.6	68.8	0	0	Non-absorptive	11	44.7	0
17041 2nd Ave Ne	7305300310	161700	SF Residence on 2nd Ave.	1	2	2	69	249	Ballast & Tie	55	No	48.8	Ldn	63.6	68.8	0	0	Non-absorptive	20	45.8	0
17035 2nd Ave Ne	7305300305	161650	SF Residence on 2nd Ave.	1	2	2	69	244	Ballast & Tie	55	No	45.9	Ldn	63.6	68.8	0	0	Non-absorptive	20	45.9	0

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17029 2nd Ave Ne	7305300300	161550	SF Residence on 2nd Ave.	1	2	2	69	259	Ballast & Tie	55	No	44.9	Ldn	63.6	68.8	0	0	Non-absorptive	20	45.7	0
17023 2nd Ave Ne	7305300295	161500	SF Residence on 2nd Ave.	1	2	2	69	282	Ballast & Tie	55	No	44.7	Ldn	63.6	68.8	0	0	Non-absorptive	21	45.4	0
17017 2nd Ave Ne	7305300290	161400	SF Residence on 2nd Ave.	1	2	2	69	281	Ballast & Tie	55	No	44.7	Ldn	63.6	68.8	0	0	Non-absorptive	21	45.5	0
17011 2nd Ave Ne	7305300285	161350	SF Residence on 2nd Ave.	1	2	2	69	266	Ballast & Tie	55	No	44.9	Ldn	63.6	68.8	0	0	Non-absorptive	22	45.8	0
110 Ne 170th St	7305300280	161275	SF Residence on 170th St.	1	2	2	69	256	Ballast & Tie	55	No	44.9	Ldn	63.6	68.8	0	0	Non-absorptive	17	45.2	0
205 Ne 174th St	7305300425	162300	SF Residence on 174th St.	1	2	2	69	324	Ballast & Tie	55	No	54.8	Ldn	63.6	68.8	0	0	Absorptive	4	49.3	0
17222 2nd Ave Ne	7305300420	162250	SF Residence on 2nd Ave.	1	2	2	69	320	Ballast & Tie	55	No	54.9	Ldn	63.6	68.8	0	0	Absorptive	4	49.4	0
17216 2nd Ave Ne	7305300415	162175	SF Residence on 2nd Ave.	1	2	2	69	349	Ballast & Tie	55	No	54.8	Ldn	63.6	68.8	0	0	Absorptive	4	50.2	0
17210 2nd Ave Ne	7305300410	162100	SF Residence on 2nd Ave.	1	2	2	69	367	Ballast & Tie	55	No	54.5	Ldn	63.6	68.8	0	0	Absorptive	4	49.8	0
17204 2nd Ave Ne	7305300405	162025	SF Residence on 2nd Ave.	1	2	2	69	382	Ballast & Tie	55	No	54.6	Ldn	63.6	68.8	0	0	Absorptive	9	43.6	0
17058 2nd Ave Ne	7305300400	161950	SF Residence on 2nd Ave.	1	2	2	69	396	Ballast & Tie	55	No	54.6	Ldn	63.6	68.8	0	0	Absorptive	11	42.8	0
17052 2nd Ave Ne	7305300395	161875	SF Residence on 2nd Ave.	1	2	2	69	415	Ballast & Tie	55	No	54.7	Ldn	63.6	68.8	0	0	Non-absorptive	11	42.2	0
17046 2nd Ave Ne	7305300390	161800	SF Residence on 2nd Ave.	1	3	2	67	416	Ballast & Tie	55	No	53.5	Ldn	62.2	67.5	0	0	Non-absorptive	11	40.6	0
17040 2nd Ave Ne	7305300385	161725	SF Residence on 2nd Ave.	1	3	2	67	427	Ballast & Tie	55	No	44.4	Ldn	62.2	67.5	0	0	Non-absorptive	12	40.6	0
17034 2nd Ave Ne	7305300380	161675	SF Residence on 2nd Ave.	1	3	2	67	431	Ballast & Tie	55	No	41.3	Ldn	62.2	67.5	0	0	Non-absorptive	20	41.9	0
17028 2nd Ave Ne	7305300375	161550	SF Residence on 2nd Ave.	1	3	2	67	425	Ballast & Tie	55	No	41.1	Ldn	62.2	67.5	0	0	Non-absorptive	21	42.1	0
17022 2nd Ave Ne	7305300370	161450	SF Residence on 2nd Ave.	1	3	2	67	431	Ballast & Tie	55	No	41.4	Ldn	62.2	67.5	0	0	Non-absorptive	21	42.3	0
17016 2nd Ave Ne	7305300365	161375	SF Residence on 2nd Ave.	1	3	2	67	429	Ballast & Tie	55	No	41.8	Ldn	62.2	67.5	0	0	Non-absorptive	21	42.6	0
17010 2nd Ave Ne	7305300360	161300	SF Residence on 2nd Ave.	1	3	2	67	417	Ballast & Tie	55	No	41.4	Ldn	62.2	67.5	0	0	Non-absorptive	17	41.8	0
204 Ne 170th St	7305300355	161250	SF Residence on 170th St.	1	3	2	67	423	Ballast & Tie	55	No	41.4	Ldn	62.2	67.5	0	0	Non-absorptive	17	42.0	0
116 Ne 174th St	7305300015	162375	SF Residence on 174th St.	1	1	2	71	57	Elevated	55	No	72.5	Ldn	65.0	70.2	0	1	Absorptive	4	61.0	0
122 Ne 174th St	7305300020	162375	SF Residence on 174th St.	1	1	2	71	108	Elevated	55	No	68.5	Ldn	65.0	70.2	1	0	Absorptive	4	59.5	0
128 Ne 174th St	7305300025	162400	SF Residence on 174th St.	1	1	2	70	169	Elevated	55	No	65.7	Ldn	64.4	69.5	1	0	Absorptive	4	58.3	0
204 Ne 174th St	7305300030	162425	SF Residence on 174th St.	1	2	2	69	219	Elevated	55	No	60.5	Ldn	63.6	68.8	0	0	Absorptive	4	54.0	0
210 Ne 174th St	7305300035	162450	SF Residence on 174th St.	1	2	2	69	283	Elevated	55	No	58.6	Ldn	63.6	68.8	0	0	Absorptive	4	52.6	0

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216 Ne 174th St	7305300040	162475	SF Residence on 174th St.	1	2	2	69	332	Elevated	55	No	57.2	Ldn	63.6	68.8	0	0	Absorptive	4	51.2	0
211 Ne 175th St	7305300085	162625	SF Residence on 175th St.	1	1	2	70	212	Elevated	55	No	64.9	Ldn	64.4	69.5	1	0	Absorptive	4	58.7	0
217 Ne 175th St	7305300090	162650	SF Residence on 175th St.	1	1	2	70	261	Elevated	55	No	63.0	Ldn	64.4	69.5	0	0	Absorptive	4	57.1	0
223 Ne 175th St	7305300095	162675	SF Residence on 175th St.	1	2	2	69	323	Elevated	55	No	57.8	Ldn	63.6	68.8	0	0	Absorptive	4	52.0	0
208 Ne 175th St	1115100230	162775	SF Residence on 175th St.	1	1	2	70	113	Elevated	55	No	68.8	Ldn	64.4	69.5	1	0	Absorptive	4	58.6	0
216 Ne 175th St	1115100210	162900	SF Residence on 175th St.	1	1	2	70	139	Elevated	55	No	67.7	Ldn	64.4	69.5	1	0	Absorptive	4	57.9	0
218 Ne 175th St	1115100208	162950	SF Residence on 175th St.	1	1	2	70	124	Elevated	55	No	68.5	Ldn	64.4	69.5	1	0	Absorptive	4	58.0	0
222 Ne 175th St	1115100211	162875	SF Residence on 175th St.	1	2	2	69	236	Elevated	55	No	61.3	Ldn	63.6	68.8	0	0	Absorptive	4	54.5	0
220 Ne 175th St	1115100209	163025	SF Residence on 175th St.	1	1	2	69	169	Elevated	55	No	67.1	Ldn	63.6	68.8	1	0	Absorptive	4	56.9	0
230 Ne Serpentine Pl	1115100200	162925	SF Residence on Serpentine Pl.	1	2	2	69	293	Elevated	55	No	59.8	Ldn	63.6	68.8	0	0	Absorptive	4	54.1	0
234 Ne Serpentine Pl	1115100205	163025	SF Residence on Serpentine Pl.	1	2	2	69	244	Elevated	55	No	62.1	Ldn	63.6	68.8	0	0	Absorptive	4	53.3	0
300 Ne Serpentine Pl	1115100195	163000	SF Residence on Serpentine Pl.	1	3	2	68	339	Elevated	55	No	57.1	Ldn	62.9	68.1	0	0	Absorptive	4	52.4	0
300 Ne Serpentine Pl	1115100190	162950	SF Residence on Serpentine Pl.	1	2	2	68	339	Elevated	55	No	58.1	Ldn	62.9	68.1	0	0	Absorptive	4	52.9	0
310 Ne Serpentine Pl	1115100182	163200	SF Residence on Serpentine Pl.	1	2	2	67	399	Elevated	55	No	56.6	Ldn	62.2	67.5	0	0	Absorptive	4	51.3	0
320 Ne Serpentine Pl	1115100175	163150	SF Residence on Serpentine Pl.	1	4	2	66	414	Elevated	55	No	53.1	Ldn	61.5	66.8	0	0	Absorptive	4	47.8	0
323 Ne 178th St	1115100172	163350	SF Residence on Serpentine Pl.	1	3	2	66	429	Ballast & Tie	55	No	53.3	Ldn	61.5	66.8	0	0	Absorptive	4	49.0	0
325 Ne 178th St	1115100171	163450	SF Residence on Serpentine Pl.	1	3	2	66	390	Ballast & Tie	55	No	54.6	Ldn	61.5	66.8	0	0	Non-absorptive	4	47.8	0
317 Ne 178th St	1115100176	163400	SF Residence on 178th St.	1	3	2	66	300	Ballast & Tie	55	No	56.8	Ldn	61.5	66.8	0	0	Absorptive	4	48.8	0
308 Ne Serpentine Pl	1115100180	163250	SF Residence on Serpentine Pl.	1	1	2	67	316	Elevated	55	No	62.7	Ldn	62.2	67.5	1	0	Absorptive	4	56.6	0
311 Ne 178th St	1115100181	163400	SF Residence on 178th St.	1	1	2	67	205	Ballast & Tie	55	No	63.4	Ldn	62.2	67.5	1	0	Absorptive	4	54.0	0
239 Ne 178th St	7772400110	163350	SF Residence on 178th St.	1	1	2	69	135	Elevated	55	No	68.0	Ldn	63.6	68.8	1	0	Absorptive	4	57.7	0
17748 2nd Pl Ne	7772400120	163300	SF Residence on 2nd Pl.	1	1	2	69	136	Ballast & Tie	55	No	65.4	Ldn	63.6	68.8	1	0	Absorptive	4	55.0	0
17738 2nd Pl Ne	7772400130	163175	SF Residence on 2nd Pl.	1	1	2	69	202	Ballast & Tie	55	No	63.8	Ldn	63.6	68.8	1	0	Absorptive	4	53.7	0
17734 2nd Pl Ne	7772400140	163100	SF Residence on 2nd Pl.	1	1	2	69	152	Ballast & Tie	55	No	65.0	Ldn	63.6	68.8	1	0	Absorptive	4	54.5	0
17733 2nd Pl Ne	7772400150	163075	SF Residence on 2nd Pl.	1	1	2	75	77	Ballast & Tie	55	No	68.6	Ldn	65.0	73.2	1	0	Absorptive	4	56.5	0

