

# City of Seattle Comments on the West Seattle and Ballard Link Extensions (WSBLE) Project Draft Environmental Impact Statement

*Exhibits 1-3*

*April 28, 2022*

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- Exhibit 2: Event-related curbside loading uses on streets near the Seattle Center campus
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## Exhibit SC-1

### Event uses throughout Seattle Center campus and facilities in a typical year

This exhibit contains records from Seattle Center’s event booking system, intended to show the broad variety of event-related uses produced on Seattle Center property in a typical year. Event activities occur virtually every day of the year, and frequently occur during daytime as well as evening hours.

The comprehensive list includes event days and move-in and move-out days reserved between January 1 - December 31, 2019. We chose a year prior to the COVID-19 pandemic because event business is still in a period of pandemic recovery.

Climate Pledge Arena events are excluded from this list, due to the construction of the Seattle Center Arena Renovation Project which closed KeyArena at the end of 2018. The reopened Climate Pledge Arena has not yet been operating for a full year; however, the Seattle Center Arena Renovation Project Final Environmental Impact Statement (2018) anticipated that the redeveloped Arena would host 242-257 events annually, with seating capacities ranging from approximately 17,300 for hockey games to approximately 18,600 for basketball games, and up to approximately 18,800 for concert configurations. More updated information may be available directly from Climate Pledge Arena for the purposes of FEIS analysis

**City of Seattle**  
Bruce Harrell, Mayor

**Seattle Center**  
Robert Nellams, Director

#### ARTS / VENUES

A/NT Gallery  
Book-It Repertory Theatre  
Classical KING FM  
KCTS 9/Crosscut  
KEXP 90.3 FM  
Pacific Northwest Ballet  
Seattle Children’s Theatre  
Seattle Opera  
Seattle Rep  
Seattle Shakespeare Company  
SIFF Film Center  
TeenTix  
Theatre Puget Sound  
The Vera Project

#### ATTRACTIONS / VENUES

Armory / Food & Event Hall  
Artists at Play Playground & Plaza  
Bill & Melinda Gates Foundation  
Discovery Center  
Chihuly Garden and Glass  
Climate Pledge Arena  
Cornish Playhouse  
International Fountain  
Marion Oliver McCaw Hall  
Museum of Pop Culture (MoPOP)  
Opera Center  
Pacific Science Center  
Seattle Center Monorail  
Seattle Center Skate Plaza  
Seattle Children’s Museum  
Space Needle

#### EDUCATION

Academy of Interactive  
Entertainment  
The Center School  
Cornish College of the Arts

#### PROGRAMS & EVENTS

Artists at the Center  
Bite of Seattle  
Bumbershoot®  
Community Created Events  
Concerts at the Mural  
Festál Cultural Festivals  
Fitness Programs  
Movies at the Mural  
Northwest Folklife Festival  
Seattle International Film Festival  
Seattle/King County Clinic  
Seattle PrideFest  
Winterfest

#### SPORTS

Seattle Kraken (NHL)  
Seattle Storm (WNBA)  
Seattle U Men’s Basketball

Accommodations  
for people with  
disabilities provided  
on request

## Exhibit SC-2

### Event-related curbside loading uses on streets near the Seattle Center campus

More than 14,000 events are produced on the Seattle Center campus in a typical year. Curbside loading is a vital part of the infrastructure needed to support safe and successful event and festival production. These uses will be impacted during WSBLE DT-1 and DT-2 construction, and will require mitigation in coordination with Seattle Center and SDOT.

Seattle Center cooperates with the Seattle Department of Transportation (SDOT) on curbside use reservations according to the terms of the SDOT/Seattle Center Memorandum of Agreement for Event Curbside Management (MOA). The MOA was updated and re-executed in 2021 following the reopening of Climate Pledge Arena.

This exhibit contains a diagram showing the rights-of-way near Seattle Center where event-related vehicle staging occurs in accordance with the MOA. It also contains records of Seattle Center curb use reservations for a full year in 2017, prior to the start of Climate Pledge Arena construction, and for a partial year in 2022, following the update of the SDOT/Seattle Center MOA.

Below are some key takeaways from this data:

- Republican St between 1<sup>st</sup> Ave N & Warren Ave gets used on nearly a daily basis to support KEXP in-studio and Vera Project performers
- Major festivals tend to utilize nearly every available block around campus. Curb use is vital to these Festivals, as it provides spaces to stage production vehicles, performer vehicles, vendor vehicles (which need to be close to facilitate restocking booths during Festival hours), and things like refrigerated trucks/ice trucks. Curb use is critical to support festival production because the pedestrian-oriented Seattle Center campus does not have ample space to facilitate all event-related vehicle needs, nor would it be safe or visually appealing to do so. Festivals include:
  - NW Folklife – Memorial Day weekend in May
  - PrideFest – last weekend in June
  - Bumbershoot – Labor Day weekend in August/September
  - SeaFair TorchLight Parade

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Seattle Rep  
Seattle Shakespeare Company  
SIFF Film Center  
TeenTix  
Theatre Puget Sound  
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- 2<sup>nd</sup> Ave N between Thomas & John Streets is sometimes utilized to create space for trucks to be able to access the Seattle Children's Theater's loading dock to support performances
- Since reopening, Climate Pledge Arena is focusing on keeping trucks and buses out of the Lower Queen Anne/Uptown area. However, major tours that travel with 20+ trucks/buses typically need to utilize a few blocks around campus, often accommodated on 4<sup>th</sup> & Republican, and the east side of 2<sup>nd</sup> Ave between Thomas & John Streets
- The Opera also utilizes 4<sup>th</sup> & Republican to facilitate loading in/out shows throughout its season
- Some blocks around campus are reserved for school bus parking during daytime hours (these are highlighted on the MOA diagram)

**Exhibit SC-3**  
**WSBLE DEIS Noise and Vibration Review Report for**  
**Seattle Center by Landau Associates**



April 20, 2022

Seattle Center  
305 Harrison St  
Seattle, Washington 98109

Attn: Julia Levitt

**Transmitted via email to:** [Julia.Levitt@seattle.gov](mailto:Julia.Levitt@seattle.gov)

**Re: Sound Transit WSBLE DEIS Review**  
**Seattle, Washington**  
**Project No. 2051001.010**

Dear Julia:

Landau Associates Inc. (Landau) has prepared the following summary of our assessment of the noise and vibration sections of the Sound Transit West Seattle and Ballard Link Extensions (WSBLE) Draft Environmental Impact Statement (DEIS).

Seattle Center is a 74-acre public campus owned and managed by the City of Seattle's Seattle Center Department. The campus comprises public recreational space with features such as interactive fountains, displays of public art, and a skate plaza. It also includes numerous highly specialized facilities such as theaters, concert halls, and rehearsal spaces; studios for radio, film, and television production; museums; and special-event venues. Many of these facilities are operated by nonprofit organizations that are tenants of Seattle Center. Seattle Center and its tenants, known as its resident organizations, have raised concerns about noise and vibration from construction and operation of the proposed Sound Transit WSBLE project.

Seattle Center has retained Landau noise and vibration expert consultants to review the WSBLE DEIS and provide comment on the document's accuracy and completeness regarding assessment of noise and vibration impacts.

Following is our review of the WSBLE DEIS as it relates to the potential for noise and vibration impact to Seattle Center facilities and resident organizations. Provided is a summary of findings, a list of documents that were reviewed for this letter, and a detailed review of select chapters of the DEIS.

## **Summary**

Landau finds the assumptions and methods used by Sound Transit to analyze noise and vibration impacts to be reasonably correct. However, Landau finds some elements of the WSBLE DEIS analysis to be incomplete and/or incorrect. These missing or incorrect analysis elements result in an incomplete assessment of noise and vibration impacts and mitigation. The following summarizes our key findings of this review:

- City of Seattle noise limits are not applied in the noise impact section when determining the potential for noise impacts and whether additional mitigation is warranted.
- Edits to the document are required to correct for incorrect noise and vibration limits for some facilities; these corrections will result in higher levels of impact at some sensitive receivers.
- There are missing receptors, including entire resident organizations and sensitive spaces within known resident organizations at Seattle Center as well as at select outdoor venues at Seattle Center.
- The assessment of airborne noise impacts during construction is incomplete.
- An assessment of mitigation measures is required for airborne noise impacts expected at multiple noise-sensitive facilities within Seattle Center as well as at select outdoor venues at Seattle Center.
- Additional assessments of groundborne noise and vibration impacts from construction is warranted to fully address potential impacts from both DT-1 and DT-2.
- Additional assessment of groundborne noise and vibration mitigation measures from construction is warranted to fully address impacts from both DT-1 and DT-2.
- The surface construction vibration impact and mitigation assessment is incomplete.
- Station construction methods for DT-1 include breaking a slurry wall with a hoe ram, a potential major source of groundborne noise and vibration that was not evaluated.
- East Station entrances would be located immediately adjacent to Seattle Rep and Cornish Playhouse; groundborne noise, vibration, and surface noise impacts are not fully evaluated.
- Operational groundborne noise impacts warrant additional mitigation for DT-1 beyond high resilience fasteners and beyond the linear extents identified in the DEIS.

## Review Documents

Landau reviewed the following documents in support of this review letter report:

- Sound Transit and Federal Transit Administration's (FTA's) West Seattle and Ballard Link Extensions Draft Environmental Impact Statement (DEIS), Chapter 4.2.7 *Noise and Vibration* (pp. 4.2.7-1 to 4.2.7-23)
- Sound Transit and FTA's West Seattle and Ballard Link Extensions DEIS, Appendix N.3, *Noise and Vibration Technical Report*
- Sound Transit and FTA's West Seattle and Ballard Link Extensions DEIS, Attachment N.3A, *Noise Measurement Data, Site Details, and Photographs*
- Sound Transit and FTA's West Seattle and Ballard Link Extensions DEIS, Attachment N.3B, *Vibration Measurement Site Photographs*
- Sound Transit and FTA's West Seattle and Ballard Link Extensions DEIS, Attachment N.3C, *Vibration Propagation Measurement Results*
- Sound Transit and FTA's West Seattle and Ballard Link Extensions DEIS, Attachment N.3D, *Maps of Noise Impact Assessment*

- Sound Transit and FTA’s West Seattle and Ballard Link Extensions DEIS, Attachment N.3E, *Maps of Vibration Impact Assessment*
- Sound Transit and FTA’s West Seattle and Ballard Link Extensions DEIS, Attachment N.3F, *Tables of Noise Predictions*
- Sound Transit and FTA’s West Seattle and Ballard Link Extensions DEIS, Attachment N.3G, *Tables of Vibration Predictions*
- Sound Transit and FTA’s West Seattle and Ballard Link Extensions DEIS, Attachment N.3H, *Vibration Analysis of Category 1 Land Uses and Special Buildings*
- FTA’s *Transit Noise and Vibration Impact Assessment Manual*, (September 2018; FTA Guidance Manual)
- Sound Transit’s Design Criteria Manual, Revision 5, Amendment 11, (May 2021).

## Review Format

The following review is focused on chapters within the WSBLE DEIS that are relevant to the assessment of noise and vibration impacts from DT-1 and DT-2. Headings that begin with “Chapter” refer to the corresponding chapter within WSBLE DEIS Appendix N.3, *Noise and Vibration Technical Report*.

## Chapter 3. Noise and Vibration Impact Criteria

The WSBLE DEIS applies the noise and vibration impact criteria established for transit projects according to the FTA Guidance Manual. Sound Transit is a public transit authority that receives federal funding to support its projects. Landau finds the use of the FTA criteria is appropriate for the assessment of noise and vibration impact from this project. However, as detailed below, the FTA noise and vibration limits that were applied to some sensitive receiving spaces were incorrect

WSBLE DEIS Appendix N.3, Chapter 3.1.3 identifies the City of Seattle noise criteria, as established in Seattle Municipal Code (SMC) Chapter 25.08. SMC noise limits are applicable during daytime and nighttime hours for various source and receiving “Districts.” Further, SMC 25.08 includes sound level limits that apply specifically to construction. Landau finds the DEIS interpretation of the City’s noise criteria to be correct.

