### West Seattle and Ballard Link Extensions

Seattle Design Commission Briefing:

Interbay-Ballard Stations and Guideway Structures

March 17, 2022

**SOUNDTRANSIT** 



## Agenda

- Welcome and introductions
- Project orientation
- Guideway structures and bridges
- Smith Cove Station
- Ballard Station

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# West Seattle and Ballard Link Extensions Project timeline







2016



## PLANNING



2017-2019

Alternatives development

- Feb-March 2018: Early scoping
- Feb-April 2019: Scoping
- May-Oct 2019: Board identified preferred alternatives and other DEIS alternatives

2019-2023

**Environmental review** 

**Early 2022: Publish Draft EIS** 

Public comment period

Board confirms or modifies preferred alternatives

2023: Publish Final EIS

Board selects projects to be built

Federal Record of Decision



#### **Ballard < 2037-2039**\* **Interbay** Lake 2037 **Seattle South Center Lake Union** Smith Cove Denny **Link** light rail Westlake West Seattle and Ballard Midtown **Link Extensions** Preferred alternatives Preferred alternatives with Int'l District/ Puget third-party funding Sound Chinatown Other Draft FIS alternatives Stadium Route profiles Flevated route Tunnel route Surface route SODO 🕹 Delridge Junction **Marian**

#### Draft EIS alternatives

#### What we're studying in this phase

- Preferred Alternatives
- Preferred Alternatives with Third-Party Funding
- Other Draft EIS alternatives

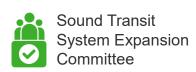
\*Dates reflect an affordable schedule based on current financial projections and cost estimates, and a target schedule.



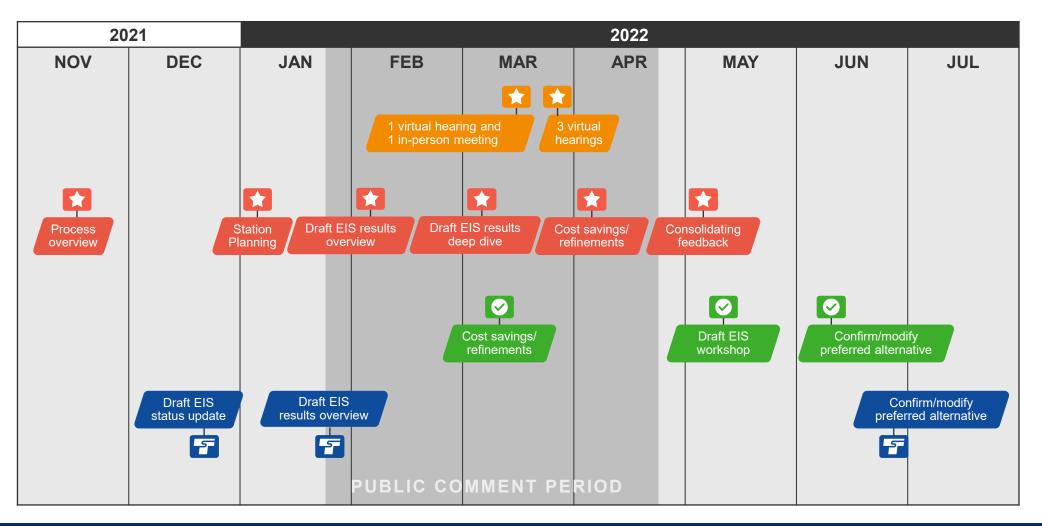
### Community engagement and collaboration Draft Environmental Impact Statement (EIS)





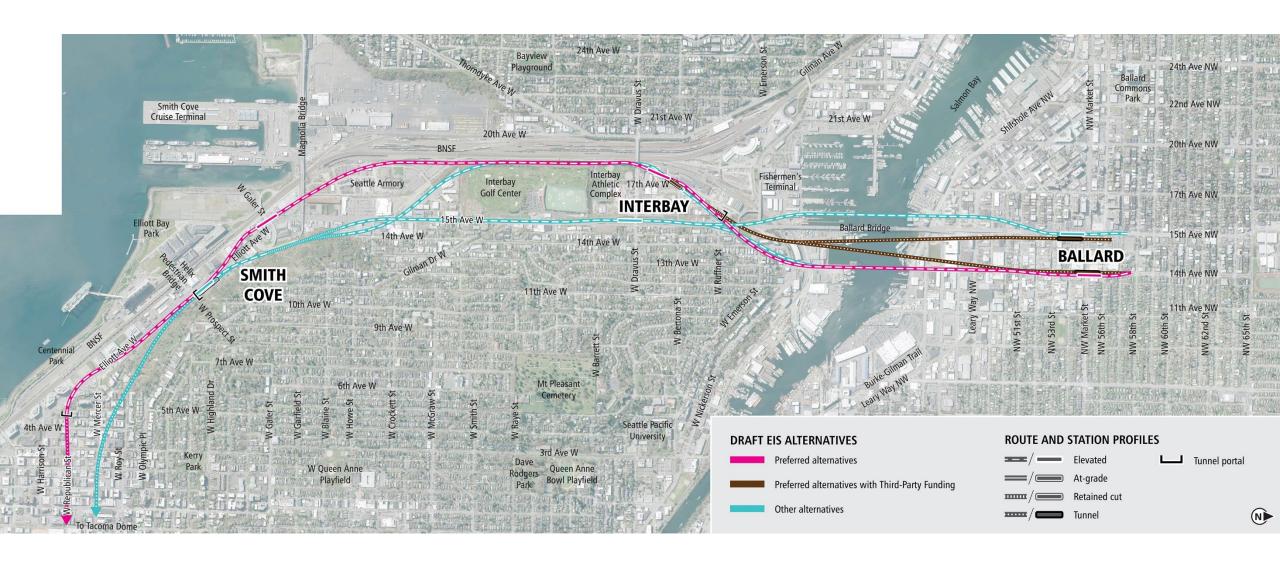


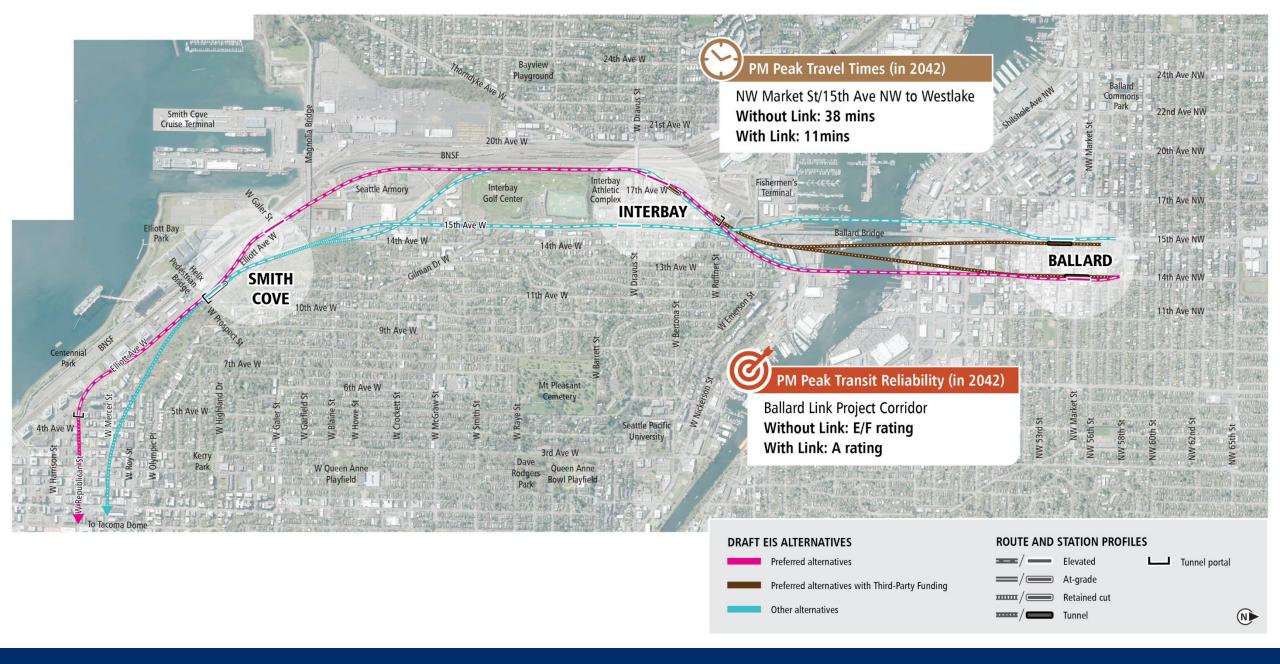


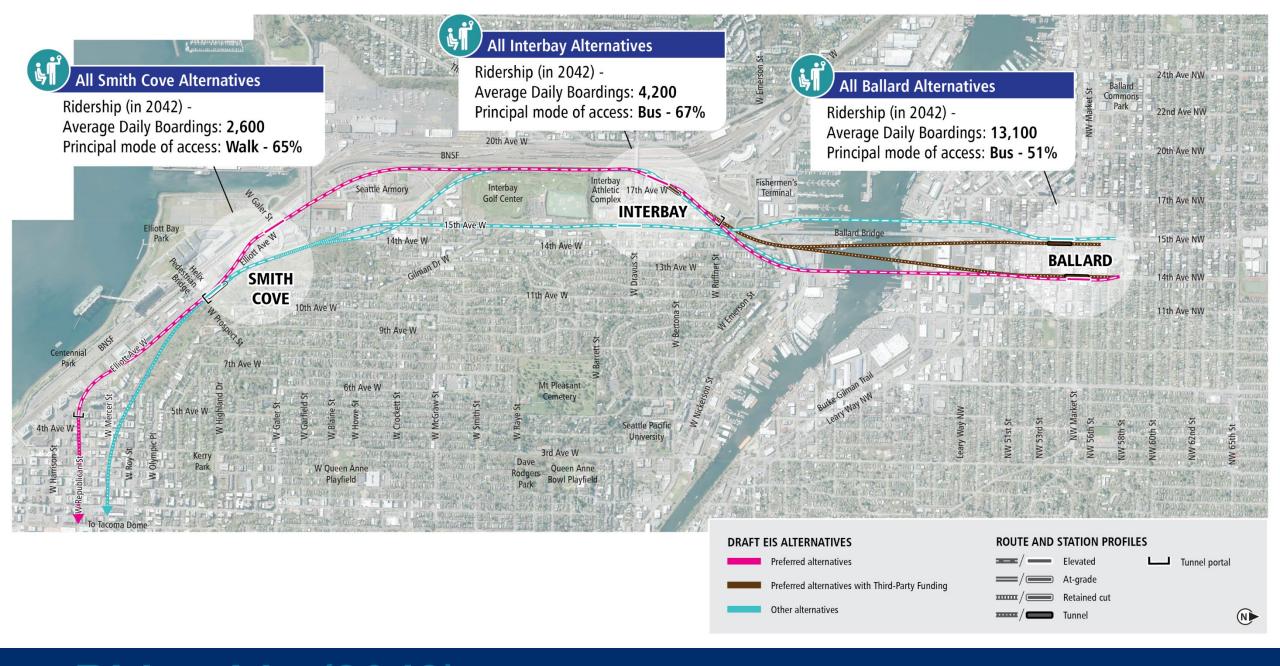


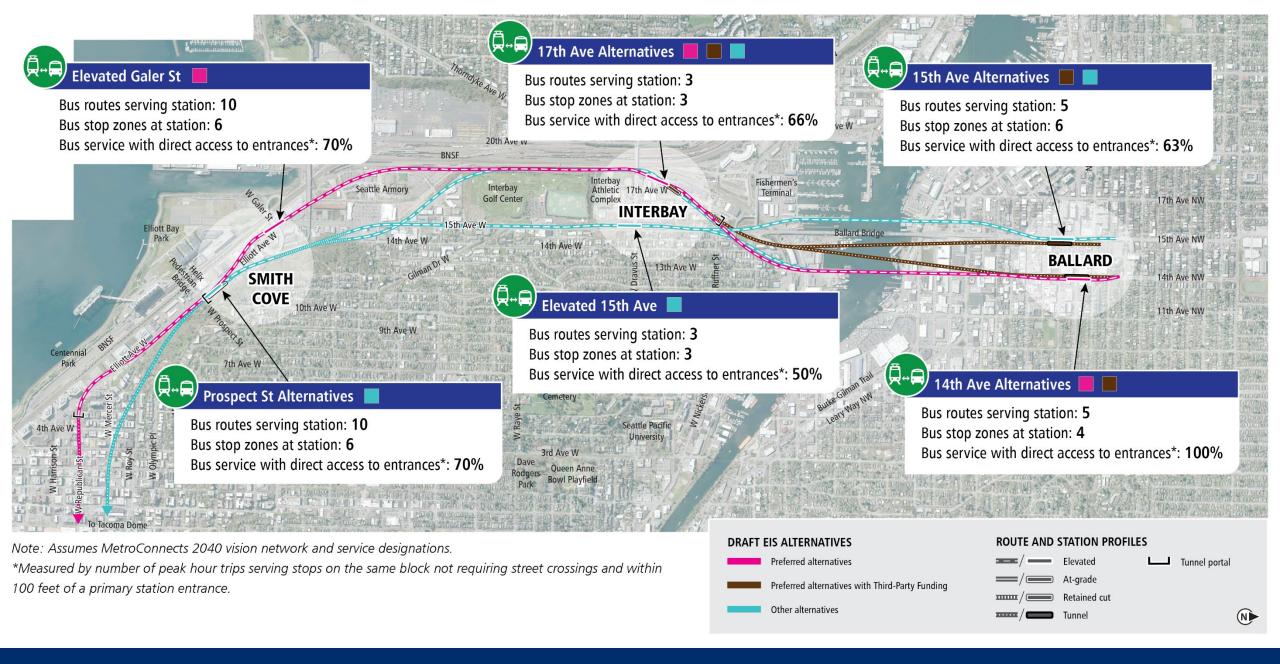


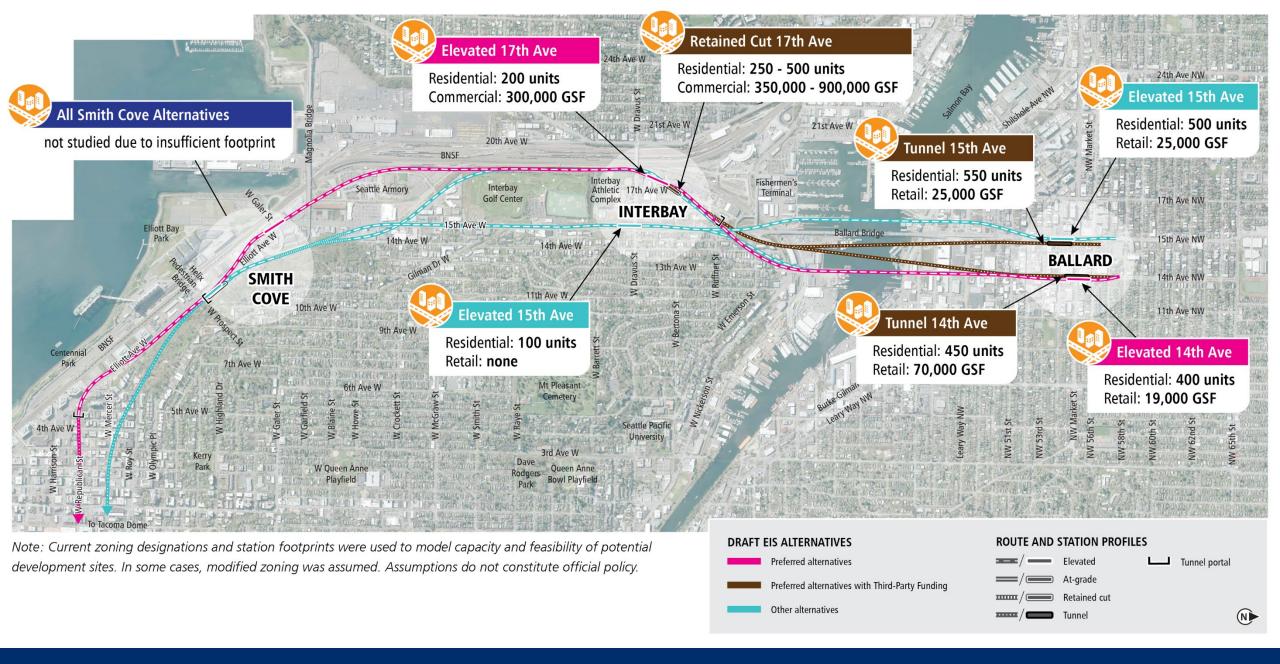
## Overview of WSBLE Alternatives in Interbay-Ballard