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17803 3rd Ave Ne	7772400010	163500	SF Residence on 3rd Ave.	1	1	2	64	69	Ballast & Tie	55	No	68.8	Ldn	60.2	65.6	0	1	Non-absorptive	4	55.0	0
17825 3rd Ave Ne	7772400050	163775	SF Residence on 3rd Ave.	1	1	2	66	95	Ballast & Tie	55	No	66.5	Ldn	61.5	66.8	1	0	Non-absorptive	6	53.4	0
17822 3rd Ave Ne	7772400060	163775	SF Residence on 3rd Ave.	1	2	2	64	173	Ballast & Tie	55	No	48.6	Ldn	60.2	65.6	0	0	Non-absorptive	6	48.6	0
17816 3rd Ave Ne	7772400070	163725	SF Residence on 3rd Ave.	1	2	2	63	198	Ballast & Tie	55	No	49.7	Ldn	59.6	65.0	0	0	Non-absorptive	6	48.4	0
17810 3rd Ave Ne	7772400080	163625	SF Residence on 3rd Ave.	1	2	2	64	170	Ballast & Tie	55	No	57.1	Ldn	60.2	65.6	0	0	Non-absorptive	4	50.4	0
17804 3rd Ave Ne	7772400090	163575	SF Residence on 3rd Ave.	1	2	2	64	198	Ballast & Tie	55	No	60.2	Ldn	60.2	65.6	0	0	Non-absorptive	4	49.6	0
312 Ne 178th St	7772400100	163625	SF Residence on 178th St.	1	3	2	63	278	Ballast & Tie	55	No	54.7	Ldn	59.6	65.0	0	0	Non-absorptive	4	47.6	0
330 Ne 178th St	1115100119	163675	SF Residence on 178th St.	1	3	2	62	332	Ballast & Tie	55	No	49.2	Ldn	58.9	64.5	0	0	Non-absorptive	4	47.3	0
340 Ne 178th St	1115100123	163750	SF Residence on 178th St.	1	3	2	62	302	Ballast & Tie	55	No	45.8	Ldn	58.9	64.5	0	0	Non-absorptive	6	45.8	0
344 Ne 178th St	1115100121	163875	SF Residence on 178th St.	1	3	2	62	268	Ballast & Tie	55	No	56.9	Ldn	58.9	64.5	0	0	Non-absorptive	6	45.9	0
337 Ne 180th St	1115100111	163775	SF Residence on 180th St.	1	1	2	63	160	Ballast & Tie	55	No	52.0	Ldn	59.6	65.0	0	0	Non-absorptive	6	52.0	0
335 Ne 180th St	1115100113	163975	SF Residence on 180th St.	1	1	2	63	99	Ballast & Tie	55	No	65.9	Ldn	59.6	65.0	0	1	Non-absorptive	14	51.8	0
336 Ne 178th St	1115100120	163725	SF Residence on 178th St.	1	3	2	62	387	Ballast & Tie	55	No	45.6	Ldn	58.9	64.5	0	0	Non-absorptive	6	44.3	0
348 Ne 178th St	1115100122	163850	SF Residence on 178th St.	1	3	2	63	334	Ballast & Tie	55	No	48.6	Ldn	59.6	65.0	0	0	Non-absorptive	6	45.4	0
17861 5th Ave Ne	1115100137	164175	SF Residence on 5th Ave.	1	2	2	62	263	Ballast & Tie	55	No	57.1	Ldn	58.9	64.5	0	0	Non-absorptive	15	46.5	0
17857 5th Ave Ne	1115100138	164150	SF Residence on 5th Ave.	1	2	2	62	242	Ballast & Tie	55	No	57.6	Ldn	58.9	64.5	0	0	Non-absorptive	15	46.7	0
17845 5th Ave Ne	1115100135	164075	SF Residence on 5th Ave.	1	2	2	62	329	Ballast & Tie	55	No	57.8	Ldn	58.9	64.5	0	0	Non-absorptive	15	45.6	0
17833 5th Ave Ne	1115100136	163975	SF Residence on 5th Ave.	1	2	2	62	363	Ballast & Tie	55	No	55.1	Ldn	58.9	64.5	0	0	Non-absorptive	14	45.2	0
17829 5th Ave Ne	1115100142	163950	SF Residence on 5th Ave.	1	2	2	62	395	Ballast & Tie	55	No	54.7	Ldn	58.9	64.5	0	0	Non-absorptive	14	44.8	0
17825 5th Ave Ne	1115100139	163850	SF Residence on 5th Ave.	1	4	2	63	400	Ballast & Tie	55	No	46.9	Ldn	59.6	65.0	0	0	Non-absorptive	6	43.7	0
17821 5th Ave Ne	1115100140	163875	SF Residence on 5th Ave.	1	5	2	63	485	Ballast & Tie	55	No	52.8	Ldn	59.6	65.0	0	0	Non-absorptive	6	42.0	0
356 Ne 178th St	1115100146	163750	SF Residence on 178th St.	1	7	2	62	482	Ballast & Tie	55	No	39.2	Ldn	58.9	64.5	0	0	Non-absorptive	6	39.2	0
17822 5th Ave Ne	927100187	164025	SF Residence on 5th Ave.	1	3	2	66	573	Ballast & Tie	55	No	47.0	Ldn	61.5	66.8	0	0	Non-absorptive	14	39.0	0
17832 5th Ave Ne	927100196	164100	SF Residence on 5th Ave.	1	3	2	66	535	Ballast & Tie	55	No	50.4	Ldn	61.5	66.8	0	0	Non-absorptive	15	40.5	0
17840 5th Ave Ne	927100200	164150	SF Residence on 5th Ave.	1	3	2	66	502	Ballast & Tie	55	No	50.4	Ldn	61.5	66.8	0	0	Non-absorptive	15	39.7	0