Landau finds that the assessment does not identify impacts relative to the City’s noise criteria. That is, the assessment is focused only on FTA criteria (that are applicable) and whether construction or operation would meet FTA criteria. The assessment refers to the required compliance with City of Seattle construction noise limits in WSBLE DEIS Appendix N.3, Chapter 7, Construction Noise Mitigation (p. 7-16), but not when evaluating the potential for noise impacts through Seattle Center. Because City of Seattle construction noise limits apply to this project, the noise assessment should consider whether construction noise is expected to meet these limits. If the project cannot meet these limits, sufficient noise mitigation measures should be required; otherwise, alternative construction methods should be explored.

## **Chapter 4. Noise and Vibration Impact Analysis Assumptions and Methods**

WSBLE DEIS Appendix N.3, Chapter 4 summarizes the analysis assumptions and the methods for assessment of noise and vibration impacts. This chapter reviews multiple elements that are considered when predicting noise and vibration emissions from light rail projects and includes results of vibration propagation testing and discusses noise and vibration measurements made by Sound Transit to support the noise and vibration impact assessment. Landau finds the impact analysis assumptions and methods to be reasonably correct.

## **Chapter 6. Impact Assessment**

The following summarizes Landau's review of the WSBLE DEIS impact assessment of DT-1 and DT-2, including airborne noise from construction and groundborne noise and vibration from construction and operation, as received at Seattle Center resident organizations. Included as an Attachment A to this letter is a map of the Seattle Center campus that illustrates the locations of DT-1 and DT-2, including rail alignments, stations, and station entrances, as well as Seattle Center resident organizations, facilities, and outdoor areas.

### **Noise and Vibration Limits**

WSBLE DEIS Appendix N.3, Chapter 6.4 (p. 6-63) indicates that noise and vibration from construction, including tunneling (cutterhead and supply train) and surface construction were evaluated against the same FTA operational noise limits "because this can be a relatively long-term activity." Landau agrees with this determination.

Landau notes that the noise limits provided in WSBLE DEIS Appendix N.3 are generally correct for most resident organizations within the Seattle Center. However, some discrepancies, errors, and omissions were noted. Table 2 of this letter (p. 5) summarizes the noise and vibration limits applied for each space, highlighting discrepancies or errors that require correction or further assessment. The list of noise and vibration limits for Seattle Center resident organizations is compiled from DEIS Appendix N.3 Attachment N.3H Tables 6-2 and 6-3 (McCaw Hall, Pacific NW Ballet, and Seattle Opera), Tables 7-2 and 7-3 (Cornish Playhouse and Seattle Rep), and Tables 8-2 and 8-3 (Vera Project, SIFF Film Center and KEXP). If a different noise or vibration limit was identified in another table within WSBLE DEIS Appendix N.3, it is noted in the center columns of Table 2 of this letter.

### **Noise and Vibration Limits – Discrepancies**

WSBLE DEIS Appendix N.3, Section 6.3, Tables 6-13 and 6-14 identify operational groundborne noise and vibration limits for DT-1 and DT-2, respectively. For some facilities, the operational groundborne noise and vibration limits are expanded to consider different rooms within the facility. These expanded tables are found in WSBLE DEIS Appendix N.3, Attachment N.3H, and include Tables 6-2, 6-3, 7-2, 7-3, 8-2, and 8-3. For example, in Table 6-13 KEXP is identified as "KEXP DJ Booth". In Attachment N.3H, Table 8-2, KEXP spaces include the DJ Booth, Studio, and Mastering Suite.



WSBLE DEIS Appendix N.3, Section 6.4.1, Tables 6-25 and 6-27 identify vibration and groundborne noise limits for construction, respectively.

As noted above, the WSBLE DEIS indicates that groundborne noise and vibration from operation and construction were evaluated against the same FTA criteria. However, in review of groundborne noise and vibration limits provided in the tables identified above, Landau finds that there are discrepancies regarding groundborne noise and vibration limits for some facilities. That is, for some facilities, different groundborne noise and/or vibration limits were applied for construction and operation. For each instance where a discrepancy was found, the operational groundborne noise and vibration limits are correct, and the differing limits in Table 6-25 and/or 6-27 (construction vibration and groundborne noise, respectively) are incorrect. These discrepancies are summarized below in Table 1.

**Table 1. Summary of DEIS Discrepancies, Noise and Vibration Limits**

Resident Organization	DEIS Limits for Operation		DEIS Limits for Construction		Explanation of Discrepancy	
	Noise (dBA)	Vibration (VdB)	Noise (dBA)	Vibration (VdB)	Noise	Vibration
Pacific Northwest Ballet Studios	35 <sup>1</sup>	72 <sup>1</sup>	40 <sup>3</sup>	78 VdB <sup>4</sup>	Construction Limit is 5 dBA above Operation Limit	Construction Limit is 6 VdB above Operation Limit
Vera Project Performance Space	35 <sup>2</sup>	72 <sup>2</sup>	40 <sup>3</sup>	-	Construction Limit is 5 dBA above Operation Limit	n/a
Vera Project Recording Space	30 <sup>1</sup>	72 <sup>1</sup>	40 <sup>3</sup>	-	Construction Limit is 10 dBA above Operation Limit	n/a
SIFF Film Center Theater	35 <sup>1</sup>	72 <sup>1</sup>	40 <sup>3</sup>	-	Construction Limit is 5 dBA above Operation Limit	n/a

<sup>1</sup> Sound Transit WSBLE DEIS Appendix N.3, Tables 6-13 and 6-14  
<sup>2</sup> Sound Transit WSBLE DEIS Appendix N.3, Attachment N.3H, Table 8-2 and 8-3  
<sup>3</sup> Sound Transit WSBLE DEIS Appendix N.3, Tables 6-27  
<sup>4</sup> Sound Transit WSBLE DEIS Appendix N.3, Tables 6-25

As summarized in Table 1, operational vibration and groundborne noise limits for several receivers differ from what is identified in Tables 6-25 and 6-27, respectively, of WSBLE DEIS Appendix N.3. Regarding vibration, the limit identified for the Pacific Northwest Ballet (Phelps Center) is 78 vibration decibels (VdB) in Table 6-27. The correct limit should be 72 VdB, consistent with the limit for this receiver in Tables 6-13 and 6-14 for operational vibration impacts, and consistent with the FTA “Special Building” vibration impact criteria for “theaters” (see DEIS Appendix N.3, Table 3-8).

Regarding groundborne noise, the limits identified for the Pacific Northwest Ballet, Vera Project (performance and recording spaces) and the Seattle International Film Festival (SIFF) Film Center

theater are 40 A-weighted decibels (dBA) in Table 6-27 (tunneling groundborne noise impacts table). These limits are inappropriate for the uses, and the assessment of impact based on these limits is, therefore, incorrect or misleading.

At the SIFF Film Center, correcting the groundborne noise limit to 35 dBA (as identified for light rail operation in Table 6-13) would result in predicted groundborne noise impacts due to supply train operation during tunneling (see DEIS Appendix N.3, Table 6-27). That is, an adjusted limit of 35 dBA would fall below the predicted level of 37 dBA, whereas the incorrect limit of 40 dBA is above the level. Currently, Table 6-27 does not identify impacts at the SIFF Film Center. See the following section and Table 2 for a justification to lower this limit even further to 30 dBA.

### ***Noise and Vibration Limits – Corrections***

Landau notes that adjustments to some limits are warranted following measurements by Landau staff and review of the noise and vibration-sensitive nature of select spaces. That is, for many facilities and resident organizations at Seattle Center, a quiet environment is germane to their use. Noise intrusion, such as low-frequency groundborne noise “rumbling” from nearby surface construction, tunneling, and rail operations, may negatively affect the facility’s use or audience experience. Vibration impacts, even at low levels, can affect a facility’s suspended lighting systems or film projectors.

If an adjustment to a groundborne noise or vibration limit is recommended by Landau, the correct limit is identified in the center two columns of Table 2 (p. 7 of this letter). Justifications for adjusted groundborne noise or vibration limits are included in the final column Table 2 and detailed further in the text following this table.

**Table 2. Summary of Noise and Vibration Limit Corrections**

Resident Organization	Limits for Operation and Construction <sup>1</sup>		Corrections (Source of Adjusted Limits) <sup>2</sup>		Notes Justification for Adjusted Limits
	Noise (dBA)	Vibration (VdB)	Noise (dBA)	Vibration (VdB)	
McCaw Hall Main Hall	25	65	-	-	-
McCaw Hall Lecture Hall	30	72	-	-	-
Exhibition Hall in Pacific Northwest Ballet Basement	30	72	-	-	-
Pacific Northwest Ballet Studios	35	72	-	-	-
Seattle Opera Concert Hall	25	65	-	-	-
Seattle Opera Rehearsal Hall	30	72	-	-	-
Seattle Opera Broadcast Booth (King FM)	25	65	-	-	-
Cornish Playhouse Theater	35	72	-	65 VdB <sup>3</sup>	Vibration limit is appropriate for “Concert Hall” per FTA Guidance Manual. DEIS noise limit appropriate, confirmed through Landau measurements
Seattle Rep Bagley Wright Theater	35	72	-	65 VdB <sup>4</sup>	Vibration limit is appropriate for “Concert Hall” per FTA Guidance Manual. DEIS noise limit appropriate, confirmed through Landau measurements
Seattle Rep Leo K. Theater	35	72	25 dBA <sup>4</sup>	65 VdB <sup>4</sup>	Noise and vibration limits are appropriate for “Concert Hall” per FTA Guidance Manual, confirmed through Landau measurements
Vera Project Performance Space	35	72	-	-	-
Vera Project Recording Space	30	72	-	-	-
SIFF Film Center Theater	35	72	30 dBA <sup>4</sup>	65 VdB <sup>4</sup>	Noise limit is appropriate per Landau and DEIS measurements. Vibration limit is appropriate for “Auditorium” per FTA Guidance Manual, confirmed through Landau measurements
KEXP DJ Booth	25	65	-	-	-
KEXP Studio	25	65	-	-	-
KEXP Mastering Suite	30	72	25 dBA <sup>4</sup>	65 VdB <sup>4</sup>	Noise and vibration limits are appropriate for “Recording Studio” per FTA Guidance Manual, confirmed through Landau measurements

<sup>1</sup> Sound Transit WSBLE DEIS Appendix N.3, Attachment N.3H, Tables 6-2 6-3, 7-2, 7-3, 8-2, and 8-3.

<sup>2</sup> Based on measurements made by Landau staff for Seattle Center in early 2022.

<sup>3</sup> Based on measurements made by Landau staff in 2021 and early 2022 under separate Landau contracts to Seattle Center resident organizations (Seattle Rep, SIFF, and KEXP). Data was shared with Seattle Center with permission of these organizations.

### Cornish Playhouse

At the Cornish Playhouse, vibration measurements at the Main Auditorium by Landau staff in January 2022 indicate that a more appropriate vibration limit is 65 VdB (i.e., not 72 VdB). The adjusted and more stringent vibration limit would be appropriately evaluated under FTA criteria as a “Concert Hall” (similar to McCaw Hall and the Seattle Opera Concert Hall), reducing the potential for vibration impacts at the Main Auditorium including stability of lighting systems and the potential for perceptible groundborne noise during performances.

### Seattle Rep

At the Seattle Rep, measurements at the Leo K. Theater by Landau staff in January 2022 suggest that a more appropriate limit is 25 dBA, aligning with FTA criteria for a “Concert Hall” (similar to McCaw Hall and the Seattle Opera Concert Hall). Although measurements made for the DEIS and documented in WSBLE DEIS Appendix N.3, Attachment N.3H Table 7-1 (p. 7-3) were 30 dBA for the Leo K Theater (which are still 5-dBA lower than what was applied in Tables 6-13 and 6-14), ambient measurements by Landau were 26 dBA and align with the suggested adjustment to a limit of 25 dBA. Further, Landau notes that Seattle Rep’s experience during construction of the Climate Pledge Arena indicates that the Leo K. Theater is highly sensitive to groundborne noise intrusion due to the very low ambient noise levels within the theater and the sensitive use of this space (i.e., unamplified performances).