## South Interbay

#### Galer Street Station/ **Central Interbay**

Project cost (2019\$ in billions)



\$1.3B

Residential displacements



**174** units

Historic property for properties 7



Park effects (permanent)



3.1 acres

Biodiversity effects (permanent) <0.1 acre



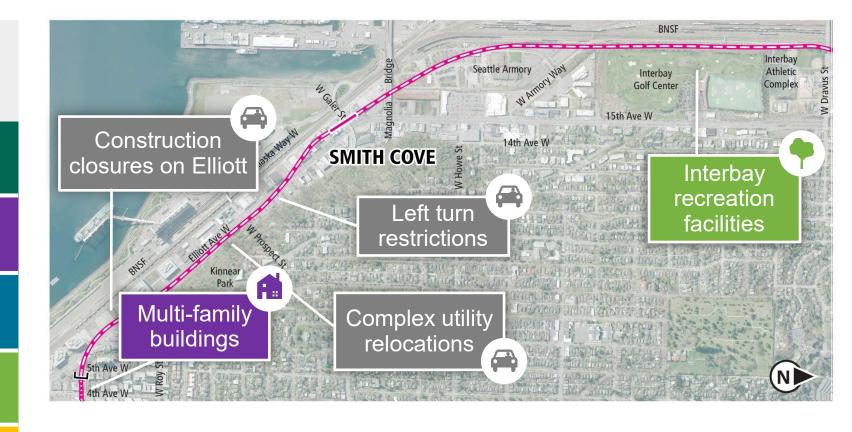
Roadway effects (Guideway)

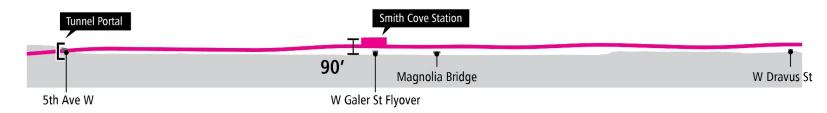


**0.4** mile

Other considerations











Project cost (2019\$ in billions)



Residential displacements



**123** units

Historic property effects 8 properties



Park effects (permanent)



0.7 acres

Biodiversity effects (permanent) 3.8 acres



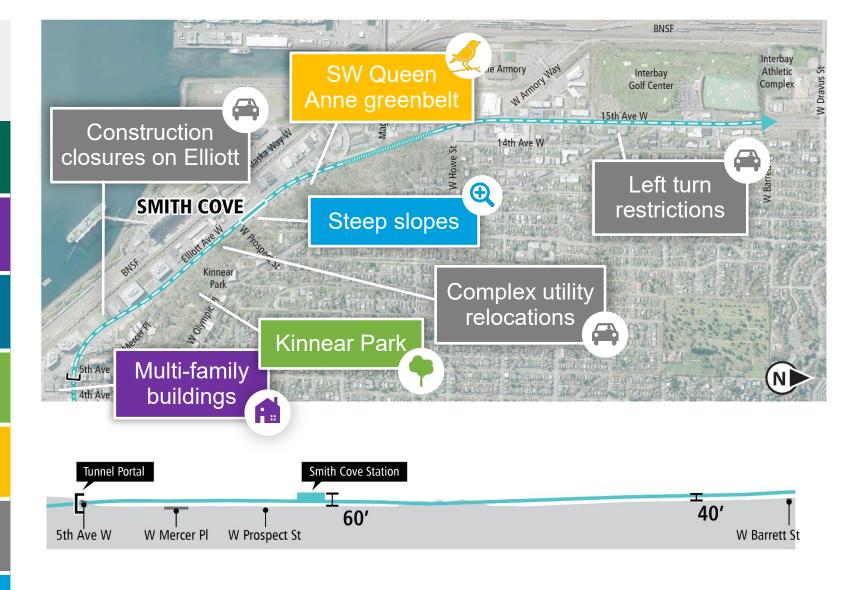
Roadway effects (Guideway)



**1.0** mile

Other considerations







#### **Prospect Street Station/ Central Interbay**

Project cost (2019\$ in billions)



\$1.5-1.6B

Residential displacements



5 units

Historic property 2 properties



Park effects (permanent)



4.0 acres

Biodiversity effects (permanent) 5.5 acres



Roadway effects (Guideway)



Other considerations









		Galer Street Station/ Central Interbay	Prospect Street Station/ 15th Avenue	Prospect Street Station/ Central Interbay
Project cost (2019\$ in billions)	•	\$1.3B	\$1.4-1.5B	\$1.5-1.6B
Residential displacements	A	174 units	123 units	5 units
Historic properties effects	血	7	8	2
Park effects (Permanent)	•	3.1 acres	0.7 acres	4.0 acres
Biodiversity effects (Permanent)	2	<0.1 acre	3.8 acres	5.5 acres
Roadway effects (Guideway)		0.4 mile	1.0 mile	0.1 mile
Other considerations	Ф		Queen Anne hillside steep slopes	Queen Anne hillside steep slopes
		The above information is for illustration only. Please refer to DEIS for further detail.		Performance  Lower performing ←→ Higher performing

## South Interbay

## Interbay/Ballard

#### **Elevated 14th Avenue**

Project cost (2019\$ in billions)



Residential displacements 105 units



Historic property from 7 properties



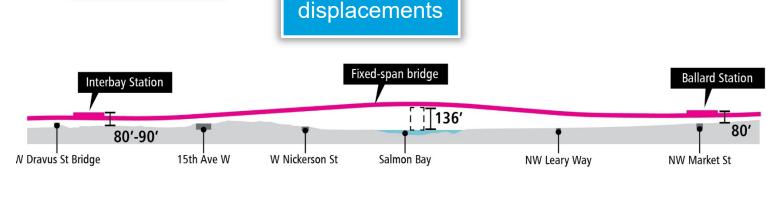
**Employee** displacements



**In-water effects** (Permanent)



Other considerations (+)



Maritime

business

Navigation

Habitat

Tribal fishing

treaty rights

**E** 

Diagrams are not to scale and all measurements are approximate. The above information is for illustration only. Please refer to DEIS for further detail.

INTERBAY

Multi-family

buildings

17th Ave W



**BALLARD** 

Boat ramp and

stormwater outfall

relocation

20th Ave NW

7th Ave NV

(N)

#### **Tunnel 14th Avenue**



Residential displacements 14 units



Historic property



effects IIII 4 properties

**Employee** displacements



**In-water effects** (Permanent)

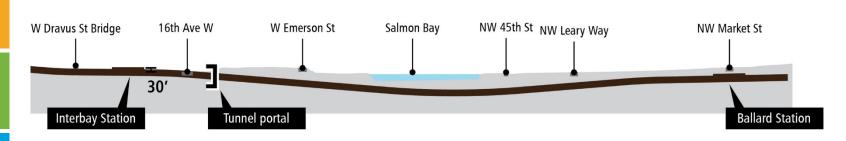


none

Other considerations (1)









#### **Tunnel 15th Avenue Station Option**



Residential displacements 21 units



Historic property



effects IIII 3 properties

**Employee** displacements



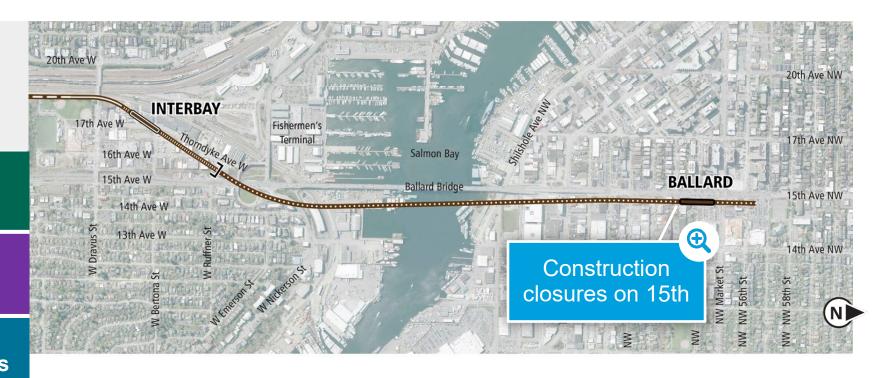
**In-water effects** (Permanent)

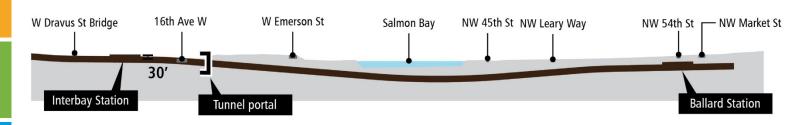


none

Other considerations (+)









#### **Elevated 14th Avenue Option (from Prospect/15th)**

**Project cost** (2019\$ in billions)



displacements 151 units Residential



Historic property



effects IIII / properties

**Employee** displacements

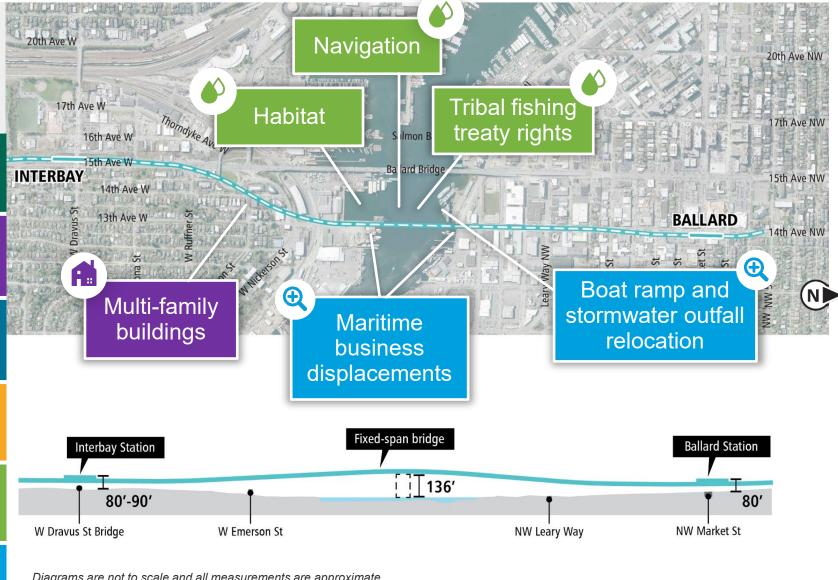


**In-water effects** (Permanent)



Other considerations (+)







#### **Elevated 15th Avenue**

Project cost (2019\$ in billions)



displacements 25 units



Historic property



10 properties

**Employee** displacements



620

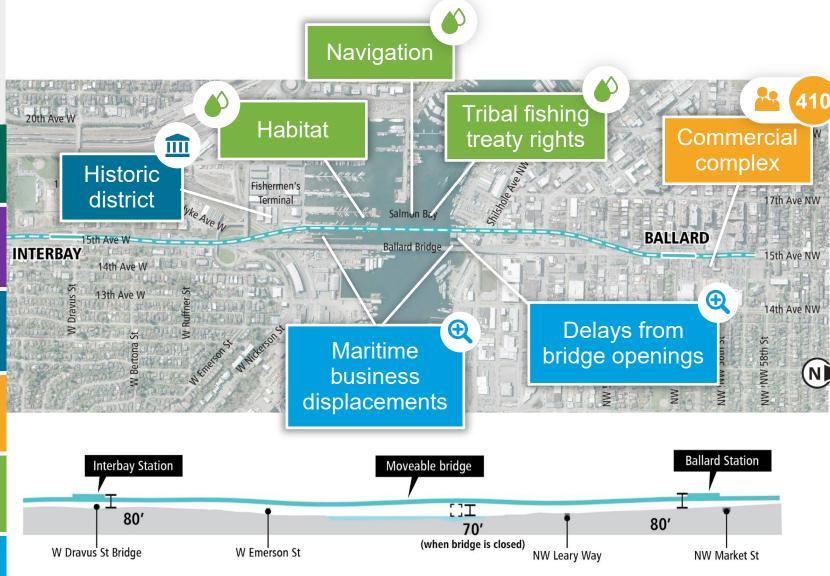
**In-water effects** (Permanent)