CITY OF SHORELINE NOISE IMPACT TABLE																				
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Street Address	Parcel	Civil Station	Description	# Units	Row	FTA CAT	Existing Ldn (dB)	Near Track Distance(ft)	Track Type	Speed (mph)	Special Track	LRV Noise Level (dB)	Type	Moderate Impact Limit (dB)	Severe Impact Limit (dB)	Moderate Impacts	Severe Impacts	Wall Type	Height Above TOR (ft)	Mitigated LRV Ldn (dB)	Residual Impacts
17844 5th Ave Ne	927100199	164200	SF Residence on 5th Ave.	1	3	2	66	460	Ballast & Tie	55	No	51.2	Ldn	61.5	66.8	0	0	Non-absorptive	15	40.7	0
17852 5th Ave Ne	927100205	164275	SF Residence on 5th Ave.	1	3	2	66	421	Ballast & Tie	55	No	45.8	Ldn	61.5	66.8	0	0	Non-absorptive	18	40.4	0
344 Ne 180th St	6084100114	164300	SF Residence on 180th St.	1	1	2	64	89	Ballast & Tie	55	No	52.8	Ldn	60.2	65.6	0	0	Non-absorptive	18	53.2	0
350 Ne 180th St	6084100116	164325	SF Residence on 180th St.	1	1	2	63	152	Ballast & Tie	55	No	50.3	Ldn	59.6	65.0	0	0	Non-absorptive	18	50.3	0
356 Ne 180th St	6084100115	164350	SF Residence on 180th St.	1	1	2	64	199	Ballast & Tie	55	No	48.4	Ldn	60.2	65.6	0	0	Non-absorptive	18	48.5	0
18017 5th Ave Ne	6084100110	164450	SF Residence on 5th Ave.	1	1	2	63	110	Ballast & Tie	55	No	52.0	Ldn	59.6	65.0	0	0	Non-absorptive	14	51.4	0
506 Ne 180th St	927100065	164425	SF Residence on 180th St.	1	3	2	64	321	Ballast & Tie	55	No	42.2	Ldn	60.2	65.6	0	0	Non-absorptive	14	42.4	0
514 Ne 180th St	927100066	164475	SF Residence on 180th St.	1	4	2	64	383	Ballast & Tie	55	No	39.5	Ldn	60.2	65.6	0	0	Non-absorptive	14	40.0	0
518 Ne 180th St	927100067	164425	SF Residence on 180th St.	1	4	2	63	427	Ballast & Tie	55	No	39.7	Ldn	59.6	65.0	0	0	Non-absorptive	14	40.0	0
524 Ne 180th St	927100068	164525	SF Residence on 180th St.	1	5	2	63	485	Ballast & Tie	55	No	34.9	Ldn	59.6	65.0	0	0	Non-absorptive	14	35.5	0
18015 7th Ave Ne	5662100015	164675	SF Residence on 7th Ave.	1	5	2	62	501	Ballast & Tie	55	No	36.6	Ldn	58.9	64.5	0	0	Non-absorptive	19	37.4	0
18021 7th Ave Ne	5662100020	164725	SF Residence on 7th Ave.	1	5	2	62	442	Ballast & Tie	55	No	37.0	Ldn	58.9	64.5	0	0	Non-absorptive	20	38.0	0
18022 5th Ave Ne	927100071	164600	SF Residence on 5th Ave.	1	3	2	63	383	Ballast & Tie	55	No	41.3	Ldn	59.6	65.0	0	0	Non-absorptive	15	41.9	0
18020 5th Ave Ne	927100079	164575	SF Residence on 5th Ave.	1	2	2	64	371	Ballast & Tie	55	No	43.0	Ldn	60.2	65.6	0	0	Non-absorptive	15	43.6	0
18016 5th Ave Ne	927100070	164525	SF Residence on 5th Ave.	1	2	2	64	251	Ballast & Tie	55	No	44.5	Ldn	60.2	65.6	0	0	Non-absorptive	14	45.1	0
18032 5th Ave Ne	927100076	164675	SF Residence on 5th Ave.	1	2	2	64	261	Ballast & Tie	55	No	43.7	Ldn	60.2	65.6	0	0	Non-absorptive	19	44.3	0
18027 7th Ave Ne	5662100025	164775	SF Residence on 7th Ave.	1	5	2	62	452	Ballast & Tie	55	No	36.0	Ldn	58.9	64.5	0	0	Non-absorptive	21	37.8	0
18033 7th Ave Ne	5662100030	164850	SF Residence on 7th Ave.	1	5	2	62	416	Ballast & Tie	55	No	35.9	Ldn	58.9	64.5	0	0	Non-absorptive	17	37.0	0
515 Ne 182nd Ct	927100075	164775	SF Residence on 182nd Ct.	1	3	2	64	310	Ballast & Tie	55	No	41.2	Ldn	60.2	65.6	0	0	Non-absorptive	21	42.7	0
18034 5th Ave Ne	927100073	164675	SF Residence on 5th Ave.	1	1	2	66	167	Ballast & Tie	55	No	49.5	Ldn	61.5	66.8	0	0	Non-absorptive	19	50.0	0
18036 5th Ave Ne	927100082	164750	SF Residence on 5th Ave.	1	1	2	66	143	Ballast & Tie	55	No	49.5	Ldn	61.5	66.8	0	0	Non-absorptive	20	50.3	0
519 Ne 182nd Ct	927100080	164825	SF Residence on 182nd Ct.	1	3	2	64	254	Ballast & Tie	55	No	41.5	Ldn	60.2	65.6	0	0	Non-absorptive	16	42.3	0
18039 7th Ave Ne	5662100035	164900	SF Residence on 7th Ave.	1	4	2	63	382	Ballast & Tie	51.6	No	37.9	Ldn	59.6	65.0	0	0	Non-absorptive	18	38.9	0
18045 7th Ave Ne	5662100040	164950	SF Residence on 7th Ave.	1	4	2	63	348	Ballast & Tie	49.5	No	38.4	Ldn	59.6	65.0	0	0	Non-absorptive	19	39.3	0
518 Ne 182nd Ct	927100084	164875	SF Residence on 182nd Ct.	1	3	2	64	227	Ballast & Tie	53.5	No	42.1	Ldn	60.2	65.6	0	0	Non-absorptive	17	42.9	0

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504 Ne 182nd Ct	927100083	164800	SF Residence on 182nd Ct.	1	1	2	66	84	Ballast & Tie	55	No	55.0	Ldn	61.5	66.8	0	0	Non-absorptive	23	53.5	0
18210 5th Ave Ne	927100085	164850	SF Residence on 5th Ave.	1	1	2	66	82	Ballast & Tie	55	No	56.9	Ldn	61.5	66.8	0	0	Non-absorptive	17	53.6	0
514 Ne 182nd Ct	927100081	164900	SF Residence on 182nd Ct.	1	1	2	65	164	Ballast & Tie	51.6	No	48.7	Ldn	60.8	66.2	0	0	Non-absorptive	18	49.3	0
18051 7th Ave Ne	5662100045	165000	SF Residence on 7th Ave.	1	3	2	64	317	Ballast & Tie	45.2	No	39.9	Ldn	60.2	65.6	0	0	Non-absorptive	20	41.3	0
18057 7th Ave Ne	5662100050	165050	SF Residence on 7th Ave.	1	3	2	64	250	Ballast & Tie	45	No	41.4	Ldn	60.2	65.6	0	0	Non-absorptive	21	42.8	0
515 Ne 183rd Ct	927100091	165075	SF Residence on 183rd Ct.	1	1	2	65	144	Ballast & Tie	45	No	50.4	Ldn	60.8	66.2	0	0	Non-absorptive	21	50.4	0
18063 7th Ave Ne	5662100055	165150	SF Residence on 7th Ave.	1	3	2	64	249	Ballast & Tie	45	No	42.7	Ldn	60.2	65.6	0	0	Non-absorptive	8	42.7	0
520 Ne 183rd Ct	927100092	165075	SF Residence on 183rd Ct.	1	2	2	65	48	Ballast & Tie	45	No	53.3	Ldn	60.8	66.2	0	0	Non-absorptive	21	53.2	0
514 Ne 183rd Ct	927100093	165050	SF Residence on 183rd Ct.	1	1	2	63	67	Ballast & Tie	42.9	No	54.7	Ldn	59.6	65.0	0	0	Non-absorptive	21	54.5	0
18313 7th Ave Ne	5662100075	165300	SF Residence on 7th Ave.	1	1	2	63	136	Ballast & Tie	45	No	50.4	Ldn	59.6	65.0	0	0	Non-absorptive	4	57.4	0
18316 7th Ave Ne	5662100080	165350	SF Residence on 7th Ave.	1	1	2	70	185	Ballast & Tie	45	No	48.7	Ldn	64.4	69.5	0	0	Non-absorptive	4	58.2	0
18323 8th Ave Ne	927100016	165425	SF Residence on 8th Ave.	1	1	2	69	257	Ballast & Tie	45	No	46.9	Ldn	63.6	68.8	0	0	Non-absorptive	4	56.9	0
18329 8th Ave Ne	927100015	165500	SF Residence on 8th Ave.	1	1	2	69	243	Ballast & Tie	45	No	49.4	Ldn	63.6	68.8	0	0	Non-absorptive	4	57.5	0
721 Ne 185th St	927100011	165525	SF Residence on 185th St.	1	1	2	71	145	Ballast & Tie	45	No	53.4	Ldn	65.0	70.2	0	0	Non-absorptive	4	62.1	0
18069 7th Ave Ne	5662100060	165100	SF Residence on 7th Ave.	1	1	2	64	201	Ballast & Tie	45	No	52.1	Ldn	60.2	65.6	0	0	Non-absorptive	4	56.7	0
18301 7th Ave Ne	5662100065	165200	SF Residence on 7th Ave.	1	1	2	64	184	Ballast & Tie	45	No	49.6	Ldn	60.2	65.6	0	0	Non-absorptive	8	49.6	0
18307 7th Ave Ne	5662100070	165250	SF Residence on 7th Ave.	1	1	2	65	156	Ballast & Tie	45	No	49.0	Ldn	60.8	66.2	0	0	Non-absorptive	8	50.1	0
18308 7th Ave Ne	5662100090	165275	SF Residence on 7th Ave.	1	2	2	64	294	Ballast & Tie	45	No	43.5	Ldn	60.2	65.6	0	0	Non-absorptive	4	52.5	0
18317 7th Ave Ne	5662100085	165350	SF Residence on 7th Ave.	1	2	2	69	259	Ballast & Tie	45	No	44.4	Ldn	63.6	68.8	0	0	Non-absorptive	4	54.5	0
731 Ne 185th St	927100008	165600	SF Residence on 185th St.	1	2	2	70	233	Ballast & Tie	45	No	45.3	Ldn	64.4	69.5	0	0	Non-absorptive	4	54.6	0
18342 8th Ave Ne	6163900092	165625	SF Residence on 8th Ave.	1	3	2	68	399	Ballast & Tie	45	No	40.8	Ldn	62.9	68.1	0	0	Non-absorptive	20	40.8	0
18343 9th Ave Ne	6163900091	165575	SF Residence on 9th Ave.	1	2	2	68	582	Ballast & Tie	45	No	38.8	Ldn	62.9	68.1	0	0	Non-absorptive	4	45.8	0
18332 8th Ave Ne	6163900095	165500	SF Residence on 8th Ave.	1	2	2	67	561	Ballast & Tie	45	No	39.6	Ldn	62.2	67.5	0	0	Non-absorptive	4	46.1	0
18318 8th Ave Ne	6163900082	165450	SF Residence on 8th Ave.	1	3	2	67	534	Ballast & Tie	45	No	37.3	Ldn	62.2	67.5	0	0	Non-absorptive	4	45.2	0
18312 8th Ave Ne	6163900081	165325	SF Residence on 8th Ave.	1	4	2	65	517	Ballast & Tie	45	No	37.3	Ldn	60.8	66.2	0	0	Non-absorptive	4	44.6	0