Similarly, the vibration limit at Seattle Rep is identified as 72 VdB in DEIS Attachment N.3, Tables 6-13 and 6-14. A more appropriate limit for Seattle Rep, including both the Leo K. Theater and Bagley Wright Theater, is 65 VdB, which also aligns with FTA criteria for a “Concert Hall”. In addition to groundborne noise impacts during construction of the Climate Pledge Arena, vibration impacts from this same construction resulted in movement (i.e., swaying) of lighting systems. An adjusted and more stringent vibration limit should apply to the Leo K. Theater and Bagley Wright Theater, reducing the potential for vibration impacts, including stability of lighting systems on these stages.

### SIFF Film Center

At the SIFF Film Center theater, noise levels measured by Landau staff in 2022 were 31 dBA, the same level measured by Sound Transit and documented in the DEIS (see DEIS Appendix N.3, Attachment N.3H, Table 8-1, p 8-4). Based on ambient noise measurements made for the DEIS and by Landau, a noise limit of 30 dBA at the SIFF Film Center would be most appropriate, especially given the low-frequency characteristics of groundborne noise compared with the ambient environment inside the SIFF Film Center. This adjusted noise limit aligns with the FTA criteria for an “Auditorium”.

Ambient measured levels of vibration made by Landau at the SIFF Film Center were well below 65 VdB, which supports the measurement data reported in WSBLE DEIS Appendix N.3, Attachment N.3H, Table 8-1 (i.e., 54 VdB). Applying a limit of 72 VdB (the FTA criteria for an “Auditorium”) is not appropriate; a more appropriate limit for the SIFF Film Center is 65 VdB, which aligns with the FTA criteria for a “Concert Hall”. Landau recognizes that this space is a theater and not a concert hall,

however the SIFF Film Center's projector is highly sensitive to impact from vibration, which can result in film projections that are not stable, negatively impacting the audience experience. Applying a limit of 65 VdB would ensure that the theater's existing ambient environment is maintained for its intended use.

### KEXP

For the KEXP mastering suite, WSBLE DEIS Appendix N.3, Attachment N.3H, Tables 8-2 and 8-3 identify a groundborne noise limit of 30 dBA. This limit is higher than what was identified for the KEXP DJ Booth and Studio (25 dBA), presumably because it was unknown to Sound Transit that the mastering suite is used for audio recording. The suite (now divided as two separate production rooms that include audio recording operations) should be evaluated against the 25-dBA noise limit because it is used for noise-sensitive audio recordings. If adjusted, groundborne noise from light rail operation under the preferred alternative DT-1 would exceed the 25 dBA limit by 10 dBA (see WSBLE DEIS Appendix N.3, Attachment N.3H, Tables 8-2). Note that Landau conducted ambient noise measurements of the existing Production Room 1 (former mastering suite) that confirmed lower ambient noise levels at 27 dBA. A limit of 25 dBA therefore is reasonable for this space.

Similarly, the vibration limit at KEXP's mastering suite is identified as 72 VdB in WSBLE DEIS Attachment N.3, Appendix N.3H, Tables 8-2 and 8-3. A more appropriate limit for the KEXP production rooms (former mastering suite) is 65 VdB, consistent with other spaces within KEXP where audio recording occurs, and consistent with measurements documented in WSBLE DEIS Attachment N.3, Appendix N.3H, Table 8-1, and confirmed by Landau staff in 2021.

### ***Noise and Vibration – Missing Sensitive Receivers***

WSBLE DEIS Appendix N.3 omits several noise-sensitive buildings and uses within the vicinity of the DT-1 and DT-2 cut-and-cover station and alignment routes within Seattle Center. Table 3 of this letter (p. 10) provides a summary of facilities and spaces that are not included in the DEIS but that should be considered for assessment of potential for noise and vibration impacts from DT-1 or DT-2.

**Table 3. DEIS Appendix N.3 Missing Seattle Center Noise and Vibration Sensitive Receivers**

Resident Organization Buildings	Suggested Noise and Vibration Limits <sup>1</sup>		Summary of Use	Potential Source(s) of Noise or Vibration Impact <sup>2</sup>
	Noise (dBA)	Vibration (VdB)		
Seattle Rep Leo K. Rehearsal Space	30	65	Rehearsal space for Leo K. Theater; quiet is germane to use	DT-1 and DT-2 surface construction and tunneling; DT-1 and DT-2 operation
Seattle Rep Poncho Forum	30	72	Rehearsal and performance space; quiet is germane to use	DT-1 and DT-2 surface construction and tunneling; DT-1 and DT-2 operation
KEXP Audio Editing Suites	25	65	Audio editing and recording spaces	DT-1 surface construction and tunneling; DT-1 operation
Museum of Popular Culture (MoPOP)	35	72	Live performances, studios, museum galleries	DT-1 tunneling
Memorial Stadium	40	-	Live outdoor music and sporting events	DT-1 tunneling
Climate Pledge Arena	35	72	Live indoor music and sporting events	DT-1 tunneling
A/NT Art Gallery <sup>3</sup>	35	72	Art gallery where high vibration can impact use	DT-1 surface construction and tunneling
International Fountain Lawn	FTA Category 1 Noise Limits <sup>4</sup>		Recreational Outdoor Use Area	DT-1 surface construction
Theater Commons				DT-2 surface construction
International Plaza				DT-1 surface construction
Fisher Lawn				DT-1 surface construction
Founders Court				DT-1 and DT-2 surface construction
Kreielsheimer Promenade				DT-1 and DT-2 surface construction
Mural Amphitheater				DT-1 surface construction

<sup>1</sup> Suggested limits based on use of space and sensitivities to noise and vibration.

<sup>2</sup> Potential for impact may be due to activities identified in this table and may also include activities not identified here. Full assessment required.

<sup>3</sup> Identified in WSBLE DEIS Chapter 6.2.3.2, p. 6-38: "Cut-and-cover construction of the Seattle Center Station for Preferred Alternative DT-1 would likely result in noise impacts at the Northwest Rooms at Seattle Center, which house several noise-sensitive spaces including ... A/NT Art Gallery." No further assessment of potential impact.

<sup>4</sup> Outdoor use areas at Seattle Center are subject to FTA noise limits for a Category 1 receiver. Applicable noise limits are based on ambient levels; the City of Seattle construction noise limits identified in the Seattle Municipal Code (SMC) Chapter 25.08 also apply.

As identified in Table 3, Landau recommends including several outdoor use areas at the Seattle Center, each considered sensitive outdoor receivers that may be impacted by airborne noise during construction of either DT-1 or DT-2. These spaces are classified as FTA Category 1 noise-sensitive

receivers. FTA defines Category 1 receivers as “Land where quiet is an essential element of its intended purpose. Example land uses include preserved land for serenity and quiet, outdoor amphitheaters and concert pavilions, and national historic landmarks with considerable outdoor use.” The following identifies the outdoor use areas that warrant consideration of impacts from the Sound Transit WSBLE project:

#### International Fountain Lawn

The International Fountain Lawn at Seattle Center is used for events such as Folklife and others and is accessible year-round for public enjoyment of this open space. The International Fountain Lawn is located immediately southwest of the DT-1 construction area and would be impacted by surface construction noise, including high levels of noise during initial phases of demolition and construction for DT-1.

#### Theater Commons

Theater Commons is located between the Seattle Rep and Cornish Playhouse. This area is a gathering space and entrance to Seattle Center during events and daily use. Although the Theater Commons would be inaccessible during construction of DT-1, it may be impacted by DT-2 construction noise.

#### International Plaza

Also known as the Northwest Courtyards, the International Plaza is a hardscape area between the Northwest Rooms and Climate Pledge Arena. Northwest Courtyards will be used by KEXP to host future outdoor performances. This area also includes the historic DuPen Fountain, a popular family recreation spot in the summer, and is used heavily during campus events and festivals. This area is likely to be impacted by DT-1 construction noise.

#### Fisher Lawn

The Fisher Lawn is located south of the International Fountain, north of the Fisher Pavilion. This space is often used for events such as speeches and outdoor concerts. The Fisher Lawn is likely to be impacted by DT-1 construction noise.

#### Founders Court

Founders Court is an open space located between the Cornish Playhouse and Pacific Northwest Ballet (Phelps Center). This area is used for events at Seattle Center and quiet enjoyment by the public. This area may be impacted by DT-1 or DT-2 construction noise.

#### Kreielsheimer Promenade

Kreielsheimer Promenade is an open space located between the Pacific Northwest Ballet (Phelps Center) and McCaw Hall . This area is used for events at Seattle Center and quiet public enjoyment. This area may be impacted by DT-1 or DT-2 construction noise.

### Mural Amphitheater

The Mural Amphitheater is located south of the Fisher Pavilion. In addition to being used for outdoor events such as concerts, the Mural Amphitheater is used to screen outdoor films during evening hours. This area may be impacted by DT-1 construction noise.

## **Chapter 6.2. Construction Noise Impacts**

The construction noise impact assessment (i.e., airborne noise) was completed using the methods described in the FTA Guidance Manual.

### ***Chapter 6.2.1.5 (Tunneling) and 6.2.1.6 (Cut-and-Cover)***

WSBLE DEIS Appendix N.3, Chapter 6.2.1.5 provides a summary of surface-level construction noise that would occur in support of tunneling operations; WSBLE DEIS Appendix N.3, Chapter 6.2.1.6 provides a summary of surface-level construction noise that would occur in support of cut-and-cover station construction.

As identified in WSBLE DEIS Appendix N.3, Table 6-30, the location of the cut-and-cover construction area could be as near as 8 feet from many of the Seattle Center resident organizations, including KEXP, the Vera Project, the SIFF Film Center, the Seattle Rep, and the Cornish Playhouse. Therefore, noise from excavation of the cut-and-cover station, as well as from station entrances, could impact operations at these facilities. Specifically, Table 6-30 identifies potential for impact at the above-listed organizations from DT-1 construction, and from both DT-1 and DT-2 construction at the Seattle Rep.

WSBLE DEIS Appendix N.3, Chapter 6.2.1.5 identifies the use of excavators and backhoes for portal and shaft excavation, and trucks and loaders for transporting spoils. In addition, WSBLE DEIS Appendix N.3, Chapter 6.2.1.5 identifies ventilation fans that “would likely run continuously to provide fresh air to construction crews working inside the tunnel.” For cut-and-cover construction, Chapter 6.2.1.6 identifies haul trucks and vibratory rollers as the loudest sources of construction noise, “over 88 dBA at 50 feet.”

Multiple resident organizations are in close proximity to the cut-and-cover stations (as near as 8 feet, per Table 6-30) and/or station entrances. Specifically, the following summarizes facilities that are closest to the DT-1 or DT-2 stations and East Station entrances:

- **KEXP:** Building is immediately adjacent to DT-1 station construction area
- **Vera Project:** Building is immediately adjacent to DT-1 station construction area
- **SIFF Film Center:** Building is immediately adjacent to DT-1 station construction area
- **Seattle Rep:** Building is immediately adjacent to DT-1 and DT-2 station construction areas, as well as to the East Station Entrance for DT-1 and DT-2
- **Cornish Playhouse:** Building is immediately adjacent to East Station Entrance for DT-1.



Landau finds that the DEIS does not fully evaluate the potential for impact from surface noise construction of stations or station entrances. Specifically, the following activities (i.e., sources of surface construction noise) were either not identified in the DEIS or additional information is required:

#### Tunnel Exhaust Fans

WSBLE DEIS Chapter 6.2.1.5 states that “Ventilation fans would likely run continuously to provide fresh air to construction crews working inside the tunnel.” A similar statement is found in DEIS Chapter 2.6.6, p 2-88 that states “fans could run for 24 hours a day and could be audible at tunnel portals, stations, or access locations.” Further, Chapter 6.2.1.15 states that “Sound levels near the tunnel portals may be over 86 dBA at 50 feet from construction activities.”