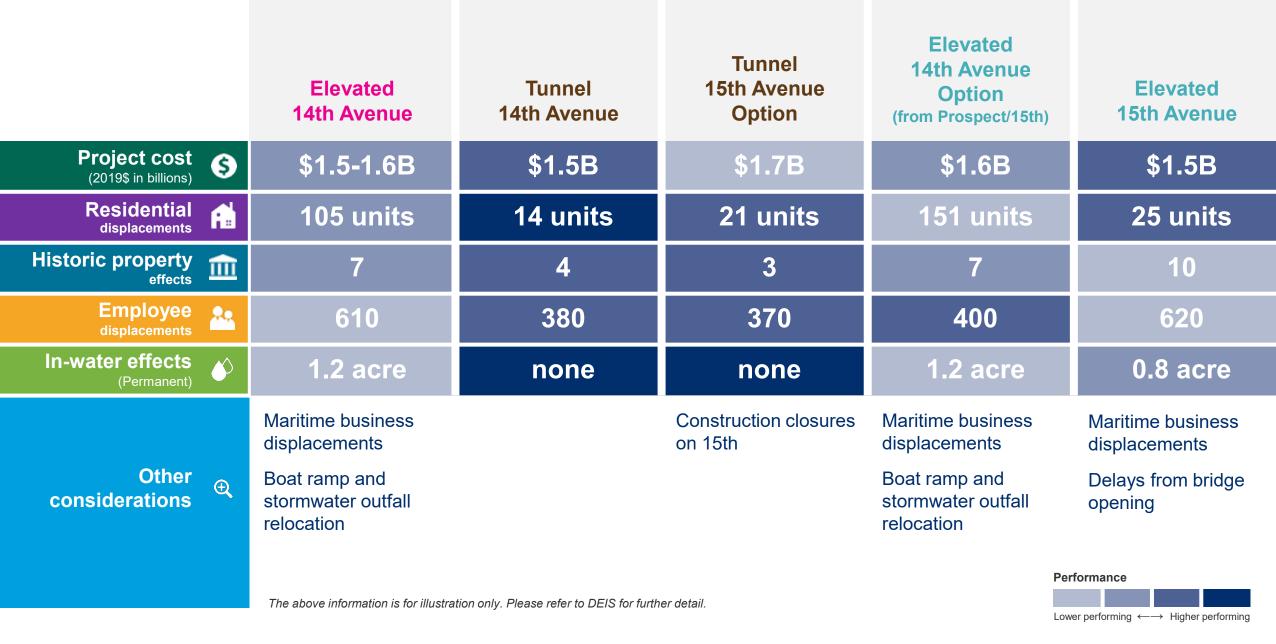
**0.8** acre

Other considerations (1)







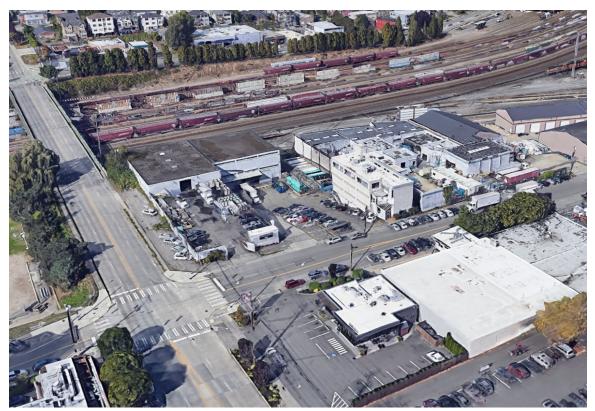


#### Interbay/Ballard

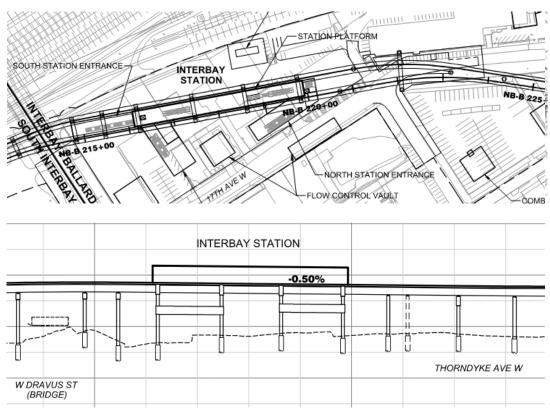
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# Interbay Station to Ballard Station Elevated Guideway Concept Design (DEIS)



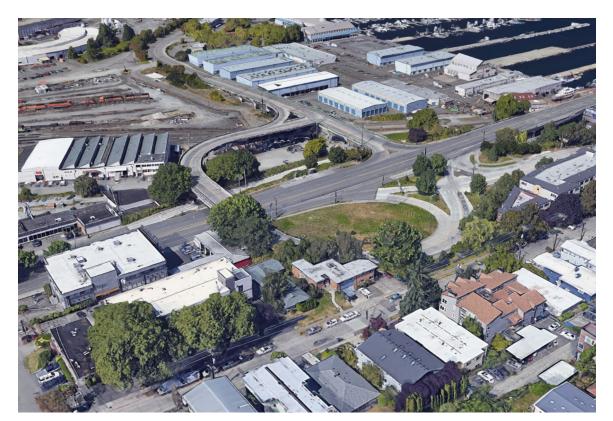
W Dravus St /17th Ave W



**Interbay Station on IBB-1a Alignment** 

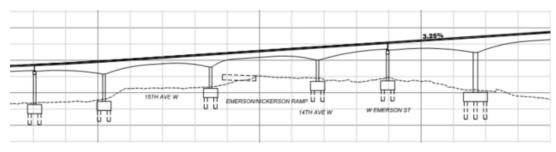
### **Transitioning to Neighborhood**





**Emmerson/Nickerson Ramp** 





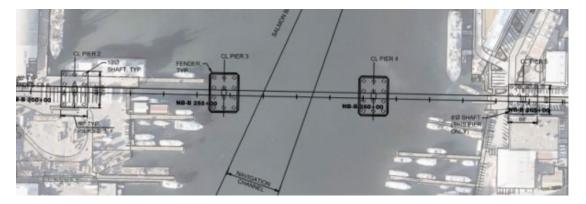
**Guideway on IBB-1a Alignment** 

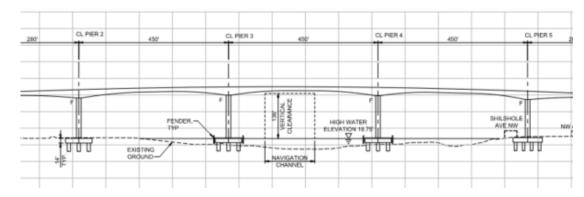
#### **Major Urban Infrastructure**





**Ballard Bascule Bridge** 





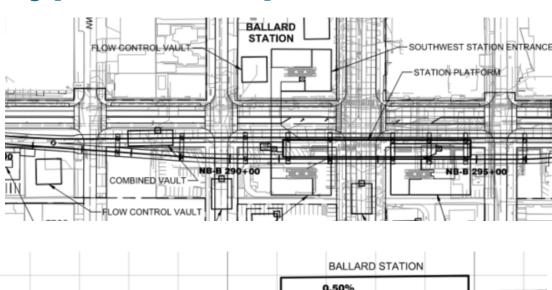
Segmental Box Bridge Option on IBB-1a
Alignment

#### **Maritime and Navigation**





14th Avenue NW near NW Market St, Ballard



D.50%

NW 53TH ST

NW 54TH ST

NW 54TH ST

NW 54TH ST

**Ballard Station on IBB-1a Alignment** 

### Neighborhood



### Guideway Design Fundamentals

- Environment: Minimize the effects due to column placement including infrastructure, major utilities, and ECAs
- Structural: Keep bridge span lengths within optimal range for structural performance, and bridge types within current ST bridge type inventory when possible.
- Geo-technical: Use appropriate foundation type and ground improvement methods to minimize environmental effects
- Rail-Structure: Minimize special track work requirements due to longer and lighter bridge spans

### Guideway Structure Summary

#### Interbay Station to Ballard Station Segment (14th Ave Alignments)

Structural Type	Length (ft)	% of Total Length
Typical Dual Tracks	2,410	22%
Typical Twin Single Track	1,435	13%
Transition (Dual to Twin Single)	510	5%
Stations (Center platform configuration)	760	7%
Long and Very Long Spans	5,712	53%
Total Length	10,827	100%

- Majority of the guideways require long-spans or very long-span bridge structures.
- Long spans and very long spans are typically segmental box girders with balanced cantilever construction.
- Water crossing bridge types vary.



## Guideway - Length, Depth, and Width

	Span Length (ft)	Depth at Mid- Span (ft)	Depth at Pier (ft)	Width (ft)
Typical Span	90 ft – 200 ft	8 ft – 10 ft	8 ft – 10 ft	30 ft or more
Long Span	200 ft - 400 ft	5 ft – 10 ft	11 ft – 22 ft	30 ft or more
Very Long Span	400 ft – 700 ft	10 ft – 18 ft	22 ft – 38 ft	30 ft or more
Water Crossing	> 700 ft	varies	varies	30 ft or more

- Typical spans can be prestressed I girder, prestressed tub girder, or segmental box girder.
- Long spans and very long spans are segmental box girders with balanced cantilever construction.
- Water crossing bridge types vary.



### Guideway Structural Height

Neighborhood	Approximate Structural Height at Rail	
Interbay Station to Nickerson	40 ft - 140 ft	
Salmon Bay Water Crossing	140 ft - 155 ft	
Leary to Ballard Station	90 ft - 50 ft	

## Guideway Dual Track (Typical Span Length)



**Prestressed I Girders** 



**Prestressed Tub** 



**Post-Tensioned Box** 



## Guideway Twin Single Track (Typical Span Length)



**Prestressed I Girders** 



**Prestressed Tub Girders** 

## Guideway Dual Track (Long Span Length)



**Balanced Cantilever Segmental Box Girder** 



Balanced Cantilever Segmental Box Girder

## Salmon Bay Crossing Bridge type preliminary concepts



**Segmental Box Girder bridge concept** 





**Steel Network Arch bridge preliminary concept** 





**Extradosed bridge preliminary concept** 

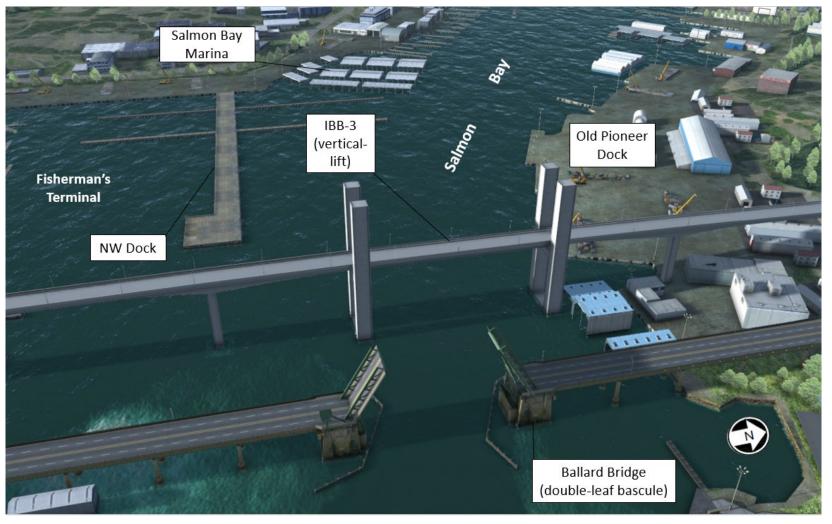




**Cable Stayed bridge preliminary concept** 



## Movable Long Span Bridge



**Vertical Lift Bridge preliminary concept** 



# Structural design feature concepts

## Possible Structural Design Features

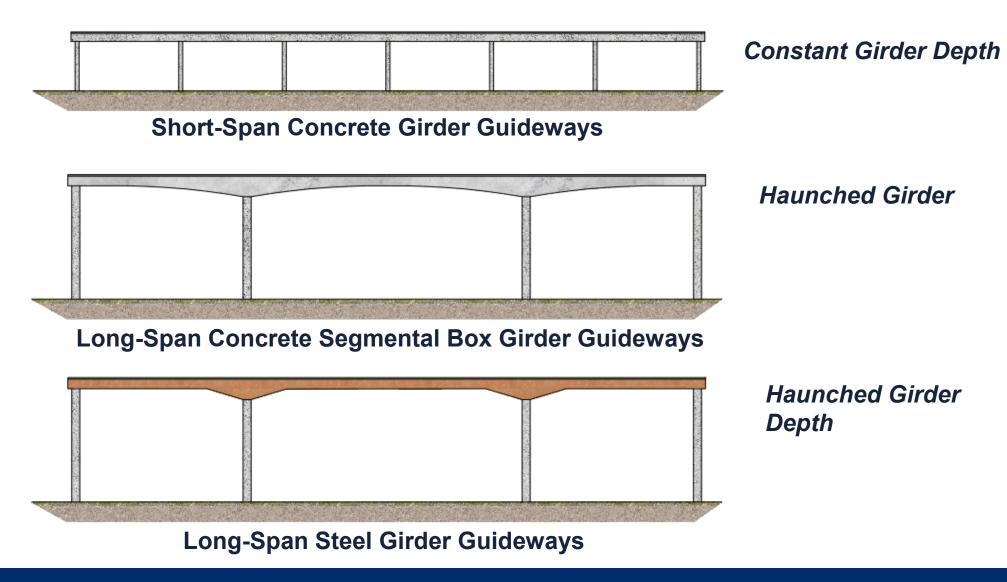
- Span length, structural types, and use of materials
- Column proportion
  - single mast vs. double-blade
  - plumb vs. tapering
  - single column vs. straddle bents
  - diamond-shape, H-shape, or A-shape towers

#### Girder proportion

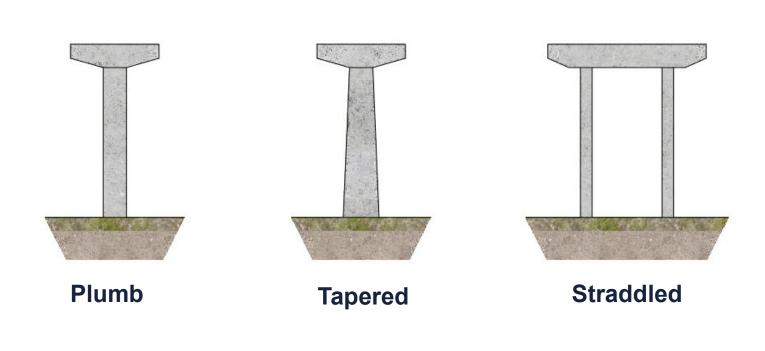
- constant depth vs. haunched depth
- cords vs. smooth curve for horizontal curvature
- above-deck vs. under deck for truss and arch bridges
- single cable plane vs. double cable planes for extradosed or cable stayed bridges

