



West Seattle and Ballard Link Extensions

DRAFT Stakeholder Advisory Group | 7.16.18

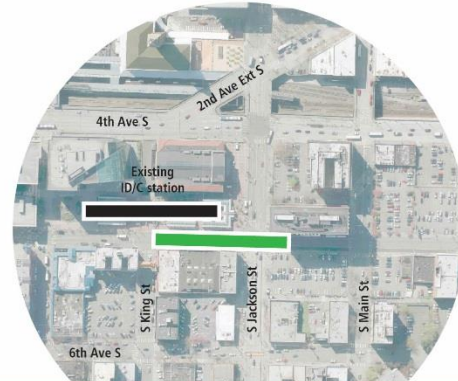


Chinatown-ID Evaluation Results



LEGEND

- ST3 representative project - West Seattle extension/Station area
- Massachusetts tunnel portal - West Seattle extension/Station area
- Surface E-3 - West Seattle extension/Station area
- Existing Link light rail
- Approximate portal location
- New roadway overcrossing
- Surface
- Elevated guideway
- Tunnel
- Surface station
- Elevated station



Station location alternative (straddle S Jackson St)

Note: applicable to both cut and cover and bored tunnel alternatives



Bored tunnel alternative

Reduces in-street cut-and-cover construction from 1,600' to 400'

C-ID alignment and station alternatives

Additional feedback

SODO and Chinatown-ID

- Consider 4th Avenue location for Chinatown-ID station
- Explore alignments further west of ST3 Representative Project



Improve intermodal connections

Activate Union Station

Minimize Chinatown-ID construction impacts

Chinatown-ID community concerns



Desire for better and safer connection to King Street Station

Opportunity to partner on 4th Ave viaduct rebuild

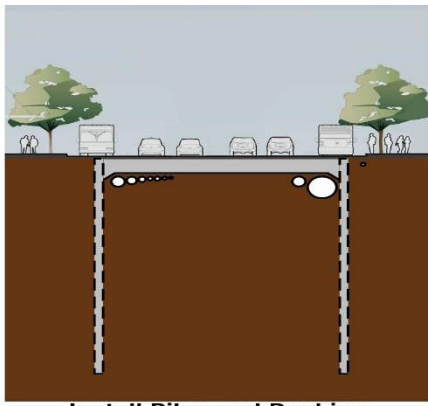
Avoid affordable housing impact

Traffic impacts of construction on 4th Ave

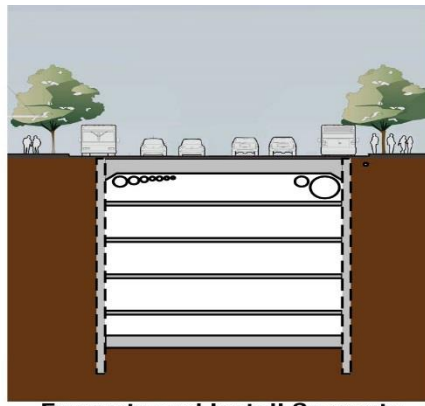
Trolley bus access

Avoid fire station and emergency operations center impact

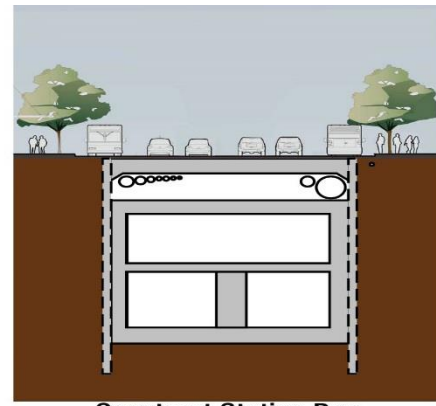
Agency workshop feedback



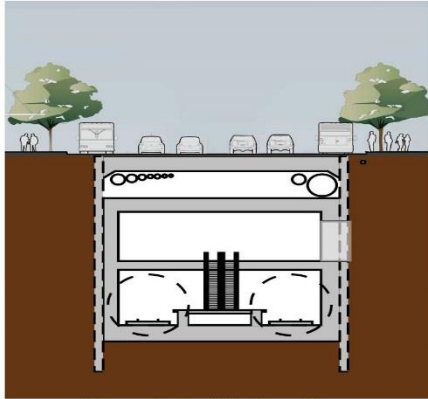
Install Piles and Decking



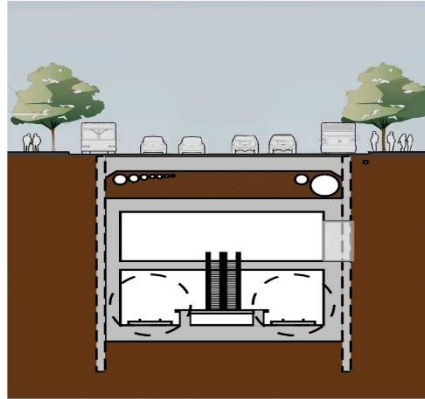
**Excavate and Install Supports
(from beneath decking)**