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18306 8th Ave Ne	6163900073	165375	SF Residence on 8th Ave.	1	4	2	63	517	Ballast & Tie	45	No	37.7	Ldn	59.6	65.0	0	0	Non-absorptive	4	45.4	0
18300 8th Ave Ne	6163900071	165300	SF Residence on 8th Ave.	1	4	2	64	554	Ballast & Tie	45	No	37.7	Ldn	60.2	65.6	0	0	Non-absorptive	4	45.7	0
18302 7th Ave Ne	5662100095	165275	SF Residence on 7th Ave.	1	2	2	64	313	Ballast & Tie	45	No	43.2	Ldn	60.2	65.6	0	0	Non-absorptive	8	44.9	0
18070 7th Ave Ne	5662100100	165200	SF Residence on 7th Ave.	1	4	2	63	371	Ballast & Tie	45	No	41.0	Ldn	59.6	65.0	0	0	Non-absorptive	8	41.0	0
18064 7th Ave Ne	5662100105	165150	SF Residence on 7th Ave.	1	4	2	63	401	Ballast & Tie	45	No	50.2	Ldn	59.6	65.0	0	0	Non-absorptive	8	40.3	0
18058 7th Ave Ne	5662100110	165100	SF Residence on 7th Ave.	1	4	2	63	423	Ballast & Tie	45	No	42.8	Ldn	59.6	65.0	0	0	Non-absorptive	8	39.8	0
18052 7th Ave Ne	5662100115	165075	SF Residence on 7th Ave.	1	4	2	62	453	Ballast & Tie	45	No	38.9	Ldn	58.9	64.5	0	0	Non-absorptive	21	39.2	0
18046 7th Ave Ne	5662100120	165025	SF Residence on 7th Ave.	1	4	2	62	489	Ballast & Tie	45.2	No	36.7	Ldn	58.9	64.5	0	0	Non-absorptive	20	38.3	0
18072 8th Ave Ne	6163900063	165275	SF Residence on 8th Ave.	1	4	2	62	577	Ballast & Tie	45	No	37.7	Ldn	58.9	64.5	0	0	Non-absorptive	8	38.8	0
18066 8th Ave Ne	6163900061	165225	SF Residence on 8th Ave.	1	4	2	62	596	Ballast & Tie	45	No	37.5	Ldn	58.9	64.5	0	0	Non-absorptive	8	38.7	0
18060 8th Ave Ne	6163900053	165200	SF Residence on 8th Ave.	1	4	2	62	614	Ballast & Tie	45	No	38.4	Ldn	58.9	64.5	0	0	Non-absorptive	8	38.4	0
18054 8th Ave Ne	6163900050	165150	SF Residence on 8th Ave.	1	4	2	62	651	Ballast & Tie	45	No	47.8	Ldn	58.9	64.5	0	0	Non-absorptive	8	38.3	0
18048 8th Ave Ne	6163900043	165100	SF Residence on 8th Ave.	1	4	2	62	680	Ballast & Tie	45	No	40.6	Ldn	58.9	64.5	0	0	Non-absorptive	8	37.7	0
719 Ne 189th St	3971702316	166550	SF Residence on 189th St.	1	1	2	63	80	Direct Fixation	49.5	Yes	75.0	Ldn	59.6	65.0	0	1	Non-absorptive	16	60.9	1
721 Ne 189th St	3971702315	166400	SF Residence on 189th St.	1	1	2	63	98	Direct Fixation	45	Yes	72.7	Ldn	59.6	65.0	0	1	Non-absorptive	16	58.8	0
18807 8th Ave Ne	3971702311	166375	SF Residence on 8th Ave.	1	1	2	63	168	Direct Fixation	45	Yes	67.7	Ldn	59.6	65.0	0	1	Non-absorptive	15	54.3	0
727 Ne 189th St	3971702310	166450	SF Residence on 189th St.	1	1	2	63	140	Direct Fixation	49.5	Yes	69.4	Ldn	59.6	65.0	0	1	Non-absorptive	15	55.7	0
18559 8th Ave Ne	526049011	166300	SF Residence on 8th Ave.	1	1	2	63	170	Direct Fixation	45	Yes	67.9	Ldn	59.6	65.0	0	1	Non-absorptive	15	54.4	0
18553 8th Ave Ne	526049024	166225	SF Residence on 8th Ave.	1	1	2	63	175	Direct Fixation	45	Yes	65.5	Ldn	59.6	65.0	0	1	Non-absorptive	15	54.1	0
814 Ne 185th St	3235100273	165750	SF Residence on 185th St.	1	2	2	71	460	Ballast & Tie	45	No	43.1	Ldn	65.0	70.2	0	0	Non-absorptive	20	41.1	0
18504 8th Ave Ne	3235100270	165750	SF Residence on 8th Ave.	1	1	2	71	398	Ballast & Tie	45	No	47.5	Ldn	65.0	70.2	0	0	Non-absorptive	20	45.1	0
18510 8th Ave Ne	3235100265	165850	SF Residence on 8th Ave.	1	1	2	68	389	Ballast & Tie	37.8	No	51.4	Ldn	62.9	68.1	0	0	Non-absorptive	20	42.2	0
18516 8th Ave Ne	3235100260	165900	SF Residence on 8th Ave.	1	1	2	65	382	Ballast & Tie	32	No	45.2	Ldn	60.8	66.2	0	0	Non-absorptive	20	40.8	0
18522 8th Ave Ne	3235100255	165975	SF Residence on 8th Ave.	1	1	2	63	380	Ballast & Tie	32	No	45.6	Ldn	59.6	65.0	0	0	Non-absorptive	20	41.0	0
18528 8th Ave Ne	3235100249	166025	SF Residence on 8th Ave.	1	1	2	61	369	Ballast & Tie	35	No	48.5	Ldn	58.4	63.9	0	0	Non-absorptive	20	41.3	0

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18534 8th Ave Ne	3235100244	166075	SF Residence on 8th Ave.	1	1	2	61	354	Ballast & Tie	40.4	No	56.1	Ldn	58.4	63.9	0	0	Non-absorptive	20	46.1	0
18540 8th Ave Ne	3235100240	166150	SF Residence on 8th Ave.	1	1	2	61	338	Ballast & Tie	45	No	56.9	Ldn	58.4	63.9	0	0	Non-absorptive	20	46.4	0
18554 8th Ave Ne	3235100205	166250	SF Residence on 8th Ave.	1	2	2	61	322	Ballast & Tie	45	No	52.4	Ldn	58.4	63.9	0	0	Non-absorptive	16	43.2	0
811 Ne 188th St	3235100210	166275	SF Residence on 188th St.	1	3	2	61	376	Ballast & Tie	45	No	51.8	Ldn	58.4	63.9	0	0	Non-absorptive	16	40.9	0
817 Ne 188th St	3235100215	166275	SF Residence on 188th St.	1	3	2	61	436	Ballast & Tie	45	No	50.9	Ldn	58.4	63.9	0	0	Non-absorptive	16	40.2	0
823 Ne 188th St	3235100220	166275	SF Residence on 188th St.	1	3	2	60	498	Ballast & Tie	45	No	49.8	Ldn	57.8	63.4	0	0	Non-absorptive	16	39.5	0
829 Ne 188th St	3235100224	166175	SF Residence on 188th St.	1	3	2	60	554	Ballast & Tie	45	No	43.9	Ldn	57.8	63.4	0	0	Non-absorptive	16	38.8	0
835 Ne 188th St	3235100230	166300	SF Residence on 188th St.	1	3	2	60	613	Ballast & Tie	45	No	49.5	Ldn	57.8	63.4	0	0	Non-absorptive	16	37.9	0
841 Ne 188th St	3235100235	166300	SF Residence on 188th St.	1	3	2	60	684	Ballast & Tie	45	No	48.3	Ldn	57.8	63.4	0	0	Non-absorptive	16	37.0	0
18810 8th Ave Ne	3235100200	166400	SF Residence on 8th Ave.	1	2	2	64	301	Ballast & Tie	45	No	56.3	Ldn	60.2	65.6	0	0	Non-absorptive	15	43.5	0
18820 8th Ave Ne	3235100105	166550	SF Residence on 8th Ave.	1	2	2	64	284	Ballast & Tie	49.5	No	56.6	Ldn	60.2	65.6	0	0	Non-absorptive	15	43.8	0
811 Ne 189th St	3235100110	166575	SF Residence on 189th St.	1	3	2	61	341	Ballast & Tie	51.6	No	54.1	Ldn	58.4	63.9	0	0	Non-absorptive	15	41.5	0
810 Ne 188th St	3235100195	166400	SF Residence on 188th St.	1	3	2	61	350	Ballast & Tie	45	No	53.8	Ldn	58.4	63.9	0	0	Non-absorptive	15	41.2	0
816 Ne 188th St	3235100190	166400	SF Residence on 188th St.	1	4	2	61	411	Ballast & Tie	45	No	51.5	Ldn	58.4	63.9	0	0	Non-absorptive	15	39.0	0
822 Ne 188th St	3235100185	166400	SF Residence on 188th St.	1	4	2	61	471	Ballast & Tie	45	No	50.6	Ldn	58.4	63.9	0	0	Non-absorptive	15	38.3	0
823 Ne 189th St	3235100120	166575	SF Residence on 188th St.	1	4	2	61	463	Ballast & Tie	51.6	No	50.6	Ldn	58.4	63.9	0	0	Non-absorptive	15	38.4	0
817 Ne 188th St	3235100115	166575	SF Residence on 188th St.	1	4	2	61	404	Ballast & Tie	51.6	No	51.5	Ldn	58.4	63.9	0	0	Non-absorptive	15	39.1	0
728 Ne 189th St	3971702305	166700	SF Residence on 189th St.	1	1	2	63	102	Ballast & Tie	55	No	63.8	Ldn	59.6	65.0	1	0	Non-absorptive	14	52.0	0
18915 8th Ave Ne	3971702210	166800	SF Residence on 8th Ave.	1	1	2	63	93	Ballast & Tie	55	No	66.7	Ldn	59.6	65.0	0	1	Non-absorptive	9	56.5	0
18921 8th Ave Ne	3971702215	166875	SF Residence on 8th Ave.	1	1	2	63	79	Ballast & Tie	55	No	67.6	Ldn	59.6	65.0	0	1	Non-absorptive	11	54.9	0
19011 8th Ave Ne	526049063	167075	SF Residence on 8th Ave.	1	1	2	67	90	Ballast & Tie	55	No	67.4	Ldn	62.2	67.5	1	0	Non-absorptive	11	61.4	0
19031 8th Ave Ne	526049010	167150	SF Residence on 8th Ave.	1	1	2	67	91	Ballast & Tie	55	No	67.1	Ldn	62.2	67.5	1	0	Non-absorptive	11	56.7	0
816 Ne 190th St	526049007	167125	School on 190th St.	1	1	3	65	207	Ballast & Tie	55	No	59.4	Leq	65.8	71.2	0	0	Non-absorptive	11	46.6	0
18920 8th Ave Ne	3235100005	166875	SF Residence on 8th Ave.	1	2	2	62	234	Ballast & Tie	55	No	57.7	Ldn	58.9	64.5	0	0	Non-absorptive	11	44.8	0
18910 8th Ave Ne	3235100100	166750	SF Residence on 8th Ave.	1	2	2	62	224	Ballast & Tie	55	No	58.3	Ldn	58.9	64.5	0	0	Non-absorptive	14	44.8	0