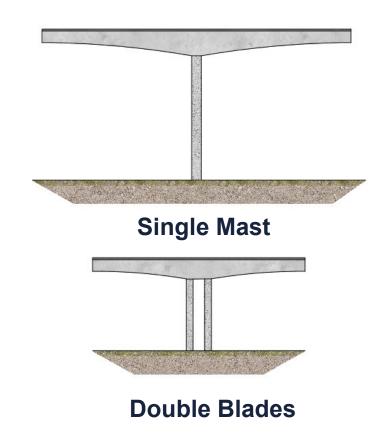


#### Span Length, Structural Types, and Use of Materials



## **Column Proportions**

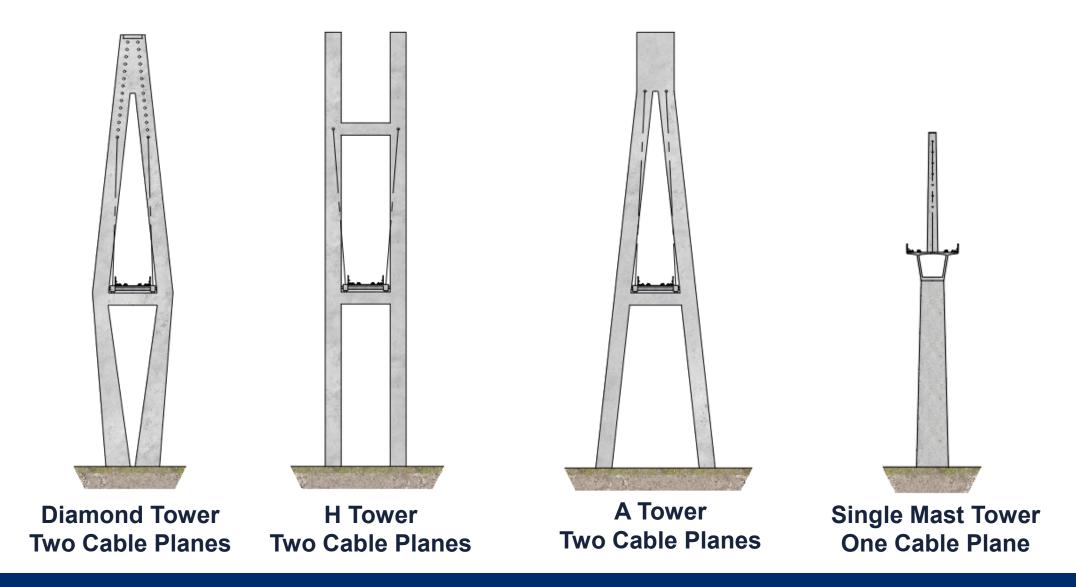




**PIER ELEVATIONS** 

**PIER SIDE-VIEW** 

#### Some Pylon Options for Cable-Stayed and Extradosed Bridges



#### Corded and Smooth Girders for Horizontal Curve



**Corded Girders** 



**Smooth Girders** 

#### Materials - Steel Girders



**Portland TriMet** 



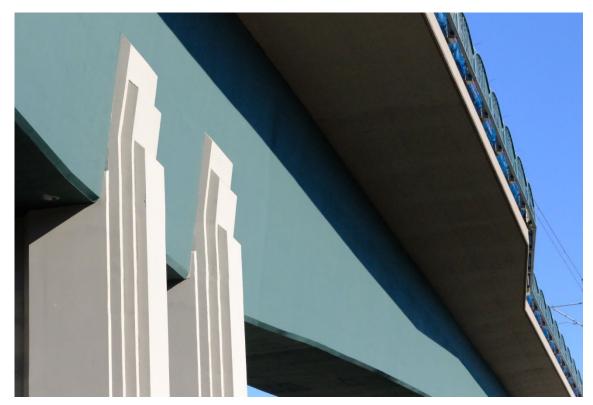
**Chicago Transit** 

Sound Transit currently has no steel plate or steel box girder bridge in its system



## Architectural Details

### Aesthetic Enhancement – Color Shape Rustication



**Color and Rustication** 



**Shape and Rustication** 

## Aesthetic Enhancement - Decorative Railing





**Decorative Sound Walls/Screening** 



**Decorative Railing** 

#### Possible Aesthetic Enhancement - Artwork



**Decorative Painting** 



**Decorative Attachment** 

### Constructability



**Drilled Shaft Installation** 



**Ground Improvement (Jet Grouting)** 

#### **Poor Soil Conditions**

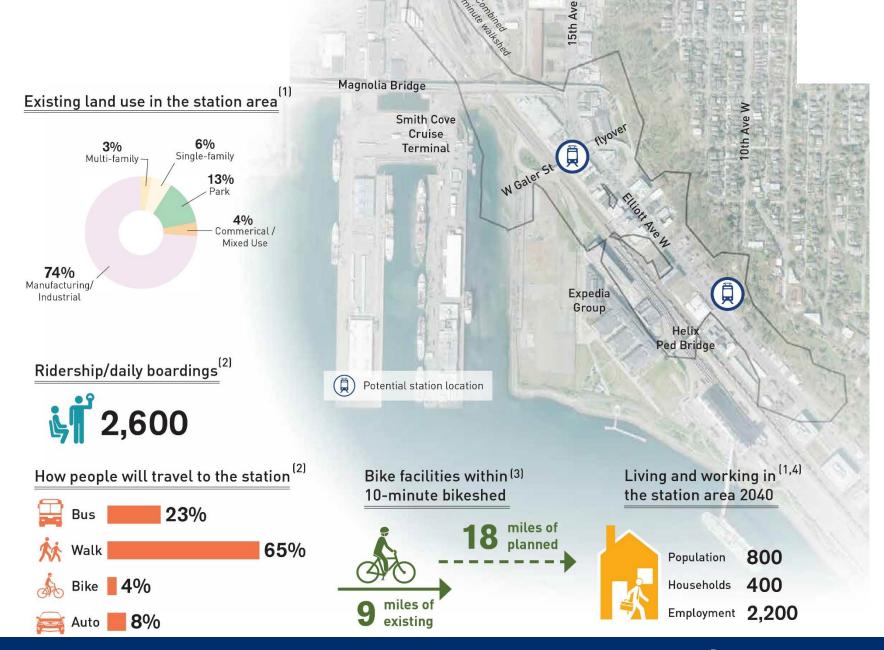
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- Enhance mobility and access for communities of color and lowincome populations
- Create opportunities for equitable development that includes expanding housing and community assets for communities of color
- Create a sense of belonging for communities of color at all stations









Interbay Armory site Magnolia **Smith Cove Cruise** What SW Queen Anne Magnolia Bridge Greenbelt **Terminal** we heard so far **NEIGHBORHOOD FEEDBACK** Integrate station with the surrounding flyover neighborhood and with multiple modes of transportation Interest in additional development/ attractions in the neighborhood Improve connections to and between public spaces and to the waterfront Helix Ped Bridge Improve and enhance Elliott Bay Trail connection Enhance connection to/from Queen Anne neighborhood Design new Magnolia Bridge to support connectivity and development Provide safe and convenient connection across Elliott Ave and BNSF tracks

Note: Neighborhood feedback gathered from in-person and on-line events during alternatives development 2018-2019.