The DEIS does not specifically address whether ventilation fans would be required near cut-and-cover station construction or station entrances. Given the high volume of air required to maintain fresh air for construction workers, and the proximity of several resident organizations to the proposed stations and station entrances, additional information is required to fully identify noise impacts from exhaust fans.

#### Truck Haul Routes

DEIS Chapter 2.6.6 (p. 2-88) states “truck hauling would require a loading area, staging space for trucks awaiting loading, and provisions to prevent tracking soil on public streets. Truck haul routes and trucking hours would require approval by the City of Seattle. Surface hauling could occur at night during off-peak traffic periods or could be concentrated during the day to minimize noise in noise-sensitive areas.” Table 7-1 of the FTA Guidance Manual (p. 176) identifies a sound level for haul trucks of 84 dBA at 50 feet.

The DEIS does not include assessment of noise from haul trucks. Noise from haul trucks includes engine idling during loading, travel to and from loading locations, and banging noise when trucks drive over uneven or unsecured surfaces that are often found at and near construction sites. Airborne noise from haul trucks collecting and moving spoils away from the DT-1 or DT-2 stations and station entrance areas, located very near KEXP, SIFF Film Center, Vera Project, Seattle Rep, and Cornish Playhouse, could represent major sources of noise.

As indicated in the DEIS, haul trucks may operate during daytime or nighttime hours, depending on the permitted hours of hauling. Many of the resident organizations include noise-sensitive spaces that operate either 24 hours per day (i.e., KEXP), or during late evening hours (i.e., Vera Project, SIFF Film Center, Seattle Rep, Cornish Playhouse). Therefore, impacts from truck hauling may impact these facilities during most hours of the day or night.

If Mercer Street is used as a primary haul route, additional impacts from hauling should be evaluated at Seattle Center resident organizations located along Mercer Street, including Pacific Northwest

Ballet (Phelps Center), McCaw Hall, Seattle Opera, and King FM. Increased truck traffic along Mercer Street may impact usage of theaters during evening hours, especially at locations such as the Seattle Opera building, which operates the Tagney Jones Hall located at the corner of Mercer Street and 4<sup>th</sup> Avenue North. Impacts to King FM could occur during late night or overnight hours.

### Construction Staging Areas

Noise emissions from construction staging areas were not evaluated in the DEIS. Airborne noise from equipment moving within and to/from staging areas could represent a major source of airborne noise during construction.

Multiple Seattle Center resident organizations are likely to be within close proximity to construction staging areas. Although the locations of the staging areas are yet to be defined, an assessment of noise impact from staging areas should be completed that evaluates equipment within the staging areas and potential routes to/from staging areas.

### Tunneling and Cut-and-Cover Construction Airborne Noise

WSBLE DEIS Appendix N.3, Chapter 6.2 (p. 6-30) identifies construction activities that would produce the highest levels of airborne construction noise and includes tunneling and cut-and-cover station construction, both of which are proposed for preferred alternative at DT-1 and alternative DT-2, and which would occur near KEXP, Vera Project, SIFF Film Center, Seattle Rep, and Cornish Playhouse.

The WSBLE DEIS provides in Appendix N.3, Table 6-8 (p. 6-31) a range of sound levels, referenced to 50 feet, that are anticipated from tunneling and cut-and-cover construction. Sound levels are based on the FTA Guidance Manual. As identified in Table 6-30 (p. 6-70), and as is illustrated in DEIS Drawing B11-ASX102, construction activities could occur as near as 8 feet from the Seattle Center resident organizations identified above. The following table has been prepared to present noise levels from construction as summarized in DEIS Table 6-8, and including sound levels at 8 feet, 15 feet, and 50 feet from construction equipment, based on noise propagation from a stationary source at +6 dBA per halving of distance to the source.

**Table 4. Surface Construction Airborne Noise Equipment and Sound Levels**

Construction Activity <sup>1</sup>	Construction Equipment <sup>1</sup>	Sound Level at 50 feet L <sub>eq</sub> (dBA) <sup>1</sup>	Sound Level at 15 feet L <sub>eq</sub> (dBA) <sup>2</sup>	Sound Level at 8 feet L <sub>eq</sub> (dBA) <sup>2</sup>
<b>Tunneling</b>	Excavators, backhoes, haul trucks, loaders	84 to 86	94 to 96	100 to 102
<b>Cut-and-Cover Station Construction</b>	Excavators, backhoes, haul trucks, loaders, vibratory rollers	84 to 88	96 to 99	102 to 104

<sup>1</sup> Sound Transit WSBLE DEIS Appendix N.3, Table 6-8.  
<sup>2</sup> Calculations by Landau based on 6 dBA per halving of distance to a stationary noise source.  
L<sub>eq</sub> = equivalent sound pressure level

WSBLE DEIS Appendix N.3, Chapter 6.2.3.2, p. 6-38 indicates that cut-and-cover construction of DT-1 “would likely result in airborne construction noise impacts at Northwest Rooms at Seattle Center, which house several noise-sensitive spaces including KEXP, the Vera Project, the SIFF Film Center, and the A/NT Art Gallery. The construction noise would also impact spaces in the north end of the Seattle Center including Seattle Repertory Theatre and Cornish Playhouse.”

For DT-2, the same page of the DEIS states that cut-and-cover construction “could result in noise impacts at the Seattle Repertory Theatre and Cornish Playhouse.” Further, the same page of the DEIS states that “Most of these noise-sensitive spaces are on the perimeter of the building and face Republican Street.”

As noted in the above table, for alternative DT-1, airborne noise levels from tunneling and cut-and-cover station construction could reach up to 104 dBA at the building facade of KEXP, Vera Project, the SIFF Film Center, Seattle Rep, and Cornish Playhouse. The Seattle Municipal Code sound level limits for construction, as correctly noted in WSBLE DEIS Appendix N.3, Table 3-4 (p. 3-7), is 85 dBA for a commercial district noise source affecting a commercial district receiving property, with shorter-duration increases permitted for impact-type equipment. Predicted sound levels from construction therefore could well exceed City of Seattle sound level limits at these facilities when equipment operates within approximately 50 feet of these building facades.

Noise reductions provided by the envelopes of these building (i.e., transmission loss provided by building construction materials) is not identified in the DEIS. Measurements at KEXP, taken by Landau staff, indicate that the north facade of this building provides approximately 61 dBA in reduction of exterior noise (reduction will vary depending on dominant noise frequency of the construction noise source). For sound levels at the exterior facade of 104 dBA, interior levels from exterior construction equipment could be 43 dBA.

The following table summarizes expected increases over ambient noise levels and established limits, based on surface construction noise reaching 43 dBA inside each of these spaces.

**Table 5. Surface Construction Airborne Noise Impacts (DT-1)**

Resident Organization	Distance to Nearest Surface Construction Activity (feet) <sup>1</sup>	DEIS Noise Limit (dBA) <sup>2</sup>	DEIS Measured Ambient Noise Level at Nearest Space (dBA) <sup>3</sup>	Highest Interior Airborne Noise Level from Surface Construction (dBA) <sup>4</sup>	Exceedance of Interior Airborne Noise Level from Surface Construction (dBA)	
					Exceedance of Limit <sup>5</sup>	Exceedance of Ambient Noise Level <sup>5</sup>
<b>KEXP</b>	8	25	29	43	18	14
<b>Vera Project</b>	8	30	24	43	13	19
<b>SIFF Film Center</b>	8	35	31	43	8	12
<b>Seattle Rep</b>	8	35	30	43	8	13
<b>Cornish Playhouse</b>	8	35	25	43	8	18

<sup>1</sup> Sound Transit WSBLE DEIS Appendix N.3, Table 6-30, p. 6-70, applies to most sensitive spaces within each facility.

<sup>2</sup> Sound Transit WSBLE DEIS Appendix N.3, Table 6-13, p. 6-51 (Operational noise and vibration for DT-1, applicable to WSBLE construction).

<sup>3</sup> Sound Transit WSBLE DEIS Appendix N.3, Attachment N.3H, Table 7-1, p. 8-3 and Table 8-1, p. 8-4.

<sup>4</sup> Based on worst-case impact of 104 dBA at 8 feet, assuming 61 dBA reduction to interior spaces. Actual exterior-interior reduction may be lower than 61 dBA (resulting in higher interior levels) and will vary based on sound sources. Actual distance to sensitive spaces inside buildings also may vary, and if farther will result in lower predicted levels.

<sup>5</sup> Based on impact at nearest portion of building. Actual impacts may be higher or lower.

As summarized above in Table 5 and in WSBLE DEIS Appendix N.3, Chapter 6.3, airborne noise from construction could reach up to 18 dBA over applicable interior sound level limits at KEXP, up to 13 dBA over the limit at Vera Project, and up to 8 dBA over limits at Seattle Rep and Cornish Playhouse.

When compared with DEIS-measured ambient noise levels, airborne construction noise could exceed existing conditions by 12 to 19 dBA at the Seattle Center resident organizations identified in Table 5. Actual increases in noise may be higher depending on exterior-interior noise reductions provided by the buildings (i.e., if less than the estimated 61 dBA reduction) and on the actual distance to the most noise-sensitive spaces within each building. Regardless, these data suggest that airborne construction noise impacts will occur, and that mitigation will be required at each of these spaces during surface construction related to tunneling and the cut-and-cover station.

It is noted in WSBLE DEIS Appendix N.3, Chapter 6.2.3.2, p. 6-38 that “the loudest construction phase is expected to be near the beginning of construction during the cutting and removal of the existing street, which would likely include the use of impact equipment such as jackhammers or hoe rams.” Landau notes that during other phases construction noise levels may be lower. However, the estimates of impact provided in Table 4 are based on the DEIS estimates of excavators, backhoes, haul trucks, loaders, and vibratory rollers. Therefore, if the estimates do not represent the highest noise that could occur from jackhammers and hoe rams, actual noise impacts may, at the initial phases, be higher than is estimated in Table 5.

Landau notes that the noise limits provided in WSBLE DEIS Appendix N.3, Table 6-27 are based on the same limits applied for operational groundborne noise (as noted above). However, as noted on p. 8 of this letter, the limits applied for the Seattle Rep are unprotective, as documented by measurements taken by Landau staff in support of this review. An adjusted limit of 25 dBA would result in noise levels 23 dBA over the impact limit (i.e., predicted level of 48 dBA over limit of 25 dBA), higher still from impact-type equipment.

For DT-2, the location of the cut-and-cover excavation area would be approximately 130 feet from the Seattle Rep. Construction of the DT-2 East Station entrance would occur as near as approximately 60 feet to the west of Seattle Rep. WSBLE DEIS Appendix N.3 does not provide an assessment of airborne noise impacts from surface construction related to DT-2, as received at the Seattle Rep from construction of the East Station entrance or the area of excavation.

### Impact Noise

As indicated above, the loudest construction phase would likely include the use of impact equipment such as jackhammers or hoe rams. WSBLE DEIS Appendix N.3, Chapter 3.1.3 correctly summarizes the City of Seattle construction criteria. Specifically, this section notes that impact noises, such as those noises generated by jackhammers and hoe rams, is limited to the daytime hours of 8 a.m. to 5 p.m. weekdays and 9 a.m. to 5 p.m. weekends. The Final Environmental Impact Statement (FEIS) and subsequent construction management plans should include consideration of timing restrictions for these types of impact noises.

### **Chapter 6.3. Operational Vibration Impacts**

The operational vibration section of WSBLE DEIS Appendix N.3 includes predicted impacts from both vibration and groundborne noise during operation of the proposed DT-1 and DT-2 alternatives. WSBLE DEIS Appendix N.3, Tables 6-13 (p. 6-51) and 6-14 (p. 6-53) identify operational groundborne noise and vibration impacts for DT-1 and DT-2, respectively.