CITY OF SHORELINE NOISE IMPACT TABLE																				
Receiver Information								Impact Analysis									Mitigation			
Street Address	Parcel	Civil Station	Description	# Units	Row	FTA CAT	Existing Ldn (dB)	Near Track Distance(ft)	Track Type	Speed (mph)	Special Track	LRV Noise Level (dB)	Type	Moderate Impact Limit (dB)	Severe Impact Limit (dB)	Moderate Impacts	Severe Impacts	Wall Type	Height Above TOR (ft)	Mitigated LRV Ldn (dB)	Residual Impacts
810 Ne 189th St	3235100095	166725	SF Residence on 189th St.	1	3	2	60	304	Ballast & Tie	55	No	53.8	Ldn	57.8	63.4	0	0	Non-absorptive	14	41.8	0
811 Ne 190th St	3235100010	166900	SF Residence on 190th St.	1	3	2	60	276	Ballast & Tie	55	No	55.5	Ldn	57.8	63.4	0	0	Non-absorptive	11	42.8	0
817 Ne 190th St	3235100015	166900	SF Residence on 190th St.	1	4	2	59	337	Ballast & Tie	55	No	52.6	Ldn	57.2	62.9	0	0	Non-absorptive	11	39.9	0
816 Ne 189th St	3235100090	166750	SF Residence on 189th St.	1	4	2	59	355	Ballast & Tie	55	No	52.3	Ldn	57.2	62.9	0	0	Non-absorptive	14	39.4	0
822 Ne 189th St	3235100085	166725	SF Residence on 189th St.	1	5	2	59	419	Ballast & Tie	55	No	48.6	Ldn	57.2	62.9	0	0	Non-absorptive	14	37.2	0
828 Ne 189th St	3235100080	166750	SF Residence on 189th St.	1	5	2	59	483	Ballast & Tie	55	No	48.7	Ldn	57.2	62.9	0	0	Non-absorptive	14	36.2	0
834 Ne 189th St	3235100075	166750	SF Residence on 189th St.	1	6	2	59	538	Ballast & Tie	55	No	46.2	Ldn	57.2	62.9	0	0	Non-absorptive	14	33.9	0
823 Ne 190th St	3235100020	166900	SF Residence on 190th St.	1	5	2	59	384	Ballast & Tie	55	No	50.1	Ldn	57.2	62.9	0	0	Non-absorptive	14	37.5	0
829 Ne 190th St	3235100025	166925	SF Residence on 190th St.	1	6	2	59	456	Ballast & Tie	55	No	47.5	Ldn	57.2	62.9	0	0	Non-absorptive	11	34.8	0
835 Ne 190th St	3235100030	166950	SF Residence on 190th St.	1	6	2	59	570	Ballast & Tie	55	No	45.8	Ldn	57.2	62.9	0	0	Non-absorptive	11	32.9	0
805 Ne 194th St	5490700080	167925	SF Residence on 194th St.	1	1	2	64	64	Ballast & Tie	55	No	55.4	Ldn	60.2	65.6	0	0	Non-absorptive	36	55.4	0
814 Ne 194th St	5490700075	168050	SF Residence on 194th St.	1	1	2	64	55	Ballast & Tie	55	No	67.9	Ldn	60.2	65.6	0	1	Non-absorptive	37	67.9	1
812 Ne 194th St	5490700070	168100	SF Residence on 194th St.	1	1	2	64	85	Ballast & Tie	55	No	54.2	Ldn	60.2	65.6	0	0	Non-absorptive	37	54.2	0
815 Ne 195th St	5490700010	168225	SF Residence on 194th St.	1	1	2	67	79	Ballast & Tie	55	No	54.5	Ldn	62.2	67.5	0	0	Non-absorptive	32	54.5	0
821 Ne 195th St	5490700015	168250	SF Residence on 194th St.	1	1	2	67	142	Ballast & Tie	55	No	52.1	Ldn	62.2	67.5	0	0	Non-absorptive	32	52.1	0
827 Ne 195th St	5490700020	168275	SF Residence on 194th St.	1	1	2	65	196	Ballast & Tie	55	No	50.8	Ldn	60.8	66.2	0	0	Non-absorptive	32	50.8	0
818 Ne 194th St	5490700065	168100	SF Residence on 194th St.	1	1	2	67	146	Ballast & Tie	55	No	52.0	Ldn	62.2	67.5	0	0	Non-absorptive	37	52.0	0
824 Ne 194th St	5490700060	168125	SF Residence on 194th St.	1	1	2	67	208	Ballast & Tie	55	No	50.5	Ldn	62.2	67.5	0	0	Non-absorptive	31	50.5	0
817 Ne 194th St	5490700085	167900	SF Residence on 194th St.	1	1	2	67	122	Ballast & Tie	55	No	52.8	Ldn	62.2	67.5	0	0	Non-absorptive	31	52.8	0
823 Ne 194th St	5490700090	167975	SF Residence on 194th St.	1	1	2	67	195	Ballast & Tie	55	No	50.8	Ldn	62.2	67.5	0	0	Non-absorptive	36	50.8	0
831 Ne 194th St	5490700095	168025	SF Residence on 194th St.	1	1	2	65	316	Ballast & Tie	55	No	48.8	Ldn	60.8	66.2	0	0	Non-absorptive	36	48.8	0
822 Ne 195th St	3985300331	168425	SF Residence on 195th St.	1	1	2	64	133	Ballast & Tie	55	No	49.8	Ldn	65.6	65.6	0	0	Non-absorptive	34	50.4	0
19605 10th Ave Ne	7805300020	168550	SF Residence on 10th Ave.	1	1	2	64	97	Ballast & Tie	55	No	51.3	Ldn	65.6	65.6	0	0	Non-absorptive	35	51.7	0
19705 10th Ave Ne	7805300030	168650	SF Residence on 10th Ave.	1	1	2	64	44	Ballast & Tie	55	No	56.3	Ldn	65.6	65.6	0	0	Non-absorptive	35	54.9	0
19715 10th Ave Ne	7805300040	168750	SF Residence on 10th Ave.	1	1	2	64	49	Ballast & Tie	55	No	56.2	Ldn	65.6	65.6	0	0	Non-absorptive	36	54.4	0