Capitalize on publicly-owned land to draw more jobs and people to the area



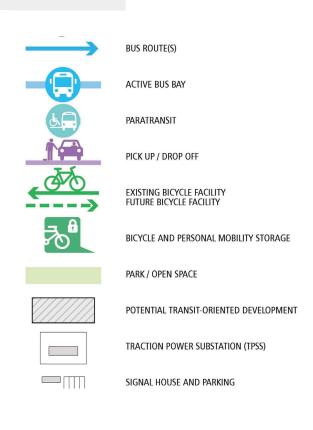
**Queen Anne** 

Kinnear Park

Potential station location

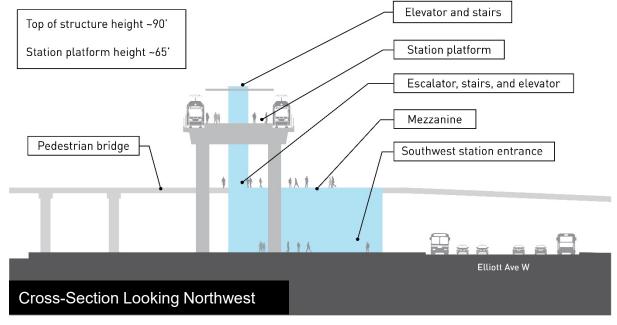
## Preferred alternative



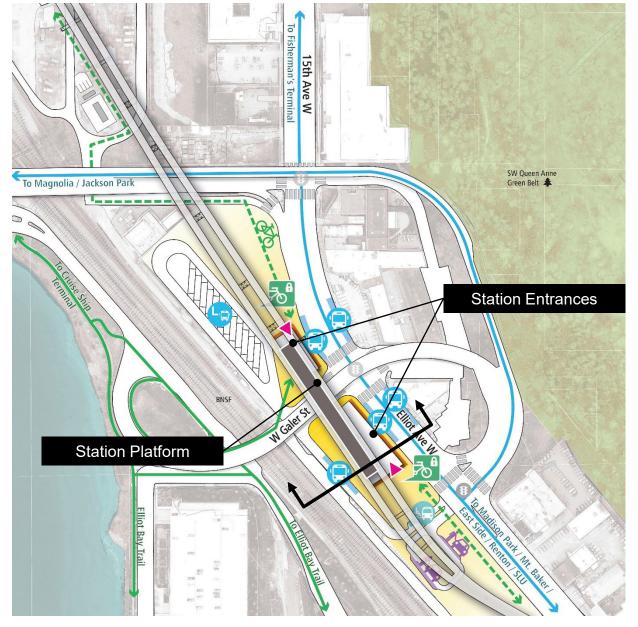




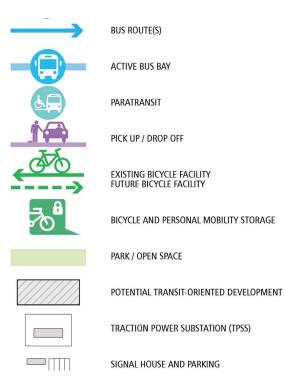






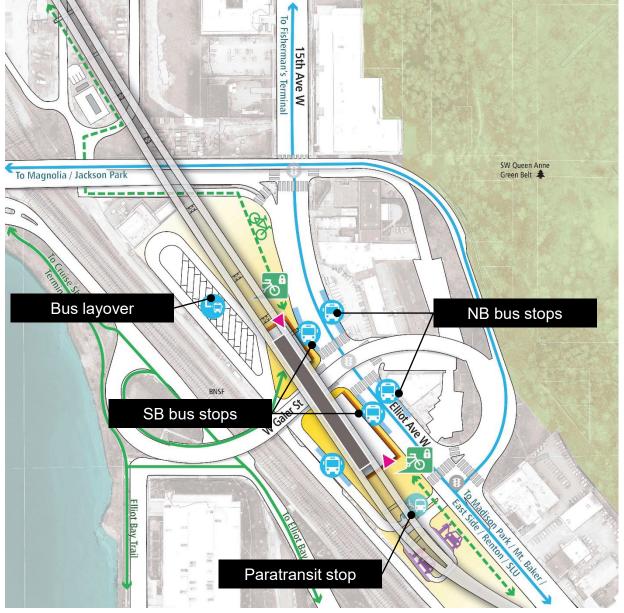




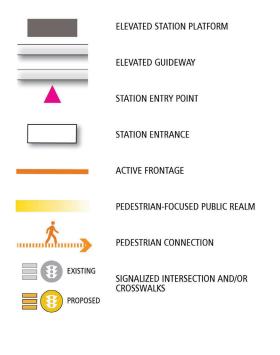




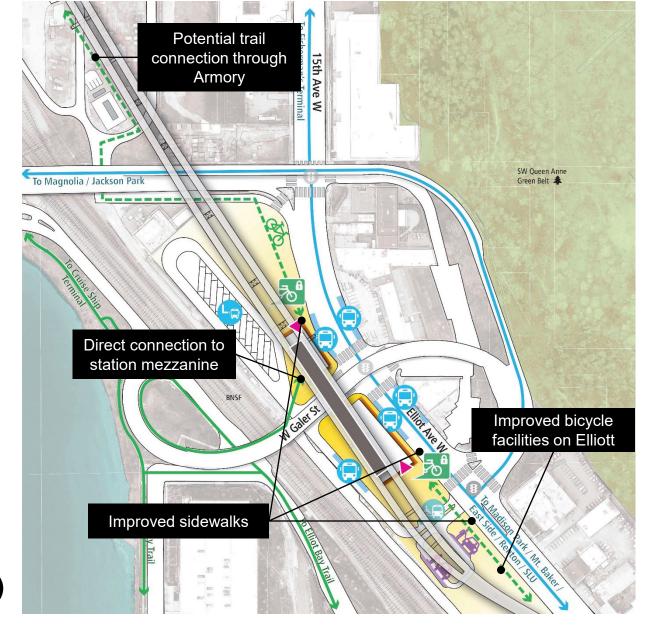




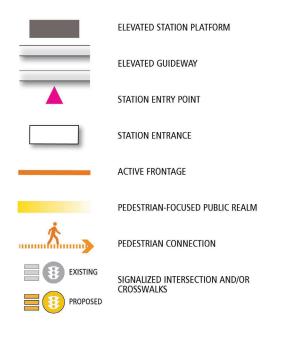




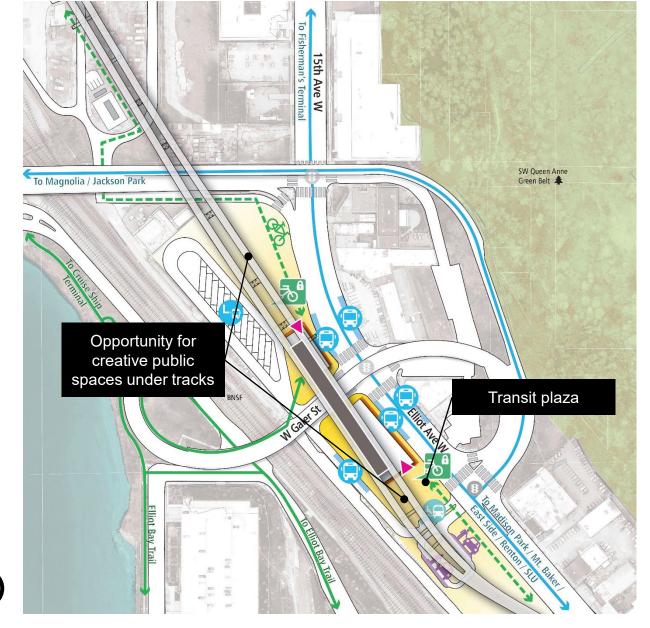








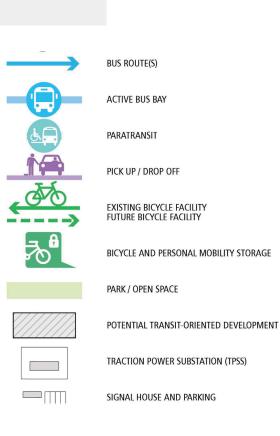






## Other Draft EIS alternatives





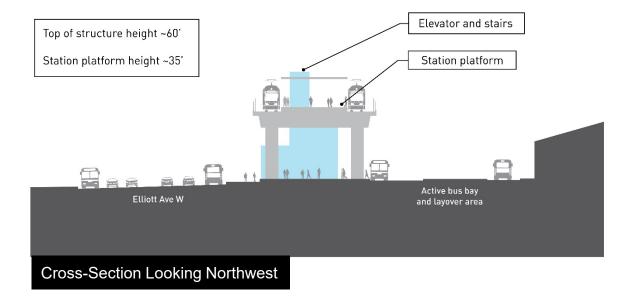




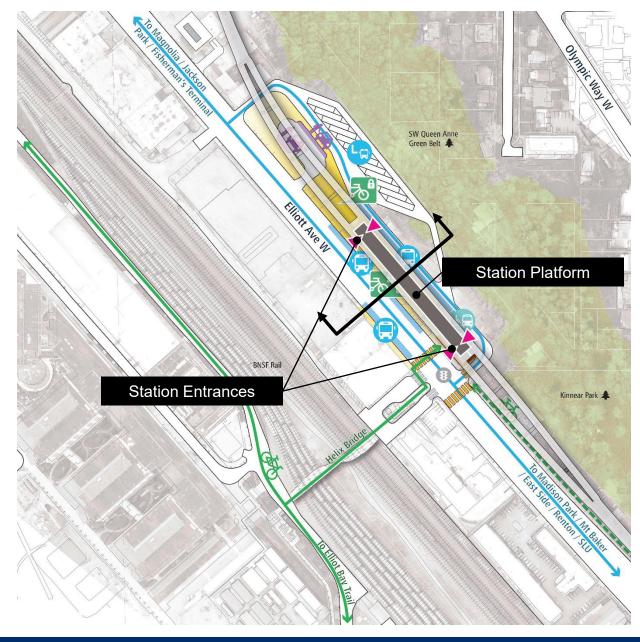
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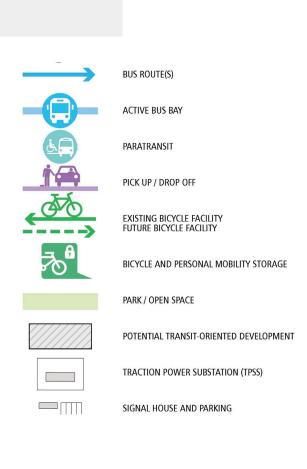
Kinnear Park

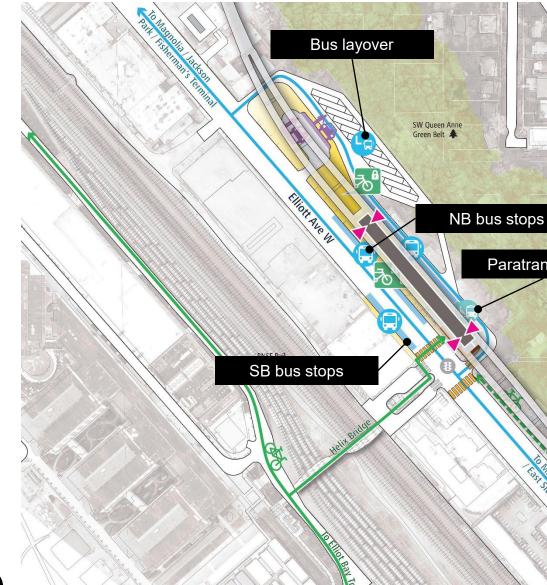


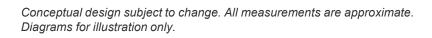












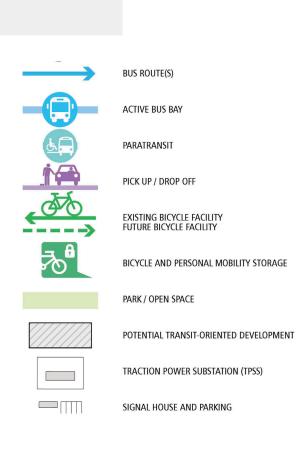


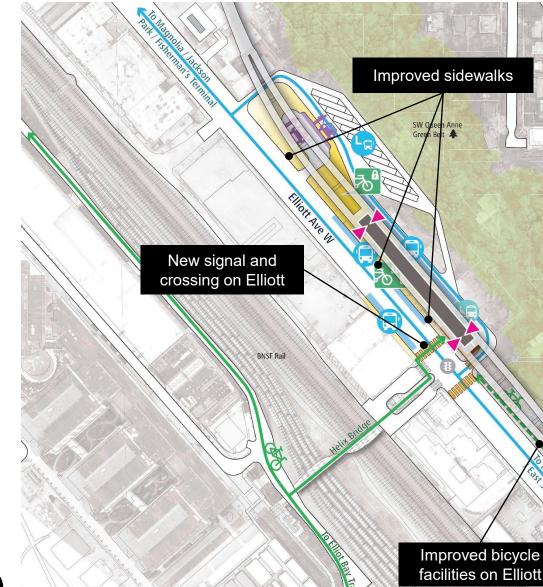


Paratransit stop

Kinnear Park





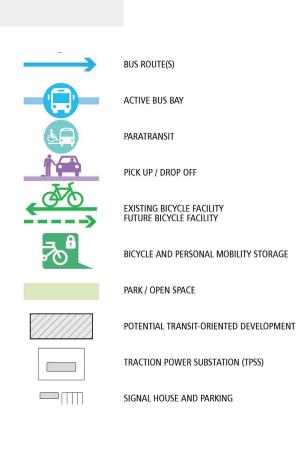


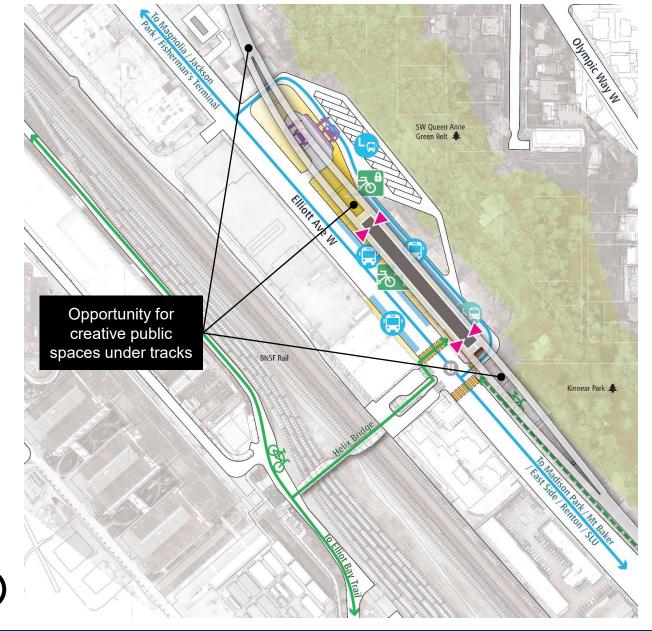
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Kinnear Park