Landau finds that additional information and/or corrections are required to evaluate completely the potential for operational vibration and groundborne noise impacts to Seattle Center facilities and resident organizations. The following summarizes these findings:

## ***Groundborne Noise Limits***

### Seattle Rep, Leo K. Theater

As summarized in Table 2 of this letter and described further on p. 8, the groundborne noise limit for the Seattle Rep Leo K. Theater is not protective enough and should be adjusted to 25 dBA, identified as the FTA Special Buildings limit for a “Concert Hall” (i.e., not based on the 35 dBA limit for a theater). Correcting the limit at the Leo K. Theater would result in a greater groundborne noise impact (23 dBA over limit) for operation of DT-1. Further, for operation of DT-2, correcting the limit would result in a groundborne noise impact (i.e., 3 dBA over limit of 25 dBA).

### Seattle Rep, Bagley Wright Theater

WSBLE DEIS Appendix N.3, Attachment N.3H, Table 7-3 identifies groundborne noise levels from DT-2 that are higher at the Leo K Theater (28 dBA) than at the Bagley Wright Theater (19 dBA). The Bagley Wright Theater is substantially closer to DT-2 than the Leo K. Theater, and it would stand to reason that predicted groundborne noise levels at the Bagley Wright Theater would be higher under DT-2. The potential for impact at the Bagley Wright Theater should be re-evaluated to confirm whether impacts are predicted for this space under DT-2.

### SIFF Film Center

As summarized in Table 2 of this letter and described further on p. 8, the groundborne noise limit for the SIFF Film Center should be 30 dBA, not 35 dBA. This limit would be similar to “Auditoriums” per FTA definition (see WSBLE DEIS Appendix N.3, Table 3-8, p. 3-10). Further, the limit would be protective of the potential for low-frequency groundborne noise impacts during film screenings, including patron experience and stability of the film projector.

### KEXP

As summarized in Table 2 of this letter and described further on p. 9, the groundborne noise limit at the KEXP mastering suite should be adjusted to 25 dBA because this space (currently Production Rooms 1 and 2) is used for audio recording. After adjustment, groundborne noise from light rail operation under the preferred alternative DT-1 is predicted to exceed the limit by 10 dBA (see WSBLE DEIS Appendix N.3, Attachment N.3H, Tables 8-2).

## ***Train Speed***

As summarized in WSBLE DEIS Appendix N.3, Table 6-13 (p. 6-51) and 6-14 (p. 6-53), light rail train speeds were assessed as part of the calculation of groundborne noise and vibration. It is noted that there are inconsistencies or potential errors that warrant further clarification.

For preferred alternative DT-1, the train speed through the Seattle Center campus is identified in Table 6-13 as 45 miles per hour (mph) near all noise-sensitive receivers *except* at KEXP, where speeds

are predicted at 55 mph, and at the Seattle Rep and Vera Project where speeds are predicted at 30 mph. Appendix N.3 of the WSBLE DEIS does not provide an explanation for the discrepancy in rail speeds. It is understood that rail speeds would slow when trains are arriving at the station and would increase when trains are departing. However, the discrepancies in rail speeds suggests there may be calculation errors that are relative to the speed of train along the rail alignment. For example, at SIFF the DT-1 speed in Table 6-13 is 45 mph, but at Seattle Rep and Vera Project the speed is 30 mph. These facilities are all in close proximity to each other and one would expect the rail speeds to be similar for each, if not identical.

At KEXP, the predicted DT-1 rail speed is 55 mph, however KEXP building would be located adjacent to the station where trains would be moving at slow speeds or stopped, and not likely to be traveling 55 mph.

Given the above, additional clarification and analysis is needed to ensure that train speed calculations are correct, and that resulting operational groundborne noise impacts from rail operations are correct.

As summarized in Table 6-14, for the DT-2 alternative, the train speed through the Seattle Center campus is 45 mph at all receivers except at the KEXP DJ booth where it is predicted at 30 mph. Although impacts are not anticipated at KEXP from DJ2, the discrepancy in train speeds suggests that additional analysis may be warranted to ensure that the effect of rail speed has been adequately addressed.

## **Chapter 6.4 Construction Vibration Impacts**

Construction-related vibration impacts, including groundborne noise, are predicted to occur from tunneling (Chapter 6.4.1) and surface construction (Chapter 6.4.2).

### ***Chapter 6.4.1 Tunneling Vibration Impacts***

During tunneling, the DEIS predicts that vibration impacts would occur only at KEXP during supply train operation (i.e., predicted vibration level of 69 VdB exceeding limit of 65 VdB), and that vibration impacts would not occur at other resident organizations during tunneling. The following summarizes adjustments in vibration and groundborne noise limits, as identified earlier in this letter (see Table 2), that would result in additional or greater impacts to sensitive spaces within Seattle Center.

#### Seattle Rep

As identified on p. 8 of this letter, Landau recommends adjusting the vibration limit for Seattle Rep to 65 VdB from 72 VdB for both the Leo K. Theater and Bagley Wright Theater. WSBLE DEIS Appendix N.3, Chapter 6.4.1, Table 6-25 identifies a predicted supply train level of 67 VdB at the Seattle Rep. Adjusting the limit at Seattle Rep would result in a predicted vibration level that is 2 VdB over the 65 VdB limit at the Seattle Rep during unmitigated use of the supply train with alternative DT-1.

Regarding groundborne noise, Landau recommends adjusting the groundborne noise limit at Seattle Rep to 25 dBA (see Table 2). This would result in groundborne noise impacts from both cutterhead and supply train operation that exceed what is predicted in WSBLE DEIS Appendix N.3, Chapter 6.4.2, Table 6-27. For example, unmitigated supply train groundborne noise at Seattle Rep is predicted to be 40 dBA, which would exceed the adjusted limit of 25 dBA by 15 dBA and would be clearly discernable and disruptive.

#### SIFF Film Center

WSBLE DEIS Appendix N.3, Chapter Table 6-25 identifies a predicted supply train level of 65 VdB at the SIFF Film Center, with a limit of 72 VdB. Adjusting the vibration limit to 65 VdB for the SIFF Film Center (as recommended on p. 8 of this letter) would result in supply train levels that just meet this limit. While this does not constitute an impact, Landau predicts that continued exposure to years of vibration from unmitigated supply trains at 65 VdB (the recommended vibration limit for the SIFF Film Center), could result in an impact to the SIFF Film Center. This is based on the SIFF Film Center having previously experienced vibration impacts to its main screening room projector due to vibration from nearby construction.

Regarding groundborne noise, Landau recommends adjusting the groundborne noise limit at the SIFF Film Center to 30 dBA from 35 dBA. This would result in groundborne noise impacts from both cutterhead and supply train operation; currently the WSBLE DEIS Appendix N.3, Chapter 6.4.2, Table 6-27 predicts no impacts at the SIFF Film Center during tunneling. Adjusting the groundborne noise limit would warrant a review of mitigation measures to shield the SIFF Film Center from groundborne noise impacts.

#### Vera Project

At the Vera Project, an adjusted groundborne noise limit in WSBLE DEIS Appendix N.3, Chapter 6.4.2, Table 6-27 would result in a higher degree of impact than is predicted for DT-1. Currently, Table 6-27 indicates levels of up to 44 dBA from unmitigated supply train operation, a 4-dBA increase over the incorrect 40-dBA limit that is identified in this table. Correcting the groundborne noise limit at Vera Project to 30 dBA (as applied in the DEIS for light rail operation) would result in a noise level that is 14 dBA over the limit. A 14-dBA impact at Vera Project emphasizes the need for mitigation during supply train operation.

#### KEXP

At KEXP, WSBLE DEIS Attachment N.3, Appendix N.3H Tables 8-2 and 8-3 identify a vibration limit of 72 VdB for the mastering suite. As identified on p. 9 of this letter, the limit should be adjusted to 65 VdB to be consistent with other audio recording spaces within KEXP, and consistent with the FTA criteria for a "Recording Studio." Adjusting the vibration limit of the KEXP mastering suite (currently Production Rooms 1 and 2) would not change the conclusions in Table 6-25 (impact at KEXP due to supply train use for DT-1) based on predicted impacts to the DJ Booth and studio (live performance



space). However, applying the adjusted vibration limit for the KEXP mastering suite would ensure that migration efforts are equally protective for all vibration-sensitive spaces within KEXP.

Similar to vibration, adjusting the groundborne noise limit for the KEXP mastering suite would not change results identified in Table 6-27 regarding impacts at KEXP, but it would ensure that migration efforts are equally protective for all groundborne noise-sensitive spaces within KEXP.

### ***Tunneling Equipment***

WSBLE DEIS Appendix N.3, Section 6.4.1.2 and Table 6-26 (p. 6-66) identify equipment that would generate the highest levels of vibration during tunneling, including the boring machine cutterhead, thrust-jack retraction, and supply trains with steel wheels and jointed tracks.

In the footnote of Table 6-27 (p. 6-67), the WSBLE DEIS states “The predicted levels for the thrust-jack are more than 5 dB below the impact threshold for all sensitive receivers.” Groundborne noise predictions for thrust jack retraction is not provided in the WSBLE DEIS. However, Table 6-26 (p. 6-66) provides a range of sound levels of 13 to 29 dBA, as measured between 0 and 200 feet from thrust-jack operation. The range in sound levels for supply trains with steel wheels and jointed tracks is 24 to 28 dBA. While the median level of groundborne noise for supply trains is clearly higher than for thrust jack retraction, there is a potential for thrust jack retraction to generate groundborne noise levels that are as high as supply trains, according to the data provided in Table 6-26. The potential for groundborne noise impact is further increased when the limits for Seattle Rep, SIFF Film Center, Vera Project, and KEXP are adjusted (i.e., lowered).

A more detailed assessment should be provided that further evaluates the potential for groundborne noise and vibration impact from thrust jack retraction.

### ***Chapter 6.4.2. Surface Construction Vibration Impacts***

WSBLE DEIS Appendix N.3, Table 6-29, p. 6-70, identifies distances for impact to Special Buildings during surface construction. The minimum distance for the least sensitive spaces (i.e., V.C.-A) is greater than would be realized at KEXP, Vera Project, SIFF Film Center, Seattle Rep and Cornish Playhouse for the equipment identified in this table. For example, the minimum distance for potential impact to a bulldozer under the V.C.-A curve is 125 feet, and the nearest distance to Special Buildings located near surface construction areas (KEXP, The Vera Project, SIFF Film Center, Seattle Rep, and Cornish Playhouse) is 8 feet, as documented in WSBLE DEIS Appendix N.3, Table 6-29.

WSBLE DEIS Appendix N.3, Chapter 6.4.2.2, p. 6-70 states that “Surface construction vibration has not been assessed for Category 1 or special-use buildings near tunnel alignments, However, vibration from surface construction may be of concern if these buildings are close to the tunnel portals or station construction. These activities should be assessed in the Construction Vibration Control Plan”

Given the degree of impact that may occur from surface vibration during construction (see Tables 6-29 and 6-30), and given the need to understand if effective mitigation to these impacts is feasible, a

more detailed assessment of the potential impacts and proposed mitigation should be included in a supplemental DEIS study, in lieu of only requiring future assessments through a control plan. Specifically, for cut-and-cover station excavation, in addition to the potential for usage impacts to tenants of the Northwest Rooms, an additional assessment should be completed that determines the potential for structural damage to KEXP, Vera Project, SIFF Film Center, Seattle Rep and Cornish Playhouse.

#### Slurry Wall Demolition

The south wall of the DT-1 station design includes a diagonal portion that would extend underneath the Northwest Rooms, including underneath KEXP, Vera Project, and the SIFF Film Center. A profile view of the station is presented WSBLE DEIS Appendix J, Drawing B11-ASX102. Landau understands through ongoing workshops hosted by Sound Transit, that the southern wall of the DT-1 station would be constructed first as a vertical slurry wall, and then widened below grade, toward the south, to provide sufficient space for a station platform. Further, Landau understands that construction methods to expand the station footprint include breaking large portions of the slurry wall with a hoe ram.