CITY OF SHORELINE NOISE IMPACT TABLE																				
Receiver Information								Impact Analysis										Mitigation			
Street Address	Parcel	Civil Station	Description	# Units	Row	FTA CAT	Existing Ldn (dB)	Near Track Distance(ft)	Track Type	Speed (mph)	Special Track	LRV Noise Level (dB)	Type	Moderate Impact Limit (dB)	Severe Impact Limit (dB)	Moderate Impacts	Severe Impacts	Wall Type	Height Above TOR (ft)	Mitigated LRV Ldn (dB)	Residual Impacts
19723 10th Ave Ne	7805300050	168900	SF Residence on 10th Ave.	1	1	2	64	70	Ballast & Tie	55	No	56.7	Ldn	65.6	65.6	0	0	Non-absorptive	37	53.0	0
19731 10th Ave Ne	7805300060	169000	SF Residence on 10th Ave.	1	1	2	64	88	Ballast & Tie	55	No	53.5	Ldn	65.6	65.6	0	0	Non-absorptive	38	52.1	0
1000 Ne 198th St	3971700710	169150	SF Residence on 198th St.	1	1	2	64	94	Ballast & Tie	55	No	51.6	Ldn	65.6	65.6	0	0	Non-absorptive	38	51.8	0
1006 Ne 198th St	3971700707	169250	SF Residence on 198th St.	1	1	2	67	122	Ballast & Tie	55	No	50.4	Ldn	67.5	67.5	0	0	Non-absorptive	39	50.8	0
834 Ne 195th St	7805300180	168400	SF Residence on 195th St.	1	1	2	67	132	Ballast & Tie	55	No	49.9	Ldn	67.5	67.5	0	0	Non-absorptive	34	50.4	0
840 Ne 195th St	7805300010	168475	SF Residence on 195th St.	1	1	2	65	207	Ballast & Tie	55	No	47.8	Ldn	66.2	66.2	0	0	Non-absorptive	34	48.6	0
1003 NE 196th	7805300130	168475	SF Residence on 196th St.	1	2	2	64	430	Ballast & Tie	55	No	42.5	Ldn	65.6	65.6	0	0	Non-absorptive	35	42.5	0
19604 10th Ave Ne	7805300140	168600	SF Residence on 10th Ave.	1	2	2	65	255	Ballast & Tie	55	No	44.7	Ldn	66.2	66.2	0	0	Non-absorptive	35	44.7	0
1020 NE 196th	7805300150	168700	SF Residence on 196th St.	1	3	2	64	307	Ballast & Tie	55	No	42.4	Ldn	65.6	65.6	0	0	Non-absorptive	36	42.4	0
1010 Ne 197th St	7805300160	168750	SF Residence on 197th St.	1	1	2	65	171	Ballast & Tie	55	No	49.4	Ldn	66.2	66.2	0	0	Non-absorptive	36	49.4	0
19728 10th Ave Ne	7805300170	168825	SF Residence on 10th Ave.	1	1	2	65	303	Ballast & Tie	55	No	47.0	Ldn	66.2	66.2	0	0	Non-absorptive	37	47.0	0
1036 Ne 197th St	7805300100	168825	SF Residence on 197th St.	1	3	2	65	407	Ballast & Tie	55	No	41.2	Ldn	66.2	66.2	0	0	Non-absorptive	37	41.2	0
19741 10th Ave Ne	7805300070	169025	SF Residence on 10th Ave.	1	2	2	65	232	Ballast & Tie	55	No	44.4	Ldn	66.2	66.2	0	0	Non-absorptive	38	45.1	0
1002 Ne 198th St	3971700705	169175	SF Residence on 198th St.	1	2	2	67	142	Ballast & Tie	55	No	46.8	Ldn	67.5	67.5	0	0	Non-absorptive	39	47.1	0
1010 NE 198th St.	3971700700	169225	SF Residence on 198th St.	1	2	2	65	195	Ballast & Tie	55	No	45.3	Ldn	66.2	66.2	0	0	Non-absorptive	39	45.8	0
1016 NE 198th St.	3971700695	169225	SF Residence on 198th St.	1	3	2	65	272	Ballast & Tie	55	No	41.8	Ldn	66.2	66.2	0	0	Non-absorptive	39	42.9	0
1022 NE 198th	3971700690	169225	SF Residence on 198th St.	1	3	2	65	323	Ballast & Tie	55	No	40.54	Ldn	66.2	66.2	0	0	Non-absorptive	39	42.2	0

APPENDIX B: VIBRATION IMPACT CALCULATIONS SUMMARY

CITY OF SEATTLE VIBRATION IMPACT TABLE											
Receiver Information			Impact Analysis						With Mitigation		
Address	Project Parcel	Civil Station	Track Type	Speed	Horiz Offset (ft)	Depth (ft)	Max 1/3 OB	VdB	Mitigation Type	Max 1/3 OB	VdB
11200 1st Ave Ne	N/A	145475	Elevated	55	83	0	12.5	67.3	None	12.5	67.3
11200 1st Ave Ne	N/A	145475	Elevated	55	83	0	12.5	67.3	None	12.5	67.3
11300 1st Ave Ne	LL100	145475	Elevated	55	61	0	50	68.3	None	50	68.3
11300 1st Ave Ne	LL100	145475	Elevated	55	61	0	50	68.3	None	50	68.3
11300 1st Ave Ne	LL100	145475	Elevated	55	61	0	50	68.3	None	50	68.3
11300 1st Ave Ne	LL100	145475	Elevated	55	49	0	50	70.4	None	50	70.4
11300 1st Ave Ne	LL100	145475	Elevated	55	49	0	50	70.4	None	50	70.4
11300 1st Ave Ne	LL100	145475	Elevated	55	49	0	50	70.4	None	50	70.4
133 Ne 115th St	LL100.1	146075	Ballast & Tie	55	61	0	40	70.2	None	40	70.2
142 Ne 115th St	LL101.1	146275	Ballast & Tie	55	68	0	40	69.4	None	40	69.4
11523 3rd Ave N	LL102.1	146475	Ballast & Tie	55	84	0	40	67.2	Ballast Mat	10	63.9
156 Ne 116th St	LL104	146650	Ballast & Tie	55	45	0	40	72.2	Ballast Mat	40	68.2
11622 3rd Ave Ne	N/A	146825	Ballast & Tie	55	97	0	10	66.3	16 Hz Floating Slab	12.5	66.6
308 Ne 117th St	LL106	146950	Ballast & Tie	55	40	0	40	72.8	16 Hz Floating Slab	10	63.8
11710 3rd Ave Ne	LL108	147075	Ballast & Tie	55	24	0	40	82.0	16 Hz Floating Slab	40	69.6
331 Ne 120th St	LL112	147550	Ballast & Tie	55	53	0	40	71.4	16 Hz Floating Slab	10	64.0
338 Ne 120th St	LL114	147725	Ballast & Tie	55	37	0	40	74.5	16 Hz Floating Slab	10	64.4
344 Ne 120th St	LL114.1	147775	Ballast & Tie	55	87	0	40	65.1	16 Hz Floating Slab	10	63.2
12027 5th Ave Ne	LL116	147900	Ballast & Tie	55	33	0	31.5	80.8	16 Hz Floating Slab	31.5	67.3
12025 5th Ave Ne	LL116.1	147950	Ballast & Tie	55	88	2	31.5	71.5	16 Hz Floating Slab	12.5	62.2
12035 5th Ave Ne	LL117	147975	Ballast & Tie	55	26	1	31.5	81.5	16 Hz Floating Slab	31.5	68.0
500 Ne 124th St	N/A	148750	Ballast & Tie	55	86	0	31.5	71.8	None	31.5	71.8
505 Ne 125th St	LL127	148875	Ballast & Tie	55	95	0	31.5	63.9	None	31.5	63.9
502 Ne 125th St	LL128	149050	Ballast & Tie	55	84	0	31.5	60.3	None	31.5	60.3
12518 5th Ave Ne	LL129	149150	Ballast & Tie	55	82	0	31.5	60.4	None	31.5	60.4
12520 5th Ave Ne	LL130	149175	Ballast & Tie	55	87	0	31.5	60.1	None	31.5	60.1
12528 5th Ave Ne	LL131	149275	Ballast & Tie	55	89	0	31.5	60.0	None	31.5	60.0
503 NE 127th St	LL136	149525	Elevated	55	87	0	40	58.2	None	40	58.2
12708 5th Ave Ne	LL138	149750	Elevated	55	94	0	40	57.3	None	40	57.3
505 Ne 131st Pl	LL145	150500	Elevated	55	83	0	40	58.7	None	40	58.7