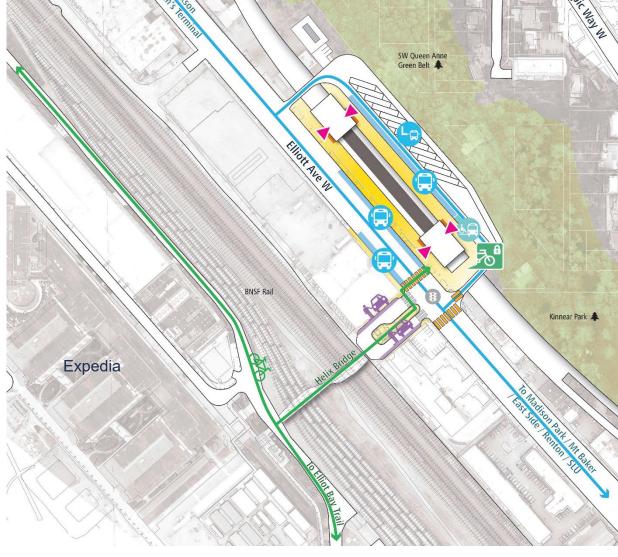




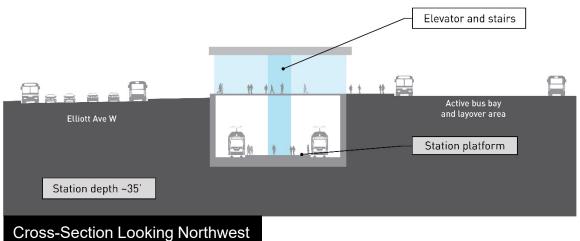








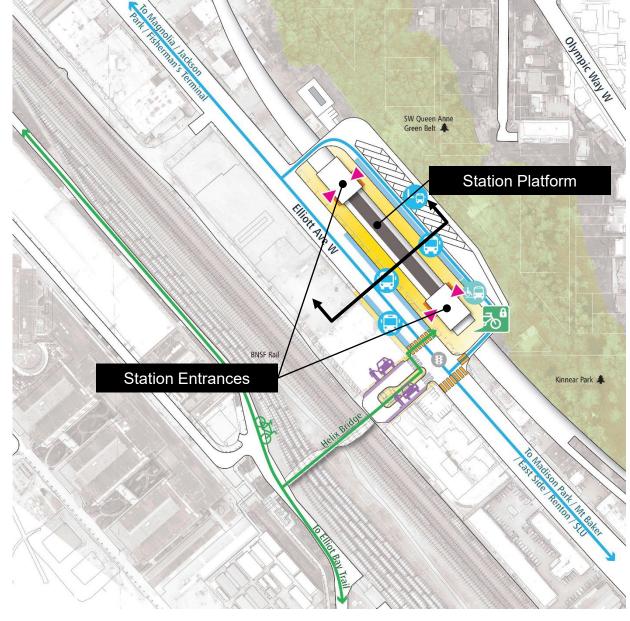




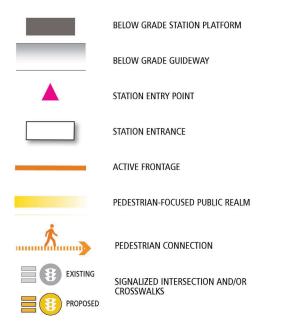


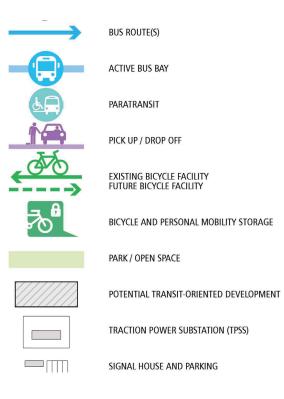






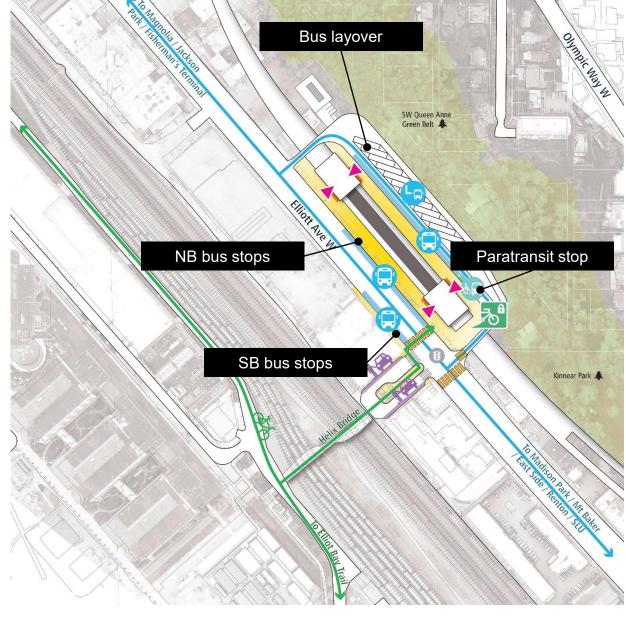






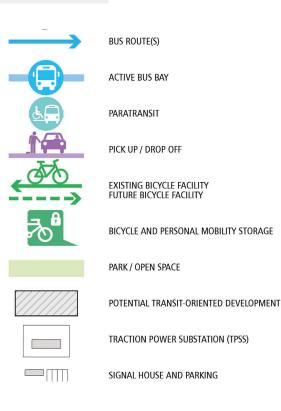




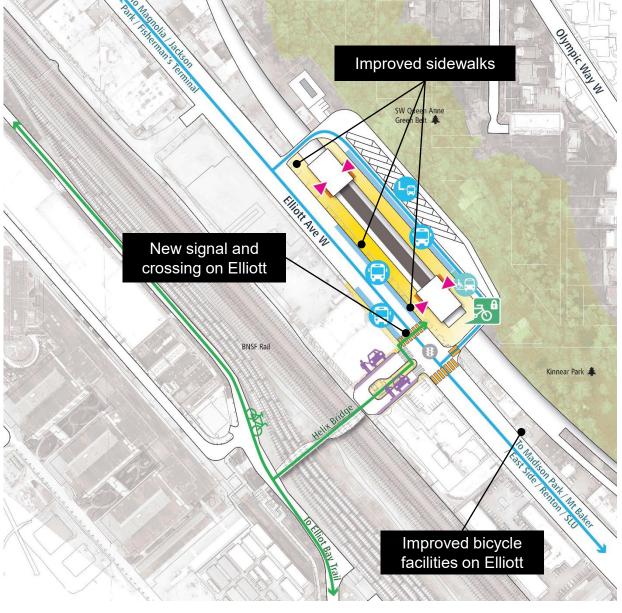






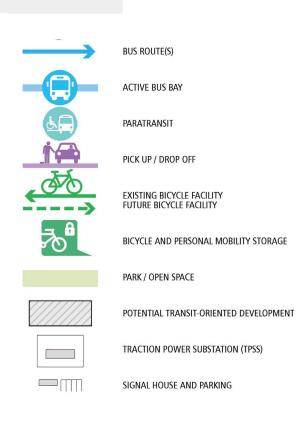


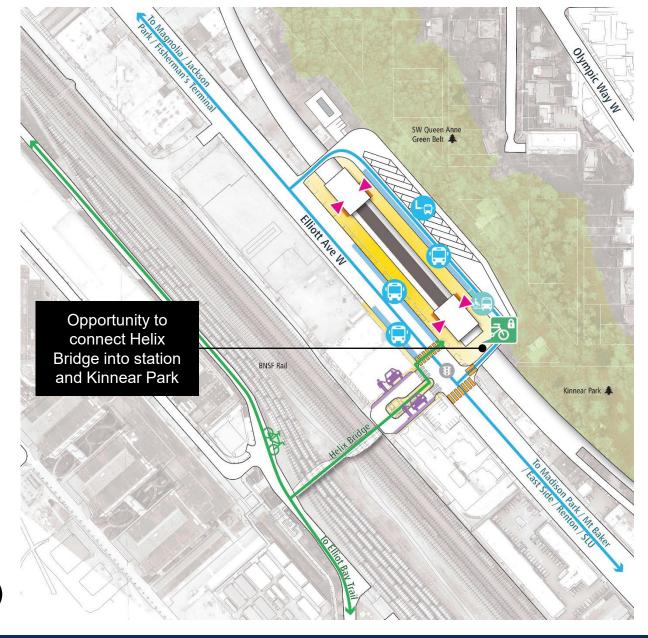








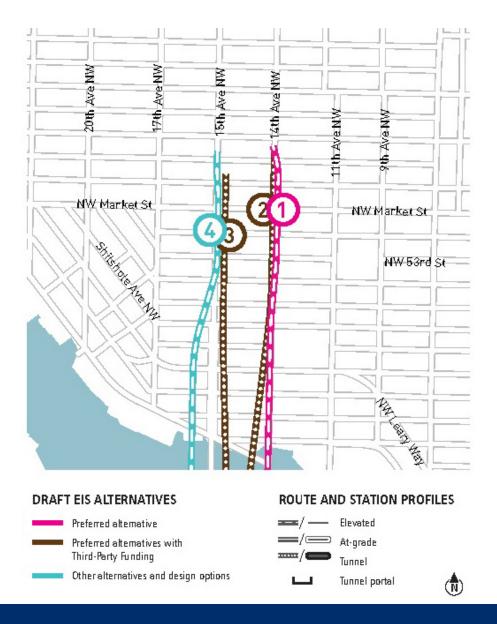






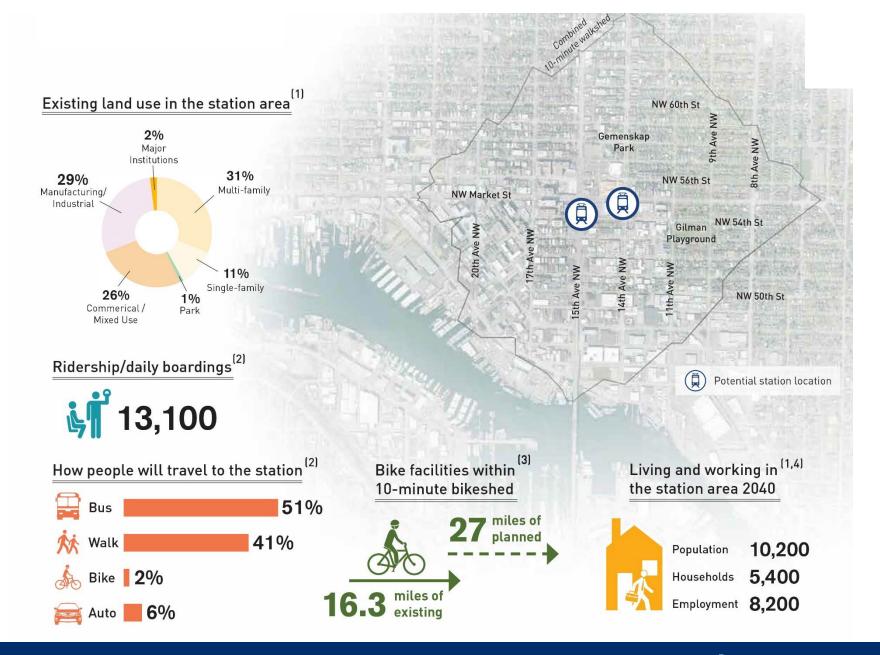
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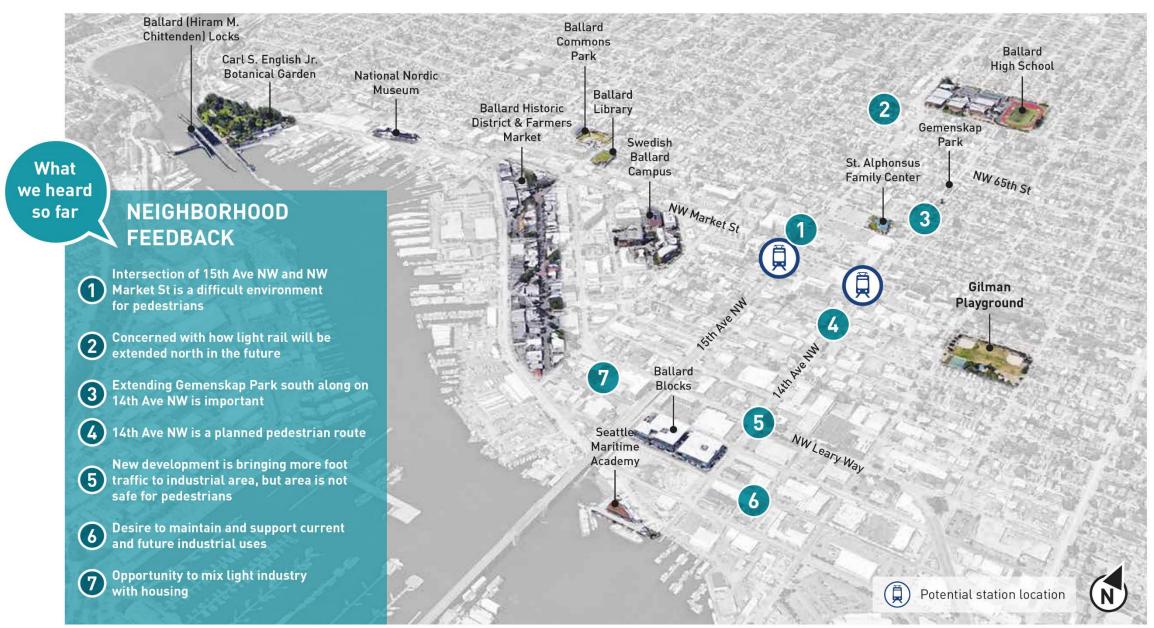


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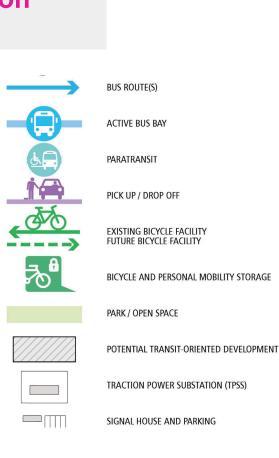


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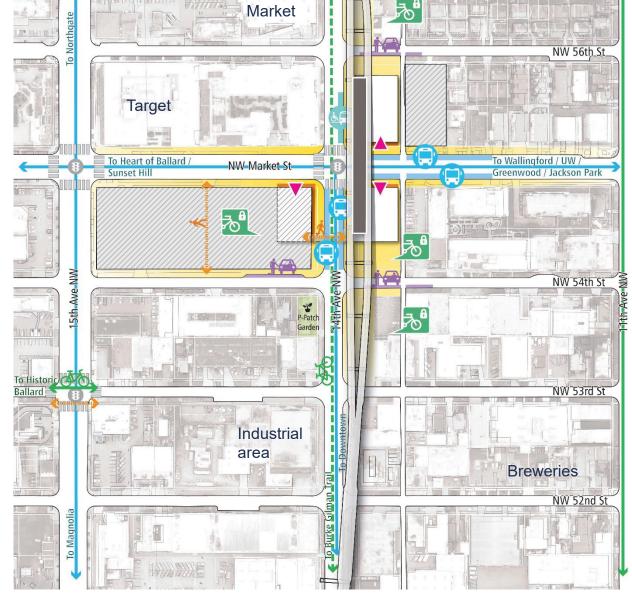
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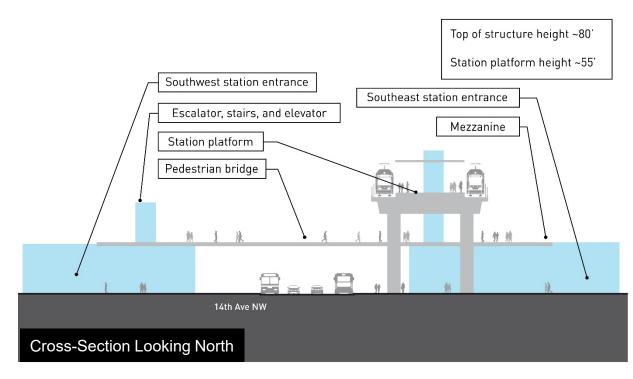




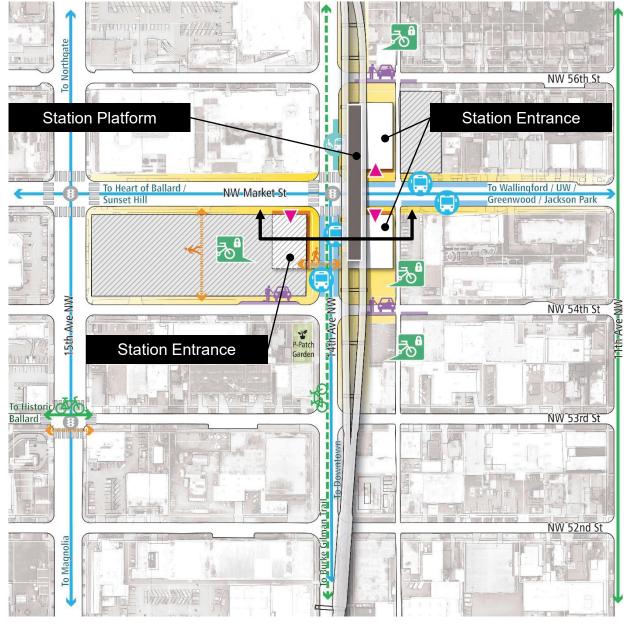


Ballard

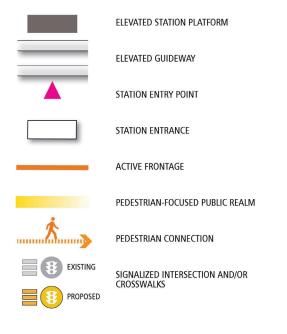


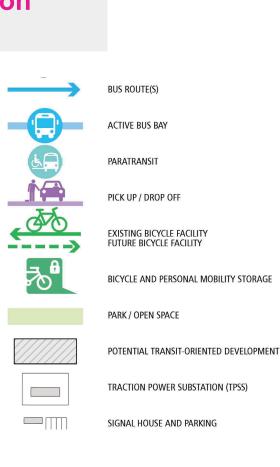






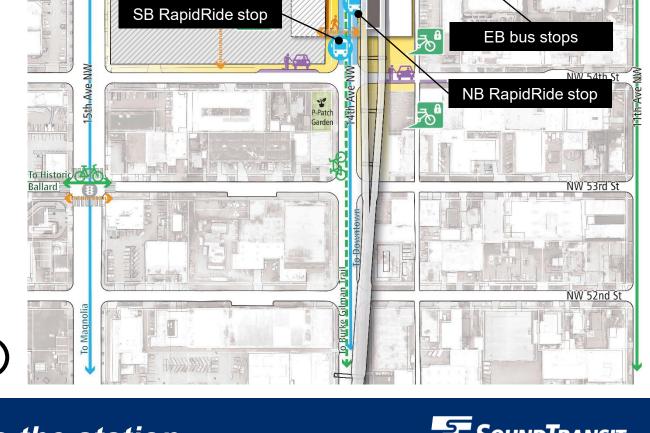












Paratransit stop

NW-Market-St

To Heart of Ballard

Sunset Hill

Conceptual design subject to change. All measurements are approximate. Diagrams for illustration only.