The WSBLE DEIS does not include a review of impacts that is specific to the breaking of the slurry wall. However, demolition of this wall would occur very near Seattle Center resident organizations including KEXP, Vera Project, SIFF Film Center, and Seattle Rep. It is anticipated that high levels of vibration would be emitted during this process, and these were not considered or included in the DEIS. Given the high levels of vibration from this activity, the likely lengthy construction schedule, and the many potentially impacted facilities that are sensitive to groundborne noise and vibration impact, there is a high potential for substantial impacts during this phase of construction.

In addition to the use of a hoe ram, excavation of materials behind the slurry wall and directly underneath the Northwest Rooms may result in additional vibration and groundborne noise impacts to these receivers.

#### Station Entrances

The WSBLE DEIS provides very minimal information on the potential for noise and vibration impact from construction of the station entrances. Specifically, for DT-1 the proposed East Station Entrance would be located directly between the Seattle Rep and Cornish Playhouse. Construction of this station entrance would likely require demolition of existing structures and surfaces, excavation and hauling of materials, reinforcement of station walls, and construction of the station itself. Vibration and groundborne noise impacts are likely to be experienced at both Seattle Rep and Cornish Playhouse.

As identified on p. 8 of this letter, Landau recommends adjusting the vibration limits for the Seattle Rep and Cornish Playhouse to 65 VdB from 72 VdB. Adjusting the limits to 65 VdB would be protective of these facilities during surface construction of the East Station Entrance given the low levels of

ambient vibration at both facilities (see ambient vibration measurement data in WSBLE DEIS Appendix N.3, Attachment N.3H, Table 7-1, and verified by Landau measurements in January 2022).

Given the very close proximity of the DT-1 East Station Entrance to the Seattle Rep and Cornish Playhouse, and the proximity of Seattle Rep to the DT-2 East Station Entrance, as well as the recommended adjustments of vibration limits for Seattle Rep and Cornish Playhouse, an assessment of station entrance construction should be completed to determine the potential for impacts. In addition, an assessment should be completed of the potential for structural damage to these buildings.

## **Chapter 7. Noise and Vibration Mitigation Measures**

### **Chapter 7.2. Construction Noise Mitigation**

DEIS Appendix N.3, Chapter 7.2 (p. 7-16) identifies standard mitigation measures for construction noise. The following summarizes mitigation measures that were not included but should be considered:

#### ***General Construction Equipment***

Loud construction equipment operating within the cut-and-cover construction area could operate as near as 8 feet from many Seattle Center facilities and resident organizations including KEXP, Vera Project, SIFF Film Center, Seattle Rep, and Cornish Playhouse. As summarized in this letter in Table 4, estimated sound levels at some buildings could reach 104 dBA and could reach up to 43 dBA at interior spaces, potentially impacting noise-sensitive uses such as performances and recording operations at several facilities (see Table 5 of this letter).

Mitigation measures summarized in the WSBLE DEIS are effective strategies to reduce airborne construction noise but do not specifically target the potential for impacts.

Mitigation measures should include an emphasis on administrative controls, scheduling the noisiest activities during times that would be less likely to interfere with noise-sensitive operations. This will require coordination with Seattle Center and multiple resident organizations.

Noise barriers could be installed at locations where airborne noise impacts are predicted or anticipated, and where this is sufficient room to build a wall that is long and tall enough to be effective. Noise barriers should be required as part of the project's Construction Noise Control Plan, and should be considered for:

- The north wall of the Northwest Rooms, shielding KEXP, Vera Project, and SIFF Film Center
- The south and east walls of Seattle Rep, shielding from station and East Entrance construction
- The west wall of Cornish Playhouse, shielding from East Entrance construction
- The north end of the International Fountain Lawn

- The Northwest Rooms breezeway between KEXP and Vera Project, shielding the International Plaza.

### ***Tunnel ventilation fans***

Ventilation fans will be required to provide fresh air to crew within the tunnel and could operate 24-hours per day. The location of the fans is not yet defined but could be located very near to several noise-sensitive resident organizations. Due to the low-frequency noise generated by such fans, mitigation may be required to ensure fan noise does not result in impacts to interior performance and recording spaces.

Potential mitigation measures could include quieter fan models, strategic placement of fans, silencers, barriers, or other measures. Further, the EIS should include specific language within the Construction Noise Control Plan regarding exhaust fan noise.

### ***Haul trucks***

Noise from idling and movement of haul trucks during construction, as well as noises from driving over uneven or unsecured surfaces, may result in impacts at noise-sensitive spaces along routes accessing DT-1 or DT-2. Haul truck routes are not yet defined however an assessment should be completed to determine if mitigation of noise from haul trucks is warranted.

Further, the EIS should include specific language within the Construction Noise and Vibration Control Plan regarding permitted haul routes that minimize the potential for impact.

Landau anticipates that Mercer Street would likely serve as a primary haul route for either DT-1 or DT-2. If so, the nearest noise-sensitive space along this route with the greatest potential for haul truck impacts is the Seattle Opera Tagney Jones Hall, located at the corner of Mercer Street and 4th Avenue N. Additional impacts may occur at Seattle Rep, Pacific Northwest Ballet, and King FM. A study should be completed to identify the number of trucks per hour during various construction phases, and what the predicted impacts may be to these resident organizations and what mitigation measures are warranted (e.g., limited hauling hours, limited trucks per hour).

### ***Staging Areas***

Mitigation of staging area noise should be included in an updated noise impact assessment. Mitigation measures could include strategic location of staging areas to minimize impact from noise emissions related to staging areas, noise barriers, and other measures as defined under WSBLE DEIS Appendix N.3, Chapter 7.2.

## **Chapter 7.3. Operational Vibration Mitigation**

WSBLE DEIS Appendix N.3, Chapter 7.3.2.2 (p. 7-26) provides DT-1 operational groundborne noise and vibration mitigation measures that would mitigate impacts at “recording studios and performance

spaces in Seattle Center” (Chapter 7.3.2.2., p. 7-26). Included are high resilience fasteners along 900 feet of new track between construction alignment stations 79+00 and 88+00.

The FTA Guidance Manual, in Table 6-11 (p. 140) states that high resilience fasteners can achieve 5-dB of reduction in groundborne noise from tracks at frequencies above 40 hertz (Hz). As stated in WSBLE DEIS Appendix N.3, Attachment N.3H, Chapter 8.4, p. 8-20, “Because Sound Transit expects at least 5 decibels of reduction from the tunnel structure that is not included in the prediction model, no additional mitigation measures beyond high-resilience fasteners are proposed.”

If the above Sound Transit expectation is true, groundborne noise impacts from DT-1 operation would be mitigated only for KEXP and Vera Project, but not for the SIFF Film Center and Seattle Rep. As noted in this review, Landau recommends that for both SIFF and Seattle Rep, the groundborne noise limits be adjusted to a lower level that is more protective of the uses within these spaces (see Table 2). The result would be DT-1 operational groundborne noise that exceeds the limits at the SIFF Film Center and Seattle Rep by 15 dBA and 23 dBA, respectively. Accounting for an assumed 5-dBA reduction from high resilience fasteners and an additional 5-dBA reduction from the structure itself, the SIFF Film Center and Seattle Rep would experience increases of 5 dBA and 18 dBA above their respective limits. Therefore, because impacts would occur even with high resilience fasteners, Landau recommends that a higher degree of mitigation be considered, such as a floating slab or thicker tunnel materials.

For DT-2, WSBLE DEIS Appendix N.3, Attachment N.3H, Table 7-3 indicates that impacts may occur at the Seattle Rep Leo K. Theater when applying the adjusted groundborne noise limit identified in Table 2 of this letter (i.e., predicted level is 28 dBA; the proposed limit is 25 dBA). Further, as identified in this letter, there may be errors in the calculation of impact at the Bagley Wright Theater that result in predicted groundborne noise impacts at this space from DT-2. Sound Transit should confirm whether impacts are predicted, and the degree to which these impacts might occur. Once confirmed, a reassessment of DT-2 operational mitigation should be completed.

## **Chapter 7.4. Construction Vibration Mitigation**

### ***Chapter 7.4.1 Potential Surface Construction Vibration Mitigation***

WSBLE DEIS Appendix N.3, Chapter 7.4.1 (p. 7-31) identifies surface vibration mitigation measures that include pre-construction surveys, construction timing, equipment locations, continuous vibration monitoring, and alternative construction methods. The following summarizes mitigation measures that are not included or that require additional detail:

#### Construction Vibration Control Plan

As noted in Chapter 6.4.2.2, p. 6-70, “Surface construction vibration has not been assessed for Category 1 or special-use buildings near tunnel alignments. However, vibration from surface

construction may be of concern if these buildings are close to the tunnel portals or station construction. These activities should be assessed in the Construction Vibration Control Plan.”

Construction vibration measures should be updated once a more detailed assessment of surface vibration measures is completed to support a Construction Vibration Control Plan. Given the high potential for surface vibration impact during construction, mitigation of surface vibration will be critical to KEXP, Vera Project, SIFF Film Center, Seattle Rep, and Cornish Playhouse.

#### Slurry Wall Demolition

As indicated, the DEIS does not include detailed assessment of the potential for vibration impacts from demolition of the slurry wall underneath the Northwest Rooms. It is expected that both vibration and groundborne noise impacts would occur at KEXP, Vera Project, and the SIFF Film Center as a result of the slurry wall demolition, and therefore mitigation measures should be clearly evaluated and provided in the Construction Vibration Control Plan.

#### ***Chapter 7.4.2 Potential Tunneling Vibration Mitigation***

DEIS Appendix N.3, Chapter 7.4.2 (p. 7-32) identifies mitigation measures to reduce the potential for vibration and groundborne noise impact during tunneling. The following summarize key elements of this review:

#### Supply Train

Details provided in DEIS Appendix N.3, Chapter 7.4.2 are focused on mitigating vibration from the supply train, including reduced supply train speeds, smooth running surfaces, reduced gaps between rail sections, adding rubber pad between ties, and using rubber tires on supply trains.

As noted, DEIS Appendix N.3, Table 6-27 (p. 6-67) summarizes impacts from construction that states unmitigated supply trains could result in groundborne noise levels inside multiple noise-sensitive spaces that are up to 44 dBA (Vera Project), and exceeding applicable noise limits by up to 17 dBA (KEXP). In addition to the mitigating effects of measures identified above, the DEIS Appendix N.3, Chapter 7.4.2, p. 7-32 suggests that rubber tires on supply trains could provide effective mitigation of vibration and groundborne noise at frequencies above 10 Hz.

Given the high level of impact that may occur due to the supply train at multiple noise-sensitive Seattle Center facilities and resident organizations, and that predictive modeling has not been completed to fully evaluate the mitigating effect of rubber tires on supply trains, the Construction Vibration Control Plan should be supported by a detailed assessment of rubber tires on supply trains. The assessment should demonstrate that impacts to each of these spaces are effectively mitigated to below ambient levels.

### Thrust Jack

As indicated, mitigation of vibration from thrust jacks may be warranted through slower retraction of the jacks. This assessment should be completed once a more detailed assessment of the potential for impact from this activity is completed. If necessary, mitigation measures should be included the Construction Vibration Control Plan.

### Cutterhead

As stated in the DEIS Appendix N.3, Chapter 7.4.2, p. 7-32, it is not possible to mitigate vibration from the tunneling cutterhead. However, as stated, mitigation can be achieved through vibration monitoring and coordination with organization identified as Category 1 and special use buildings. For DT-1, the list of organizations should include MoPOP, Seattle Opera, King FM, McCaw Hall, Pacific Northwest Ballet, Exhibition Hall, Cornish Playhouse, Seattle Rep, SIFF Film Center, Vera Project, and KEXP. For DT-2 the list should include Seattle Opera, King FM, McCaw Hall, Pacific Northwest Ballet, Exhibition Hall, Cornish Playhouse, and Seattle Rep. The FEIS and Construction Vibration Control Plan should specify locations/receivers to be monitored, including the number of monitors and duration of monitoring, as well as the established thresholds above which action is to be taken. Also, the Plan should include clear direction for the General Contractor to coordinate with each of the noise-sensitive resident organizations to provide sufficient advance notice to allow noise-sensitive events to be scheduled accordingly.