CITY OF SHORELINE VIBRATION IMPACT TABLE											
Receiver Information			Impact Analysis						With Mitigation		
Address	Project Parcel	Civil Station	Track Type	Speed	Horiz Offset (ft)	Depth (ft)	Max 1/3 OB	VdB	Mitigation Type	Max 1/3 OB	VdB
321 Ne 149th St	LL161.1	155375	Elevated	49.5	72	0	12.5	72.8	None	12.5	**72.8**
314 Ne 149th St	LL163.1	155575	Elevated	55	93	0	12.5	72.3	None	12.5	**72.3**
307 Ne 151st St	LL164.1	155750	Ballast & Tie	55	87	0	12.5	70.3	None	12.5	70.3
15121 3rd Ave Ne	LL167.1	156100	Ballast & Tie	55	46	0	12.5	68.9	None	12.5	68.9
225 Ne 152nd St	LL168	156200	Ballast & Tie	55	98	0	12.5	69.7	None	12.5	69.7
145 Ne 155th St	LL170	156925	Ballast & Tie	55	67	0	10	61.4	None	10	61.4
110 Ne 155th St	LL171	157225	Ballast & Tie	55	61	0	40	64.0	None	40	64.0
104 Ne 156th St	LL173	157375	Ballast & Tie	55	52	0	10	61.8	None	10	61.8
111 Ne 157th St	LL176.1	157525	Ballast & Tie	55	78	0	10	61.1	None	10	61.1
105 Ne 158th St	N/A	157950	Ballast & Tie	55	90	0	10	60.8	None	10	60.8
104 Ne 158th St	LL177.2	158125	Ballast & Tie	55	92	0	10	60.7	None	10	60.7
105 Ne 159th St	LL177.1	158325	Ballast & Tie	55	65	0	10	61.4	None	10	61.4
129 Ne 163rd St	LL182.1	159325	Ballast & Tie	55	91	28	31.5	57.4	None	31.5	57.4
127 Ne 164th St	LL184	159550	Ballast & Tie	55	57	20	31.5	60.8	Ballast Mat	10	58.7
132 Ne 164th St	LL184.2	159700	Ballast & Tie	55	52	10	63	70.8	Ballast Mat	63	60.8
127 Ne 165th St	LL185	159800	Ballast & Tie	55	49	11	63	71.2	Ballast Mat	63	61.2
126 Ne 165th St	LL186	159950	Ballast & Tie	55	40	9	63	72.7	Ballast Mat	63	62.7
124 Ne 165th Pl	LL187	160050	Ballast & Tie	55	42	16	63	64.4	Ballast Mat	63	54.4
119 Ne 166th St	LL188	160175	Ballast & Tie	55	39	27	63	57.4	Ballast Mat	31.5	48.3
123 Ne 166th St	N/A	160175	Ballast & Tie	55	94	27	63	55.3	Ballast Mat	25	47.2
120 Ne 166th St	LL188.2	160325	Ballast & Tie	55	52	31	63	57.0	Ballast Mat	25	47.4
111 Ne 167th St	LL188.3	160450	Ballast & Tie	55	54	34	63	57.0	Ballast Mat	25	47.2
114 Ne 167th St	LL189	160600	Ballast & Tie	55	16	29	63	60.7	Ballast Mat	40	51.5
118 Ne 167th St	N/A	160600	Ballast & Tie	55	83	33	63	56.1	Ballast Mat	25	47.1
16719 2nd Ave Ne	LL190	160725	Ballast & Tie	55	58	33	63	57.0	Ballast Mat	25	47.2
16723 2nd Ave Ne	LL191	160775	Ballast & Tie	55	55	35	63	57.0	None	63	57.0
16729 2nd Ave Ne	LL192	160850	Ballast & Tie	55	51	34	63	57.0	None	63	57.0
16731 2nd Ave Ne	LL193	160925	Ballast & Tie	55	45	32	63	57.1	None	63	57.1
16735 2nd Ave Ne	LL194	160975	Ballast & Tie	55	38	28	63	57.4	None	63	57.4
16741 2nd Ave Ne	LL195	161050	Ballast & Tie	55	42	17	63	64.4	None	63	64.4
119 Ne 170th St	LL196.1	161125	Ballast & Tie	55	43	17	63	64.3	None	63	64.3
104 Ne 170th St	LL196.3	161300	Ballast & Tie	55	97	20	31.5	59.1	None	31.5	59.1
17010 1st Ave Ne	N/A	161350	Ballast & Tie	55	97	22	63	50.8	None	63	50.8
17016 1st Ave Ne	N/A	161425	Ballast & Tie	55	96	20	63	51.0	None	63	51.0
17022 1st Ave Ne	N/A	161500	Ballast & Tie	55	94	19	63	51.3	None	63	51.3
17028 1st Ave Ne	N/A	161575	Ballast & Tie	55	98	17	63	50.8	None	63	50.8
17034 1st Ave Ne	LL197	161650	Ballast & Tie	55	91	15	25	64.1	None	25	64.1
17040 1st Ave Ne	LL198	161700	Ballast & Tie	55	89	12	25	64.3	None	25	64.3
17052 1st Ave Ne	LL199	161750	Ballast & Tie	55	74	8	25	65.7	None	25	65.7

CITY OF SHORELINE VIBRATION IMPACT TABLE											
Receiver Information			Impact Analysis						With Mitigation		
Address	Project Parcel	Civil Station	Track Type	Speed	Horiz Offset (ft)	Depth (ft)	Max 1/3 OB	VdB	Mitigation Type	Max 1/3 OB	VdB
17046 1st Ave Ne	LL199	161775	Ballast & Tie	55	78	8	25	65.4	None	25	65.4
116 Ne 174th St	LL208	162375	Elevated	55	70	0	12.5	70.9	None	12.5	70.9
17733 2nd Pl Ne	LL212	163075	Elevated	55	78	0	50	67.9	None	50	67.9
17803 3rd Ave Ne	LL218.1	163500	Ballast & Tie	55	63	0	31.5	74.4	Ballast Mat	40	69.9
337 Ne 180th St	LL221.2	163775	Ballast & Tie	55	154	0	25	71.2	None	25	71.2
344 Ne 180th St	LL223.1	164300	Ballast & Tie	55	94	0	31.5	72.2	Ballast Mat	31.5	67.2
18023 5th Ave Ne	LL225	164525	Ballast & Tie	55	63	5	31.5	74.3	Ballast Mat	40	69.8
504 Ne 182nd Ct	LL232	164800	Ballast & Tie	55	85	6	31.5	72.8	Ballast Mat	31.5	67.8
18210 5th Ave Ne	LL233	164850	Ballast & Tie	55	83	7	31.5	72.9	Ballast Mat	31.5	67.9
514 Ne 183rd Ct	LL237	165025	Ballast & Tie	42.9	68	1	31.5	75.5	Ballast Mat	31.5	70.5
520 Ne 183rd Ct	LL238	165300	Ballast & Tie	45	140	0	31.5	71.6	None	31.5	71.6
721 Ne 189th St	LL263.1	166400	Ballast & Tie	45	82	10	31.5	69.8	Ballast Mat	31.5	64.8
719 Ne 189th St	LL264.1	166550	Ballast & Tie	49.5	64	7	31.5	72.3	Ballast Mat	31.5	67.3
18915 8th Ave Ne	LL264.2	166800	Ballast & Tie	55	95	10	31.5	66.4	None	31.5	66.4
18921 8th Ave Ne	LL264.3	166875	Ballast & Tie	55	80	9	31.5	68.2	None	31.5	68.2
19011 8th Ave Ne	N/A	167025	Ballast & Tie	55	91	12	31.5	66.9	None	31.5	66.9
19031 8th Ave Ne	N/A	167100	Ballast & Tie	55	84	18	31.5	67.6	None	31.5	67.6
805 Ne 194th St	N/A	167925	Ballast & Tie	55	65	25	63	61.5	None	63	61.5
814 Ne 194th St	LL267.16	168050	Ballast & Tie	55	56	26	63	62.5	None	63	62.5
812 Ne 194th St	N/A	168100	Ballast & Tie	55	74	27	63	60.4	None	63	60.4
815 Ne 195th St	LL267.1	168225	Ballast & Tie	55	69	26	63	61.1	None	63	61.1
19605 10th Ave Ne	LL268.6	168550	Ballast & Tie	55	97	27	31.5	59.1	Ballast Mat	31.5	54.1
19705 10th Ave Ne	LL268	168625	Ballast & Tie	55	44	25	63	63.8	Ballast Mat	31.5	53.9
19715 10th Ave Ne	LL268.2	168775	Ballast & Tie	55	49	38	63	57.0	Ballast Mat	25	47.3
19723 10th Ave Ne	LL268.5	168925	Ballast & Tie	55	70	41	63	56.6	None	63	56.6
19731 10th Ave Ne	N/A	169000	Ballast & Tie	55	88	42	63	55.4	None	63	55.4
1000 Ne 198th St	LL268.3	169125	Ballast & Tie	55	94	32	63	55.2	None	63	55.2

APPENDIX C: GROUNDBORNE NOISE IMPACT CALCULATIONS SUMMARY

CITY OF SEATTLE GROUNDBORNE NOISE IMPACT TABLE									
Receiver Information			Impact Analysis					With Mitigation	
Address	Project Parcel	Civil Station	Track Type	Speed	Horiz Offset (ft)	Depth (ft)	Groundborne Noise (dBA)	Mitigation Type	Groundborne Noise (dBA)
11200 1st Ave Ne	N/A	1454+75	Elevated	55	83	0	31.4	None	31.4
11200 1st Ave Ne	N/A	1454+75	Elevated	55	83	0	31.4	None	31.4
11300 1st Ave Ne	LL100	1454+75	Elevated	55	61	0	35.8	None	**35.8**
11300 1st Ave Ne	LL100	1454+75	Elevated	55	61	0	35.8	None	**35.8**
11300 1st Ave Ne	LL100	1454+75	Elevated	55	61	0	35.8	None	**35.8**
11300 1st Ave Ne	LL100	1454+75	Elevated	55	49	0	38.4	None	**38.4**
11300 1st Ave Ne	LL100	1454+75	Elevated	55	49	0	38.4	None	**38.4**
11300 1st Ave Ne	LL100	1454+75	Elevated	55	49	0	38.4	None	**38.4**
133 Ne 115th St	LL100.1	1460+75	Ballast & Tie	55	61	0	37.3	None	**37.3**
142 Ne 115th St	LL101.1	1462+75	Ballast & Tie	55	68	0	36.1	None	**36.1**
11523 3rd Ave N	LL102.1	1464+75	Ballast & Tie	55	84	0	37.4	Ballast Mat	29.9
156 Ne 116th St	LL104	1466+50	Ballast & Tie	55	45	0	44.1	Ballast Mat	36.0
11622 3rd Ave Ne	N/A	1468+25	Ballast & Tie	55	97	0	31.2	16 Hz Floating Slab	13.5
308 Ne 117th St	LL106	1469+50	Ballast & Tie	55	40	0	45.0	16 Hz Floating Slab	25.2
11710 3rd Ave Ne	LL108	1470+75	Ballast & Tie	55	24	0	59.4	16 Hz Floating Slab	39.4
331 Ne 120th St	LL112	1475+50	Ballast & Tie	55	53	0	42.6	16 Hz Floating Slab	22.8
338 Ne 120th St	LL114	1477+25	Ballast & Tie	55	37	0	47.4	16 Hz Floating Slab	26.8
344 Ne 120th St	LL114.1	1477+75	Ballast & Tie	55	87	0	34.8	16 Hz Floating Slab	15.7
12027 5th Ave Ne	LL116	1479+00	Ballast & Tie	55	33	0	41.8	16 Hz Floating Slab	26.1
12025 5th Ave Ne	LL116.1	1479+50	Ballast & Tie	55	88	2	31.0	16 Hz Floating Slab	16.4
12035 5th Ave Ne	LL117	1479+75	Ballast & Tie	55	26	1	43.5	16 Hz Floating Slab	27.3
500 Ne 124th St	N/A	1487+50	Ballast & Tie	55	84	0	31.6	None	31.6
505 Ne 125th St	LL127	1488+75	Ballast & Tie	55	95	0	28.0	None	28.0
502 Ne 125th St	LL128	1490+50	Ballast & Tie	55	84	0	24.7	None	24.7
12518 5th Ave Ne	LL129	1491+50	Ballast & Tie	55	82	0	25.0	None	25.0
12520 5th Ave Ne	LL130	1491+75	Ballast & Tie	55	87	0	24.3	None	24.3
12528 5th Ave Ne	LL131	1492+75	Ballast & Tie	55	89	0	24.1	None	24.1
503 NE 127th St	LL136	1495+25	Elevated	55	87	0	21.8	None	21.8
12708 5th Ave Ne	LL138	1497+50	Elevated	55	94	0	20.8	None	20.8
505 Ne 131st Pl	LL145	1505+00	Elevated	55	83	0	22.3	None	22.3