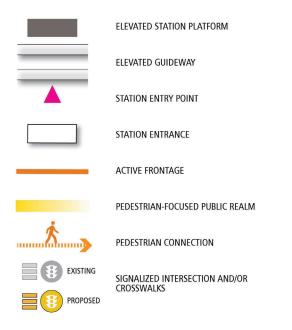


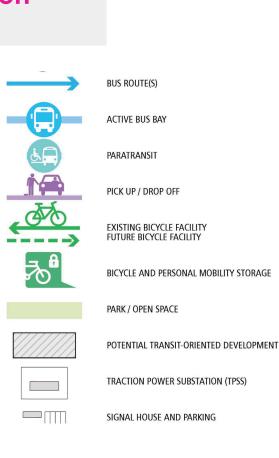
NW 56th\_St

WB bus stops

To Wallingford / UW

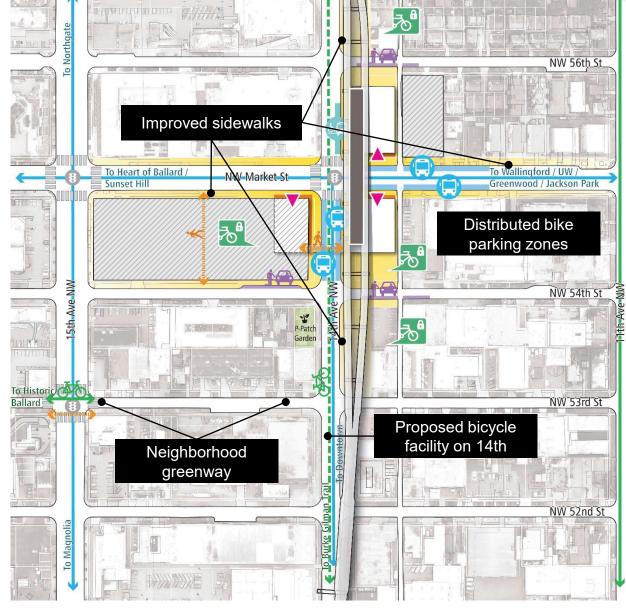
Greenwood / Jackson Park



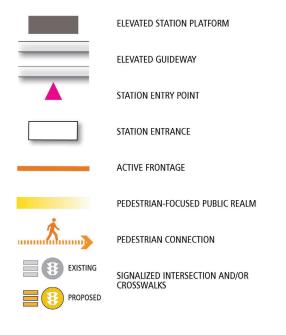


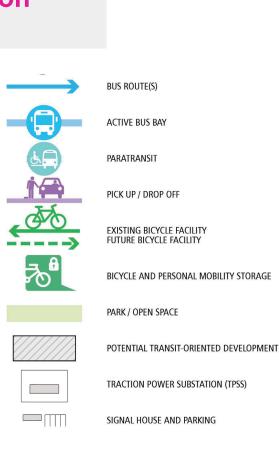






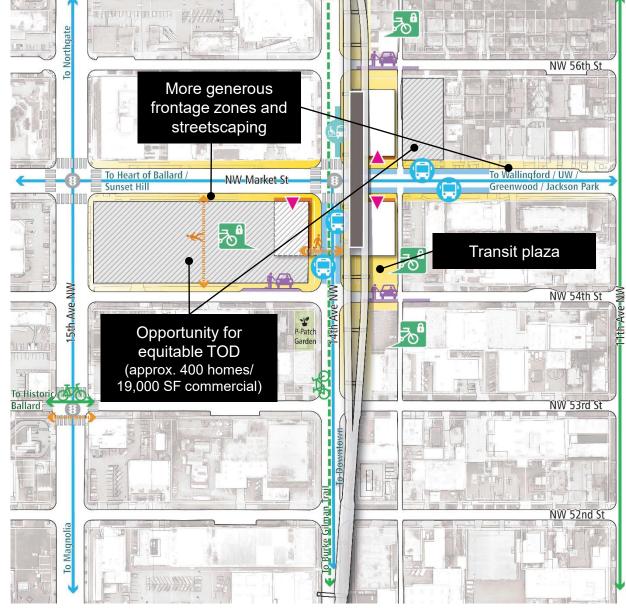








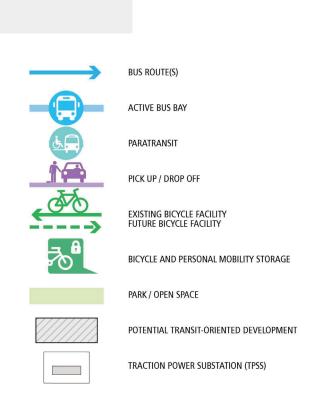


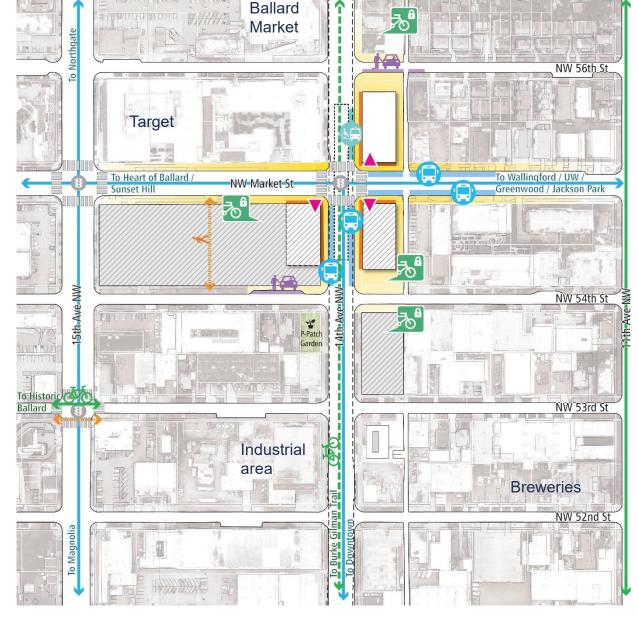




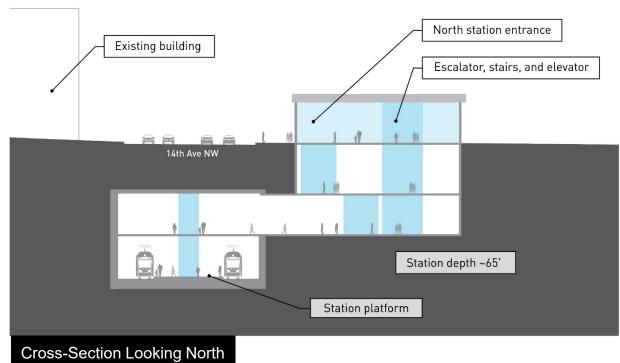
# Preferred alternatives with third party funding

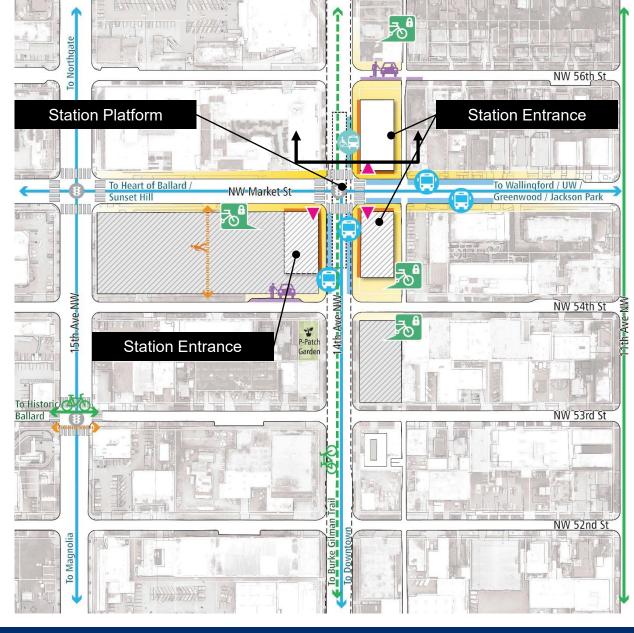
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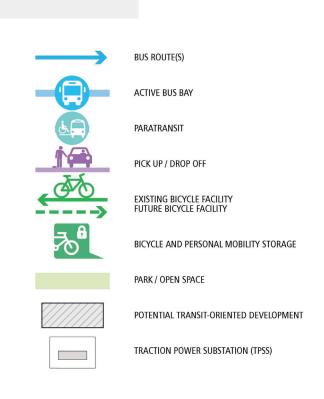




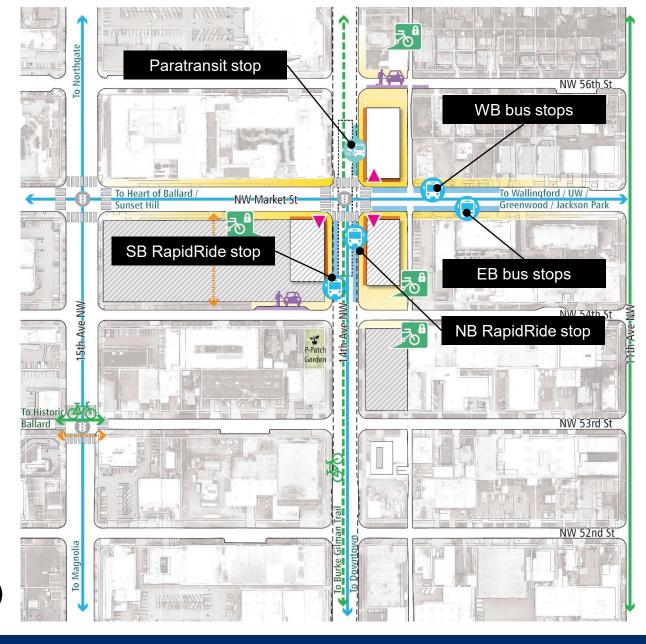




TUNNEL STATION PLATFORM **TUNNEL GUIDEWAY** STATION ENTRY POINT STATION ENTRANCE **ACTIVE FRONTAGE** PEDESTRIAN-FOCUSED PUBLIC REALM PEDESTRIAN CONNECTION SIGNALIZED INTERSECTION AND/OR

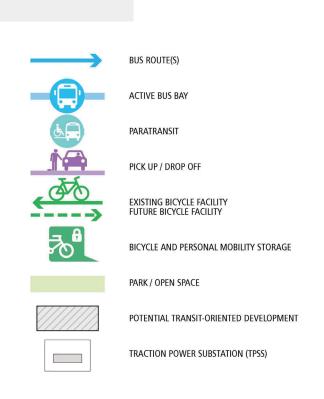


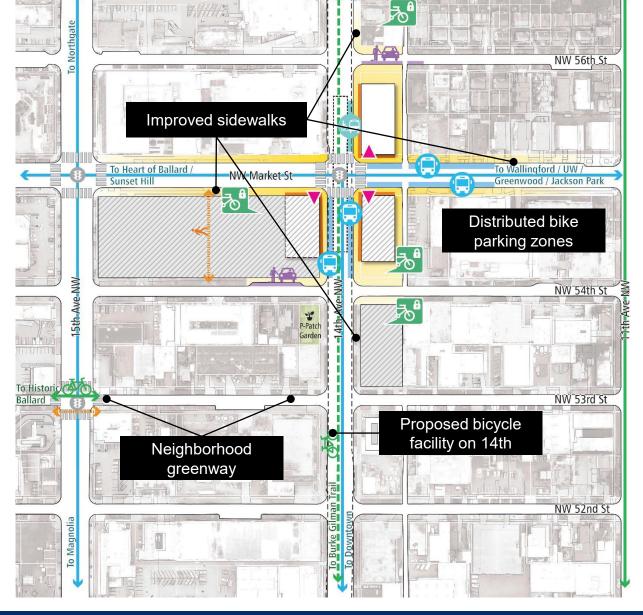






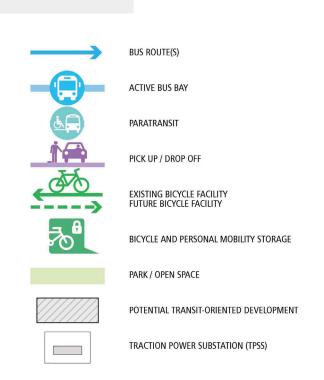
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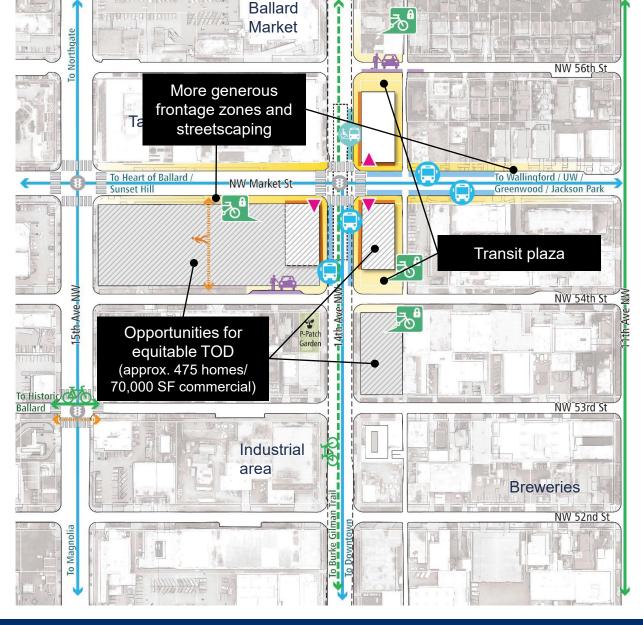






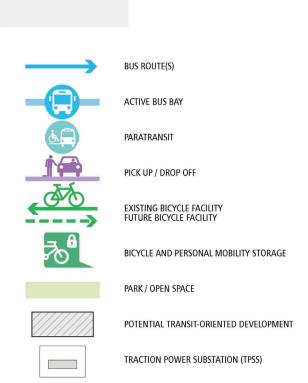
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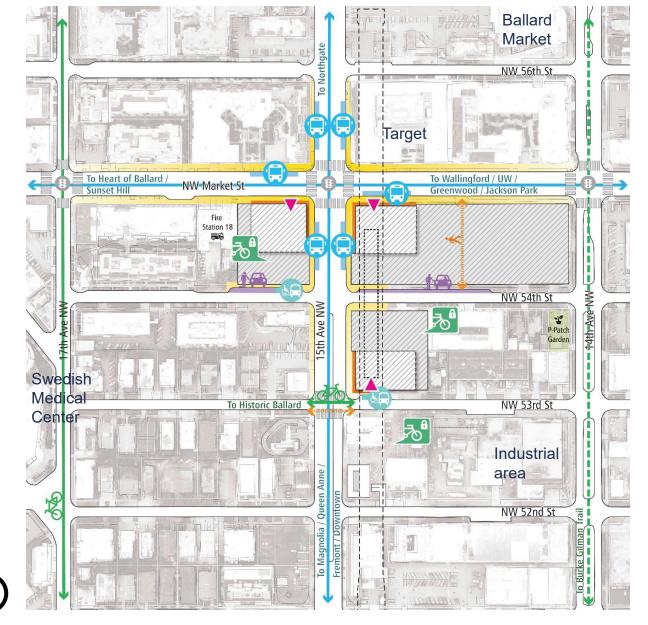




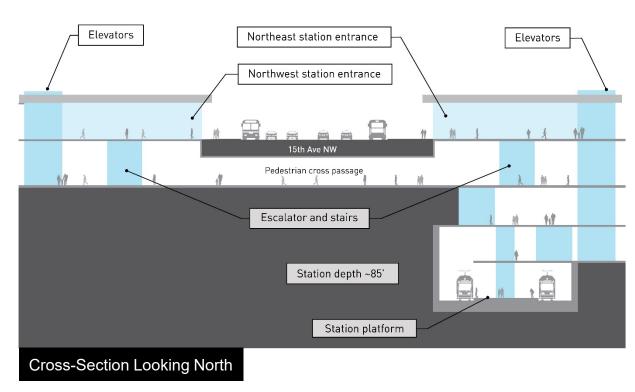


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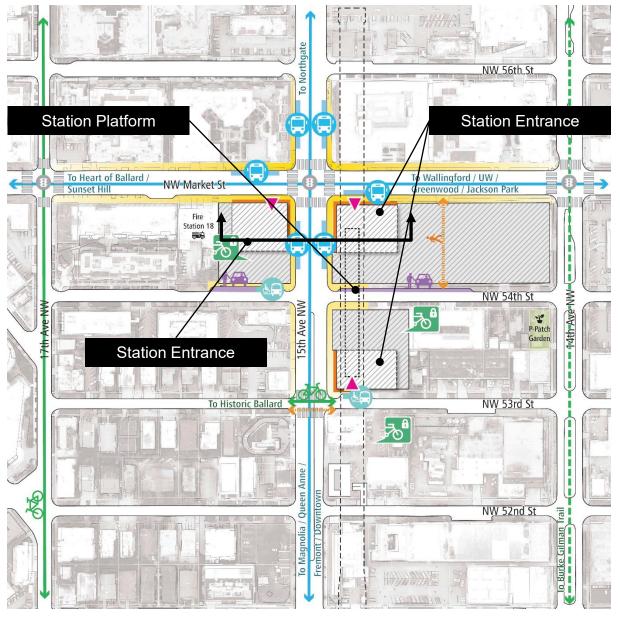