## **Refinement Designs Presented to Public**

In April 2022, Sound Transit publicly presented early studies of potential design refinements to the WSBLE DEIS. A copy of slides from Sound Transit's April 2022 presentation is included as an Attachment to this letter. The refinements include an alternative double-canted concept design for the DT-1 station, a refinement that moves the DT-1 station further west, and a mix-and-match alternative that incorporates elements of the alignments of both DT-1 and DT-2. Further study of these refinements will be contingent upon direction from the Sound Transit Board. The following summarizes Landau's initial assessment of these alternative designs:

### **DT-1 Station Double-Canted Concept**

The double-canted design would negate the need to demolish a slurry wall underneath the Northwest Rooms by constructing the station walls with canted augered piles. The piles, driven at angles underneath the Northwest Rooms to the south, and the Expo Apartment building to the north, would form the walls of the station itself.

This station design would eliminate the need for demolishing a slurry wall underneath the Northwest Rooms. The potential for groundborne noise impacts remains, but likely at much lower levels than would occur during demolition of a slurry wall.

Airborne noise impacts would be anticipated when augers remove soils from the auger bits by shaking (a repetitive banging sound). The impact noise from augering would be limited to between 8 a.m. and 5 p.m. on weekdays, and between 9 a.m. and 5 p.m. on weekends, but could occur for up to 12 months.

As assessment of groundborne noise, vibration, and airborne noise would be required to fully evaluate whether additional mitigation measures are warranted for this alternative station design.

### **Moving Station DT-1 to West**

Under this alternative, the location of the DT-1 station would be located between approximately Queen Anne Avenue and just west of 1<sup>st</sup> Avenue North (i.e., adjacent to the SIFF Uptown Cinema). Moving the station away from the Seattle Center, including the noise-sensitive spaces within the Northwest Rooms, as well as Seattle Rep, Cornish Playhouse, and others, would reduce the potential for impacts at these spaces and limit impacts to tunneling and operation. A full assessment of impacts would be required for Seattle Center noise-sensitive spaces to confirm impacts and mitigation requirements, but generally the expected degree of noise and vibration impacts is lower than what is presented in the WSBLE DEIS DT-1.

Under this alternative, noise and vibration impacts would occur near the SIFF Uptown Cinema and other sensitive receiving locations (mainly residential). While the SIFF Uptown Cinema is not located on the Seattle Center campus, it is directly tied to the SIFF Film Center, and so impacts under this alternative design are critical to the SIFF Film Center. Based on Sound Transit's presentation, noise and vibration impacts from the DT-1 station located further west would also include assessment of a much larger cut-and-cover footprint.

As assessment of groundborne noise, vibration, and airborne noise would be required to fully evaluate whether additional mitigation measures are warranted for this alternative design.

### **Mix and Match SLU-Harrison Station to Seattle Center-Mercer Station**

The Mix and Match alternative would connect DT-1 to DT-2 by tunneling underneath McCaw Hall and portions of the Seattle Opera and Pacific Northwest Ballet. The depth of the connecting tunnel underneath McCaw Hall is not known but it is expected to be within the approximate range of DT-1 and DT-2 alignments in this area.

Impacts from the Mix and Match design are anticipated to occur due to both construction and operation. Further, noise and vibration impacts are expected to be greater than was predicted in the DEIS for alternatives DT-1 or DT-2 for the Seattle Opera, McCaw Hall, and Pacific Northwest Ballet. Construction impacts from tunneling would occur from cutterhead and supply train operations directly underneath these facilities, and it is very likely that rubber-tired supply trains and/or additional mitigation measures would be required to ensure continued impacts do not occur during tunneling, where groundborne noise limits are 25 dBA.



Operational impacts also are expected along the Mix and Match route. An assessment would need to be completed to determine the extent of these impacts. Mitigation required to bring operational noise and vibration impacts below the limits for Seattle Opera, McCaw Hall, and Pacific Northwest Ballet would likely include measures beyond what is currently proposed for WSBLE DEIS for DT-1 or DT-2 at Seattle Center, such as floating slabs and thicker tunnel walls.

LANDAU ASSOCIATES, INC.



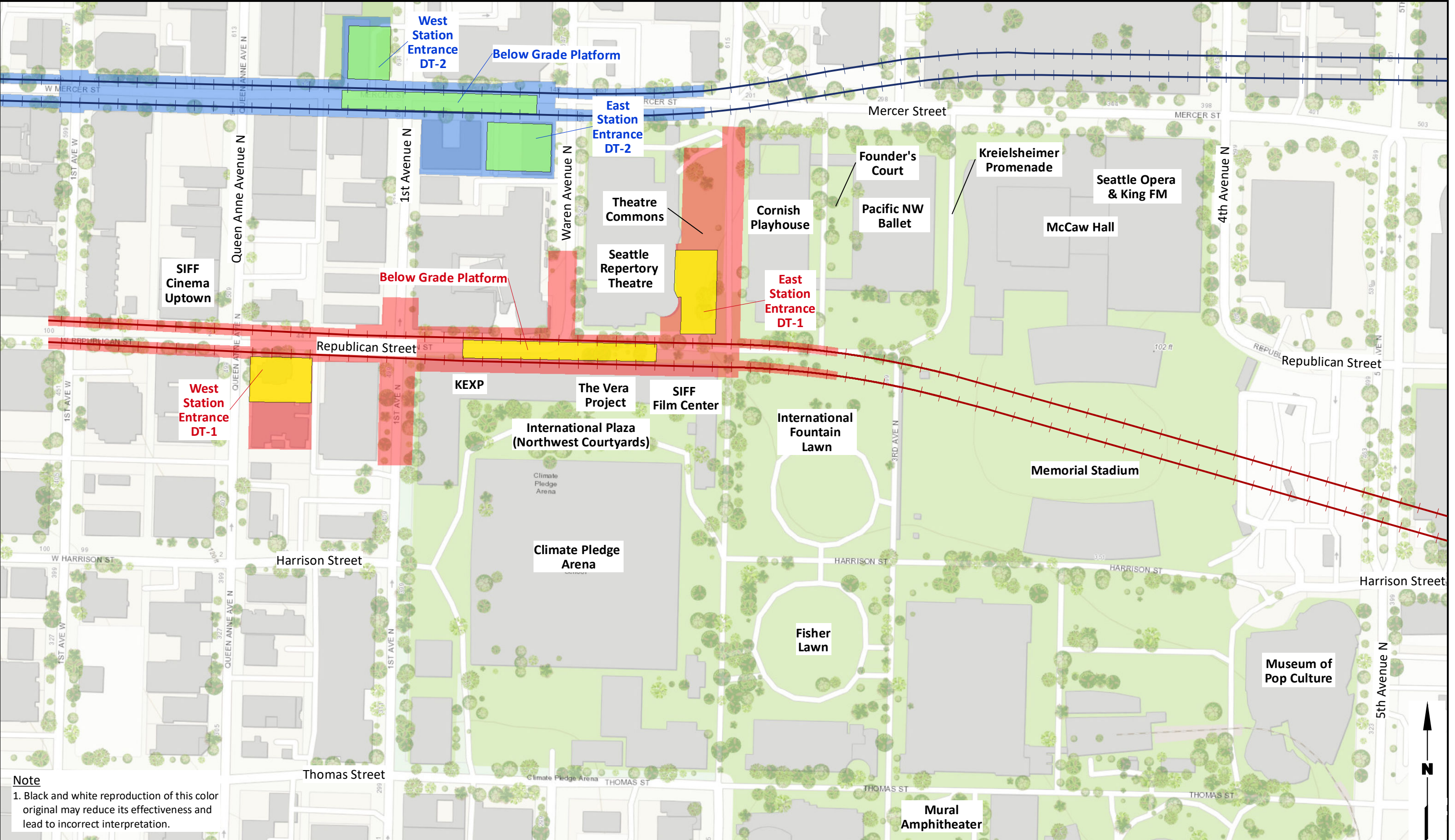
Kevin Warner  
Principal, Permitting and Compliance

## **Attachments**

Figure 1. Overview Map

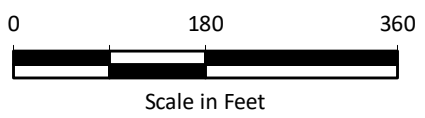
Figure 2. West Seattle and Ballard Link Extensions PowerPoint Presentation (Sound Transit, 4/8/2022)

G:\Projects\2051\001\OverviewMap.mxd 4/21/2022 | ezick



**Note**  
 1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

- Legend**
- DT-1 Tracks
  - DT-2 Tracks
  - DT-1 Platform and Stations
  - DT-2 Platform and Stations
  - DT-1 Construction Areas
  - DT-2 Construction Areas



Basemap source: Esri, 2022. Sound Transit. HTNB.

Sound Transit WSBLE DEIS  
 Seattle Center  
 Seattle, Washington

**Overview Map**

Figure  
**1**

# *West Seattle and Ballard Link Extensions*

*Seattle Center Organizations  
4/8/2022*



# *Agenda*

- Grounding and Brief Check-in (15 min)
- Seattle Center Station: Potential refinement concepts (10 min)
- City of Seattle response (10 min)
- Q&A and Discussion (45 min)
- Next Steps in the Process (15 min)

# Seattle Center organizations engagement

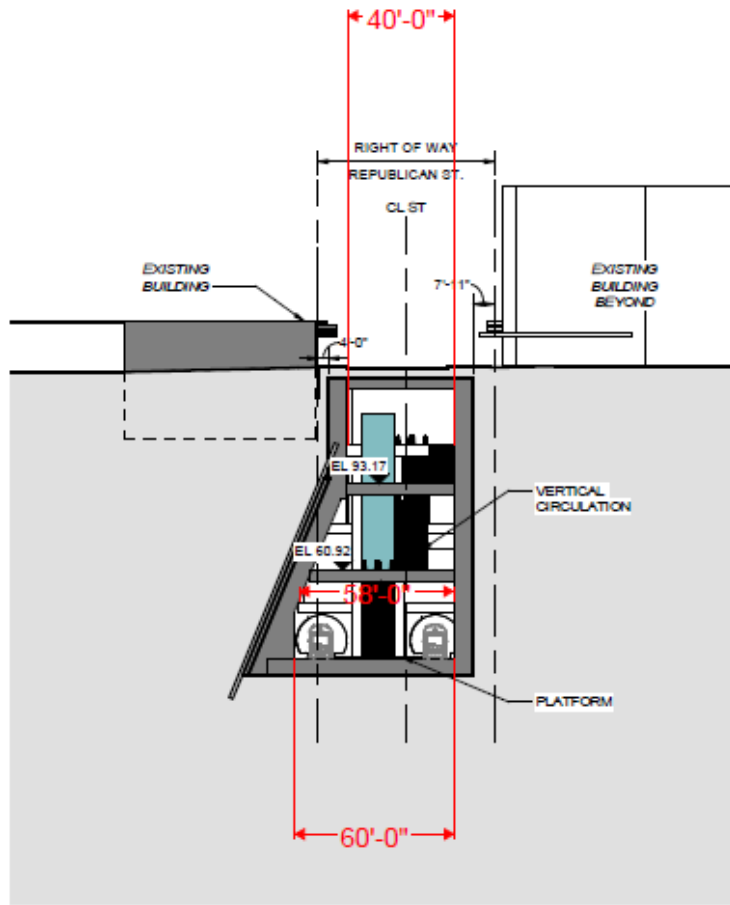
## Pre & Post Draft EIS publication

Date	Briefing/ Workshop
Jun 22	Seattle Center Advocacy Committee briefing
Oct 1	WSBLE Workshop: Noise & Vibration
Nov 18	Seattle Center/Uptown Station Design Charrette
<i>Draft EIS published January 28, 2022</i>	
Feb 16	Workshop: Draft EIS Results Overview & Station Planning
Mar 18	Workshop: Draft EIS Deep Dive – Construction focus
Apr 8	Workshop: Reflections and Potential Refinements