CITY OF SHORELINE GROUNDBORNE NOISE IMPACT TABLE									
Receiver Information			Impact Analysis					With Mitigation	
Address	Project Parcel	Civil Station	Track Type	Speed	Horiz Offset (ft)	Depth (ft)	Groundborne Noise (dBA)	Mitigation Type	Groundborne Noise (dBA)
321 Ne 149th St	LL161.1	1553+75	Elevated	49.5	72	0	21.8	None	21.8
314 Ne 149th St	LL163.1	1555+75	Elevated	55	93	0	17.8	None	17.8
307 Ne 151st St	LL164.1	1557+50	Ballast & Tie	55	87	0	21.9	None	21.9
15121 3rd Ave Ne	LL167.1	1561+00	Ballast & Tie	55	46	0	23.5	None	23.5
225 Ne 152nd St	LL168	1562+00	Ballast & Tie	55	98	0	19.4	None	19.4
145 Ne 155th St	LL170	1569+25	Ballast & Tie	55	67	0	27.5	None	27.5
110 Ne 155th St	LL171	1572+25	Ballast & Tie	55	61	0	34.0	None	34.0
104 Ne 156th St	LL173	1573+75	Ballast & Tie	55	52	0	31.3	None	31.3
111 Ne 157th St	LL176.1	1575+25	Ballast & Tie	55	78	0	25.2	None	25.2
105 Ne 158th St	N/A	1579+50	Ballast & Tie	55	90	0	22.9	None	22.9
104 Ne 158th St	LL177.2	1581+25	Ballast & Tie	55	92	0	22.5	None	22.5
105 Ne 159th St	LL177.1	1583+25	Ballast & Tie	55	65	0	27.9	None	27.9
129 Ne 163rd St	LL182.1	1593+25	Ballast & Tie	55	91	28	28.2	None	28.2
127 Ne 164th St	LL184	1595+50	Ballast & Tie	55	57	20	37.0	Ballast Mat	27.4
132 Ne 164th St	LL184.2	1597+00	Ballast & Tie	55	52	10	43.3	Ballast Mat	33.9
127 Ne 165th St	LL185	1598+00	Ballast & Tie	55	49	11	43.8	Ballast Mat	34.3
126 Ne 165th St	LL186	1599+50	Ballast & Tie	55	40	9	45.6	Ballast Mat	36.1
124 Ne 165th Pl	LL187	1600+50	Ballast & Tie	55	42	16	38.6	Ballast Mat	29.1
119 Ne 166th St	LL188	1601+75	Ballast & Tie	55	39	27	36.5	Ballast Mat	26.7
123 Ne 166th St	N/A	1601+75	Ballast & Tie	55	94	27	31.6	Ballast Mat	21.9
120 Ne 166th St	LL188.2	1603+25	Ballast & Tie	55	52	31	35.4	Ballast Mat	25.6
111 Ne 167th St	LL188.3	1604+50	Ballast & Tie	55	54	34	35.1	Ballast Mat	25.3
114 Ne 167th St	LL189	1606+00	Ballast & Tie	55	16	29	38.6	Ballast Mat	28.8
118 Ne 167th St	N/A	1606+00	Ballast & Tie	55	83	33	32.6	Ballast Mat	22.8
16719 2nd Ave Ne	LL190	1607+25	Ballast & Tie	55	58	33	34.8	Ballast Mat	25.0
16723 2nd Ave Ne	LL191	1607+75	Ballast & Tie	55	55	35	35.0	None	**35.0**
16729 2nd Ave Ne	LL192	1608+50	Ballast & Tie	55	51	34	35.3	None	**35.3**
16731 2nd Ave Ne	LL193	1609+25	Ballast & Tie	55	45	32	35.8	None	**35.8**
16735 2nd Ave Ne	LL194	1609+75	Ballast & Tie	55	38	28	36.6	None	**36.6**
16741 2nd Ave Ne	LL195	1610+50	Ballast & Tie	55	42	17	38.5	None	**38.5**
119 Ne 170th St	LL196.1	1611+25	Ballast & Tie	55	43	17	38.5	None	**38.5**
104 Ne 170th St	LL196.3	1613+00	Ballast & Tie	55	97	20	32.7	None	32.7
17010 1st Ave Ne	N/A	1613+50	Ballast & Tie	55	97	22	26.2	None	26.2
17016 1st Ave Ne	N/A	1614+25	Ballast & Tie	55	96	20	26.3	None	26.3
17022 1st Ave Ne	N/A	1615+00	Ballast & Tie	55	94	19	26.4	None	26.4
17028 1st Ave Ne	N/A	1615+75	Ballast & Tie	55	98	17	26.2	None	26.2
17034 1st Ave Ne	LL197	1616+50	Ballast & Tie	55	91	15	26.1	None	26.1
17040 1st Ave Ne	LL198	1617+00	Ballast & Tie	55	89	12	26.3	None	26.3

CITY OF SHORELINE GROUNDBORNE NOISE IMPACT TABLE									
Receiver Information			Impact Analysis					With Mitigation	
Address	Project Parcel	Civil Station	Track Type	Speed	Horiz Offset (ft)	Depth (ft)	Groundborne Noise (dBA)	Mitigation Type	Groundborne Noise (dBA)
17052 1st Ave Ne	LL199	1617+50	Ballast & Tie	55	74	8	28.4	None	28.4
17046 1st Ave Ne	LL199	1617+75	Ballast & Tie	55	78	8	27.9	None	27.9
116 Ne 174th St	LL208	1623+75	Elevated	55	70	0	34.9	None	34.9
17733 2nd Pl Ne	LL212	1630+75	Elevated	55	78	0	34.4	None	34.4
17803 3rd Ave Ne	LL218.1	1635+00	Ballast & Tie	55	63	0	42.5	Ballast Mat	36.0
337 Ne 180th St	LL221.2	1637+75	Ballast & Tie	55	154	0	31.9	None	31.9
344 Ne 180th St	LL223.1	1643+00	Ballast & Tie	55	94	0	37.7	Ballast Mat	31.7
18023 5th Ave Ne	LL225	1645+25	Ballast & Tie	55	63	5	42.4	Ballast Mat	35.9
504 Ne 182nd Ct	LL232	1648+00	Ballast & Tie	55	85	6	38.9	Ballast Mat	32.8
18210 5th Ave Ne	LL233	1648+50	Ballast & Tie	55	83	7	39.2	Ballast Mat	33.0
514 Ne 183rd Ct	LL237	1650+25	Ballast & Tie	42.9	68	1	40.2	Ballast Mat	33.9
520 Ne 183rd Ct	LL238	1653+00	Ballast & Tie	45	140	0	32.1	None	32.1
721 Ne 189th St	LL263.1	1664+00	Ballast & Tie	45	82	10	33.6	Ballast Mat	26.7
719 Ne 189th St	LL264.1	1665+50	Ballast & Tie	49.5	64	7	37.5	Ballast Mat	30.8
18915 8th Ave Ne	LL264.2	1668+00	Ballast & Tie	55	95	10	32.5	None	32.5
18921 8th Ave Ne	LL264.3	1668+75	Ballast & Tie	55	80	9	34.7	None	34.7
19011 8th Ave Ne	N/A	1670+25	Ballast & Tie	55	91	12	33.1	None	33.1
19031 8th Ave Ne	N/A	1671+00	Ballast & Tie	55	84	18	33.9	None	33.9
805 Ne 194th St	N/A	1679+25	Ballast & Tie	55	65	25	35.3	None	**35.3**
814 Ne 194th St	LL267.16	1680+50	Ballast & Tie	55	56	26	36.2	None	**36.2**
812 Ne 194th St	N/A	1681+00	Ballast & Tie	55	74	27	34.4	None	34.4
815 Ne 195th St	LL267.1	1682+25	Ballast & Tie	55	69	26	34.9	None	34.9
19605 10th Ave Ne	LL268.6	1685+50	Ballast & Tie	55	97	27	32.6	Ballast Mat	23.2
19705 10th Ave Ne	LL268	1686+25	Ballast & Tie	55	44	25	37.8	Ballast Mat	28.2
19715 10th Ave Ne	LL268.2	1687+75	Ballast & Tie	55	49	38	35.3	Ballast Mat	25.5
19723 10th Ave Ne	LL268.5	1689+25	Ballast & Tie	55	70	41	33.5	None	33.5
19731 10th Ave Ne	N/A	1690+00	Ballast & Tie	55	88	42	31.7	None	31.7
1000 Ne 198th St	LL268.3	1691+25	Ballast & Tie	55	94	32	31.5	None	31.5