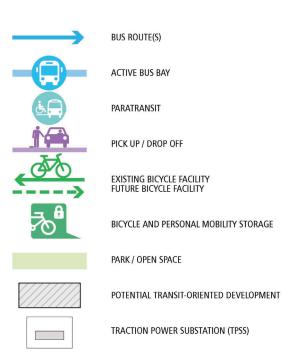


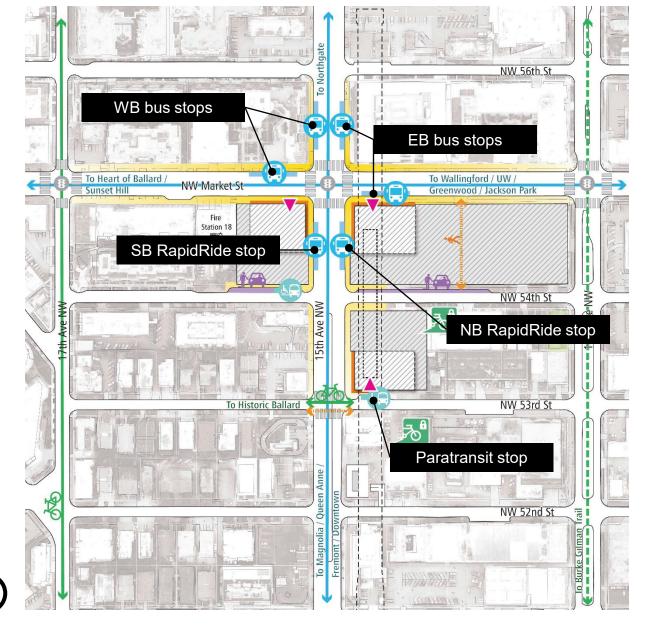






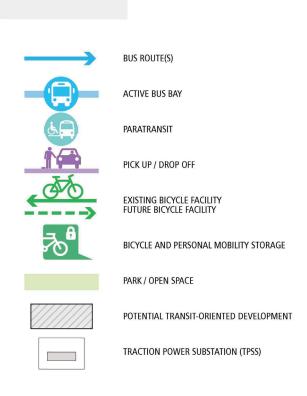
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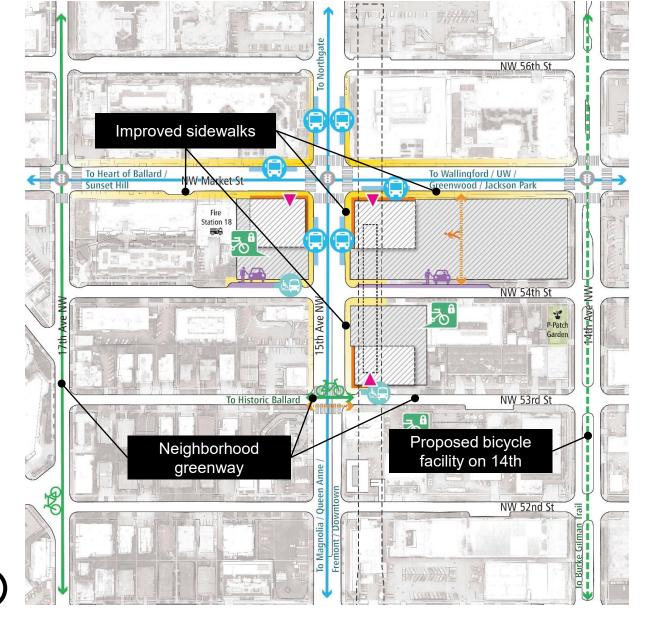


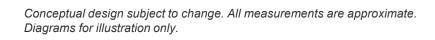




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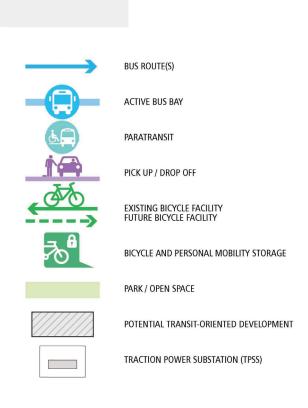


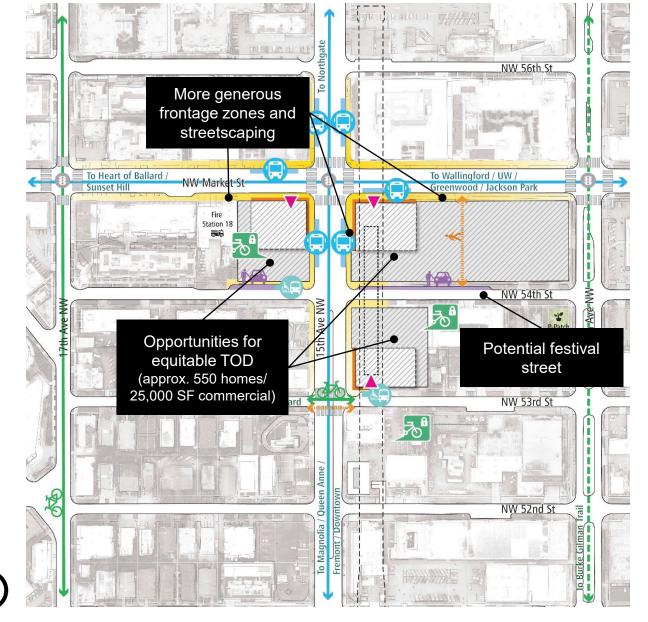






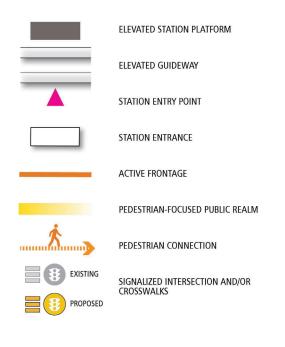
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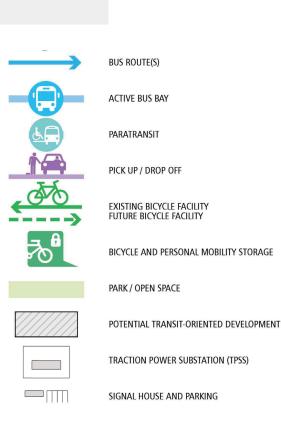






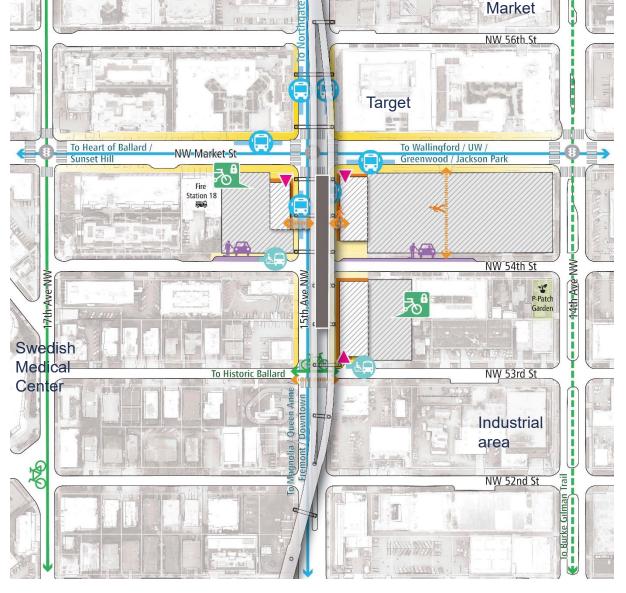
# Other Draft EIS alternatives







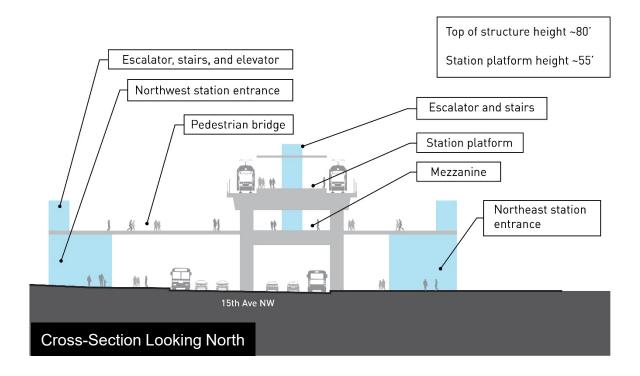




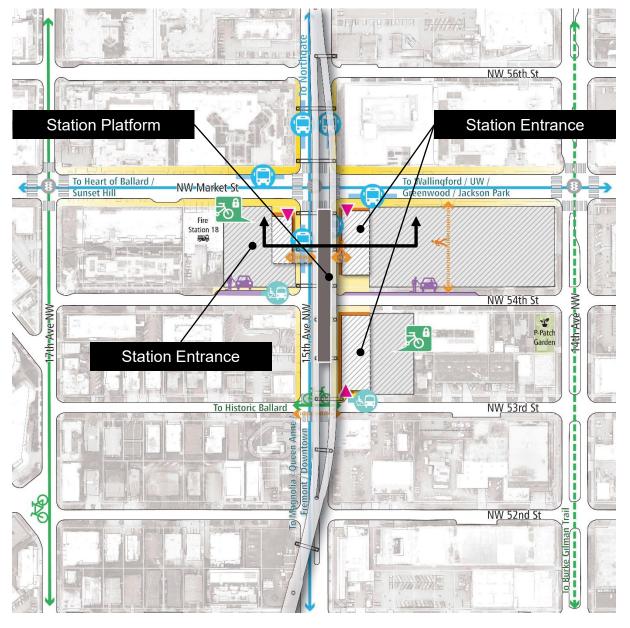
Conceptual design subject to change. All measurements are approximate. Diagrams for illustration only.

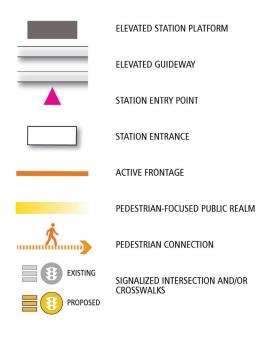


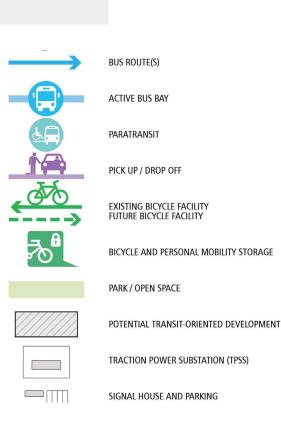
Ballard



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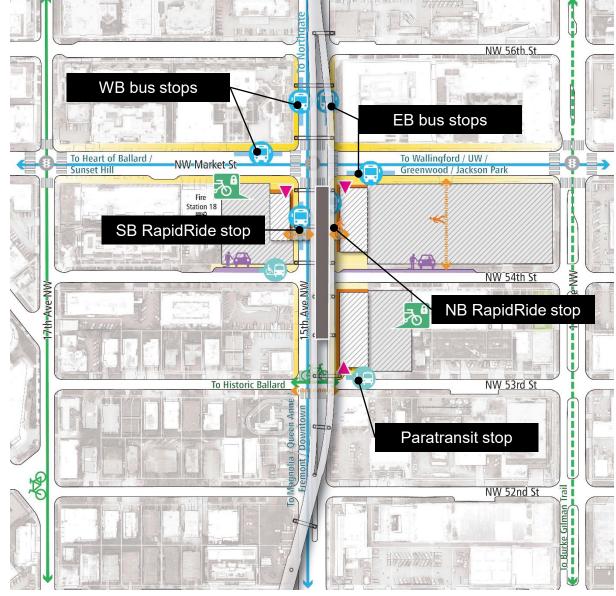






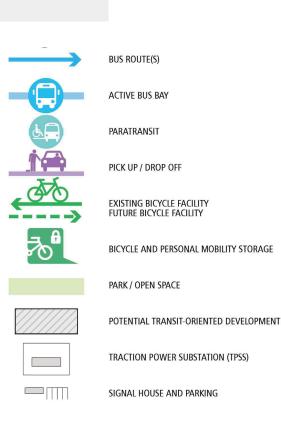




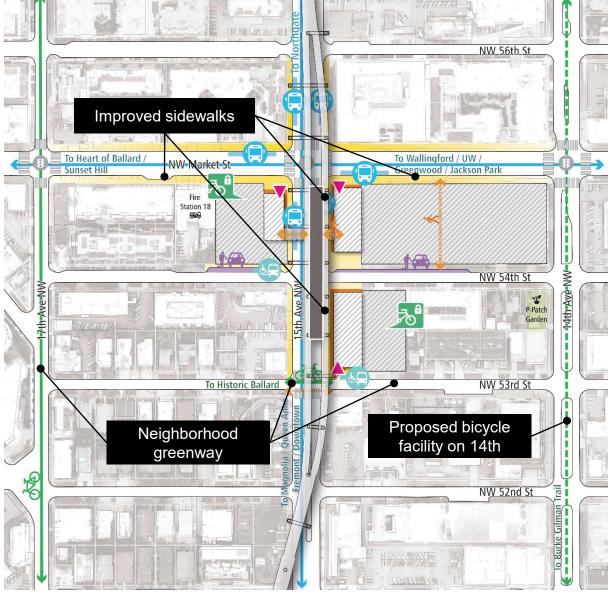




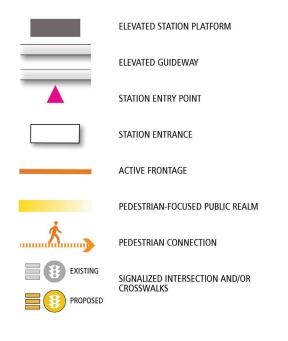


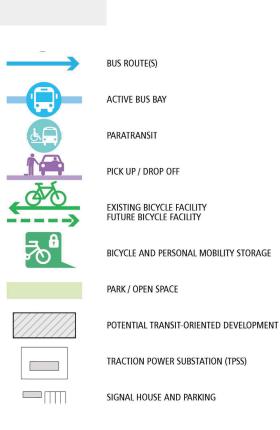




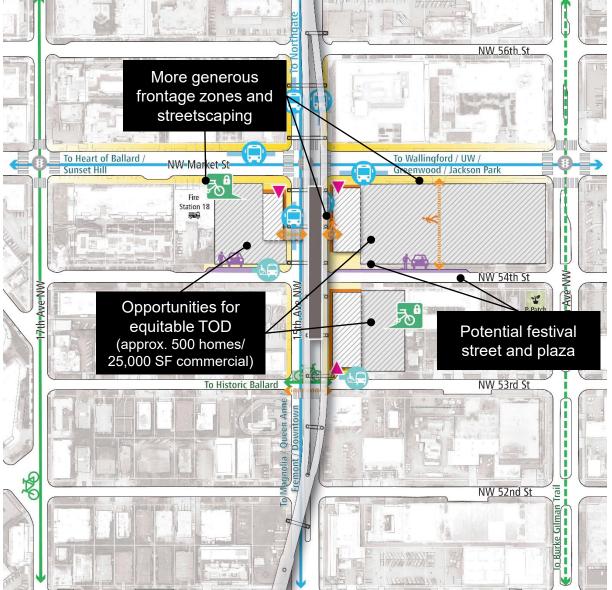
















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