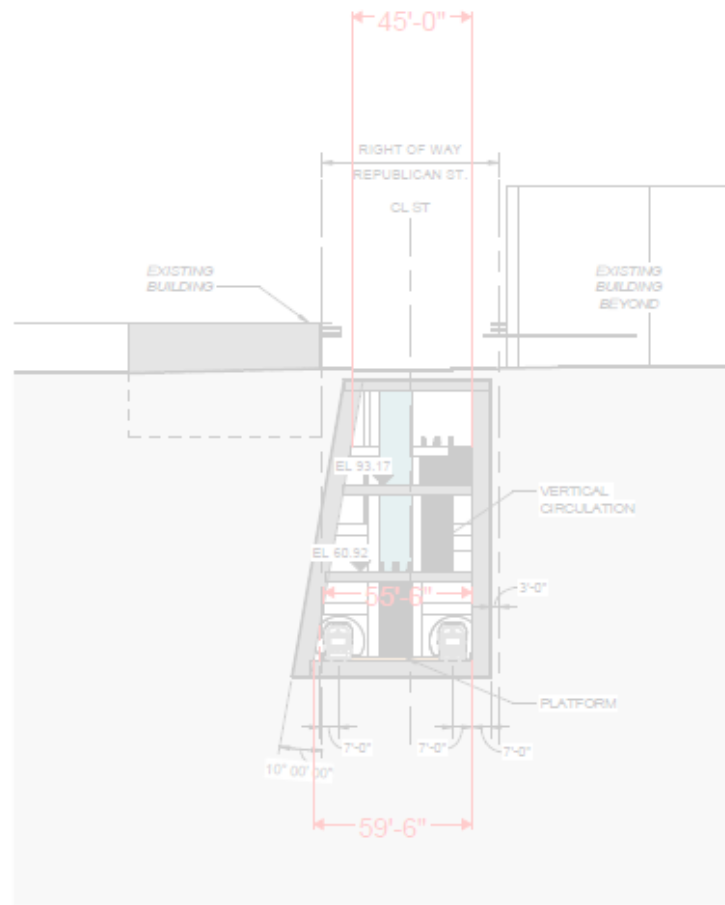


***Seattle Center Station:  
Potential refinement  
concepts***

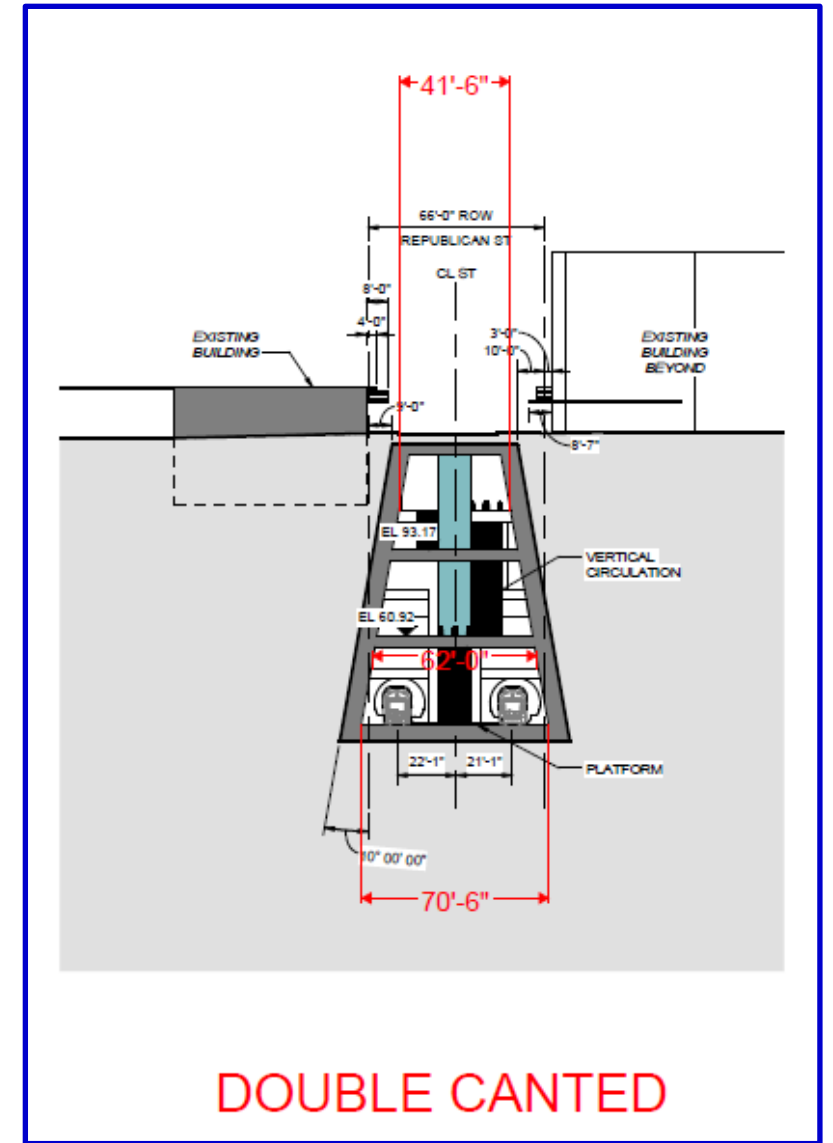
# Refined design – new double canted concept



DEIS



SINGLE CANTED



DOUBLE CANTED



# c *Shift Seattle Center (Republican) station west*





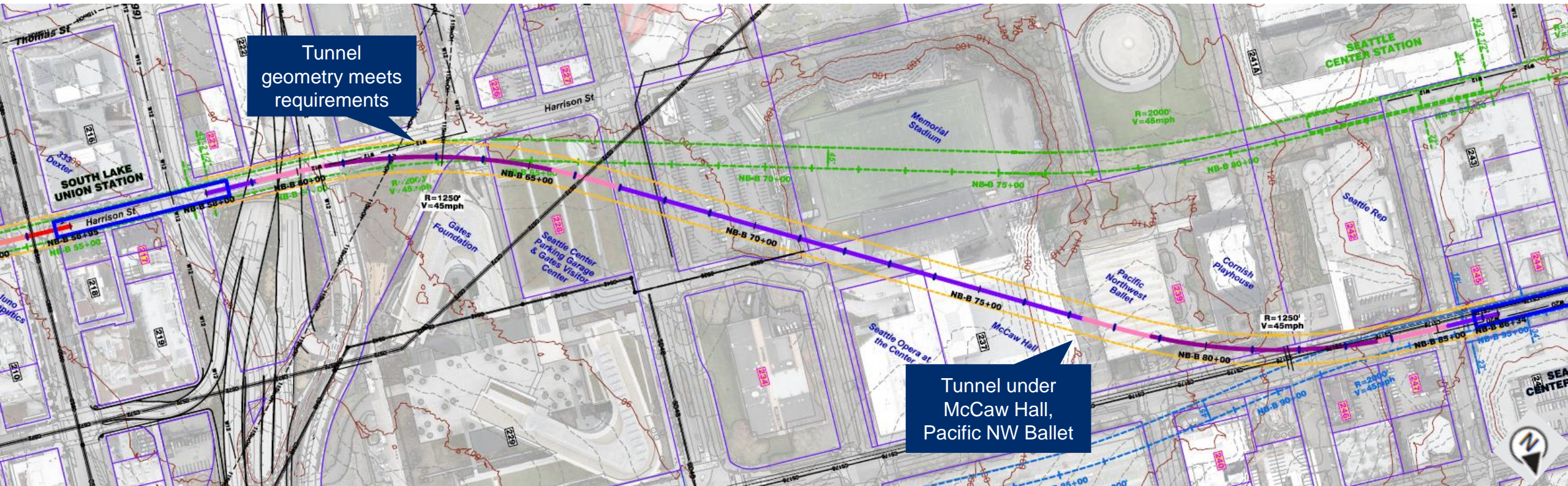
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# Connect South Lake Union (Harrison) to Seattle Center (Mercer)



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# Connect South Lake Union (Harrison) to Seattle Center (Mercer)



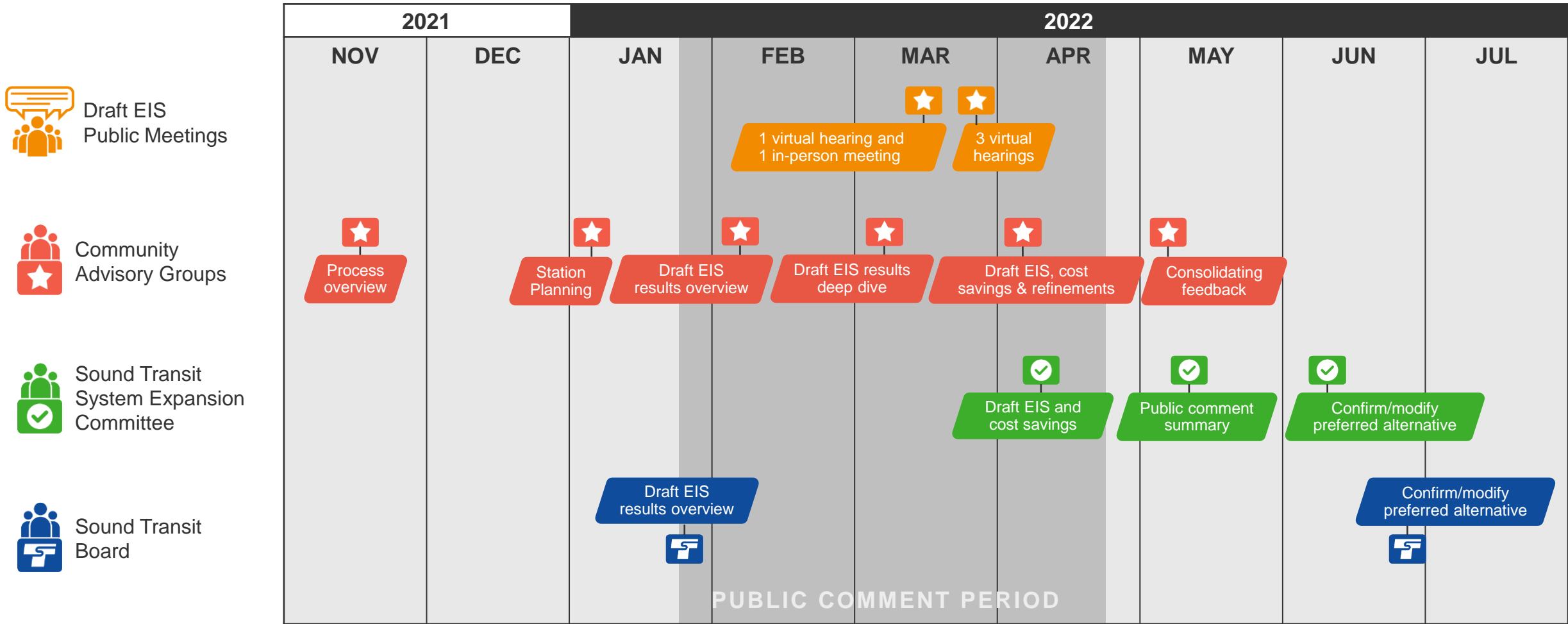
# *City of Seattle Response*

# ***Q&A and Discussion***

***Next steps of the process***

# Community engagement and collaboration

## Draft Environmental Impact Statement (EIS)





# What happens after you comment?



## Comments

Public comments shared with Sound Transit Board.

*May 2022*



## Board action

Sound Transit Board confirms or modifies the preferred alternative.

*June 2022*



## Final EIS

Sound Transit staff prepares the Final EIS, which responds to comments received on the Draft EIS.

*Mid 2022 - 2023*



## Board action

Sound Transit Board selects the project to be built.

*Late 2023*

 *wsblink.participate.online*

 **SOUNDTRANSIT**