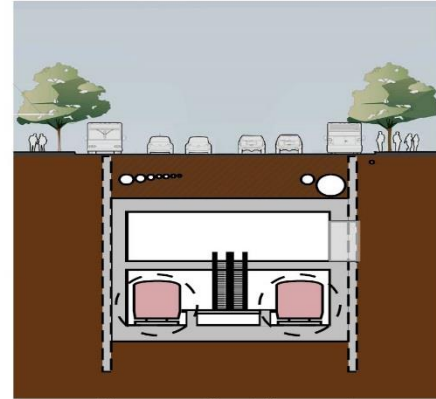
Construct Station Box



Complete Station Box

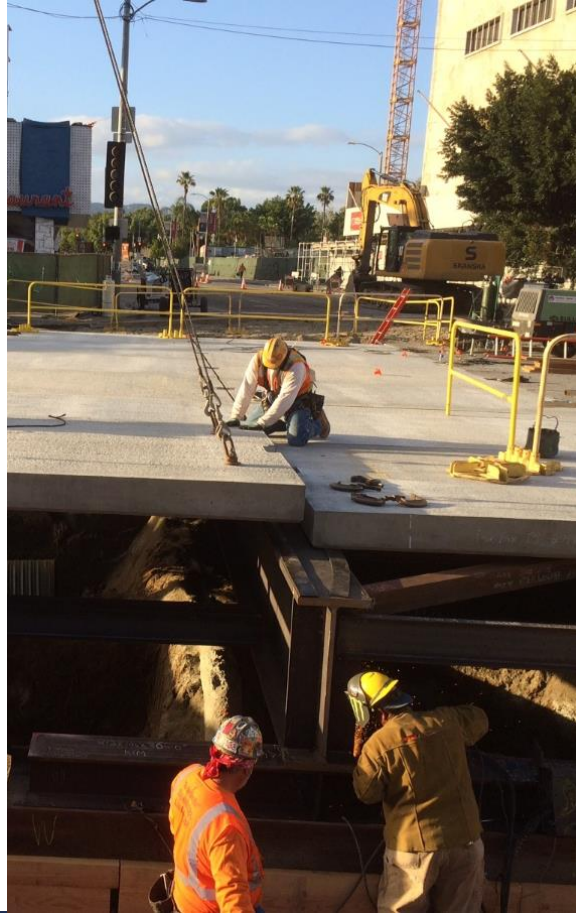


Backfill Above Structure

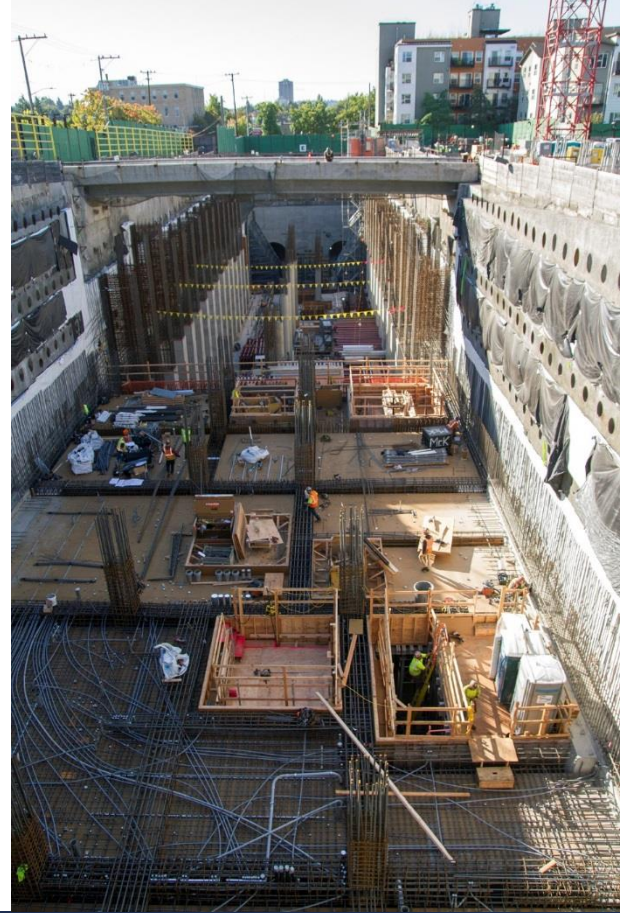
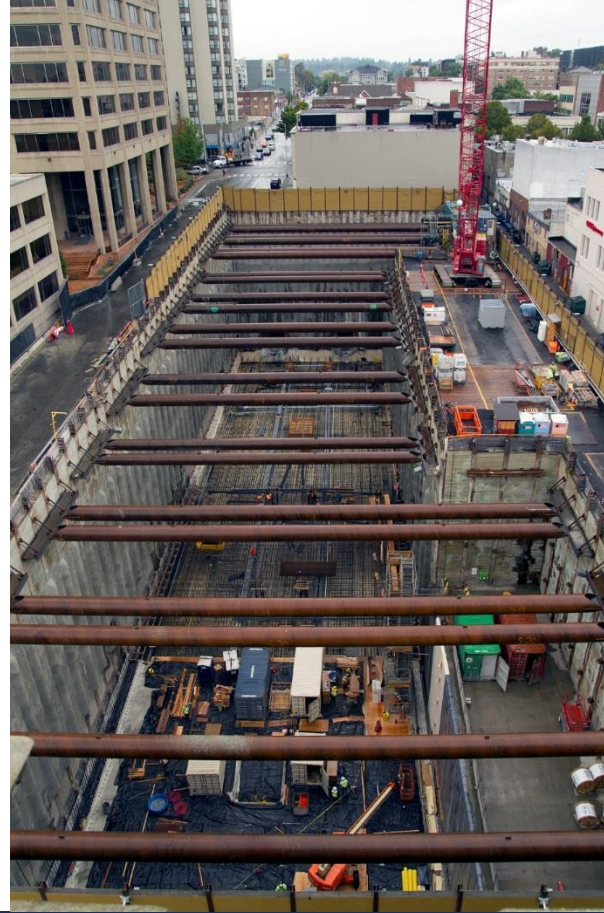


**Remove Decking and
Restore Street**

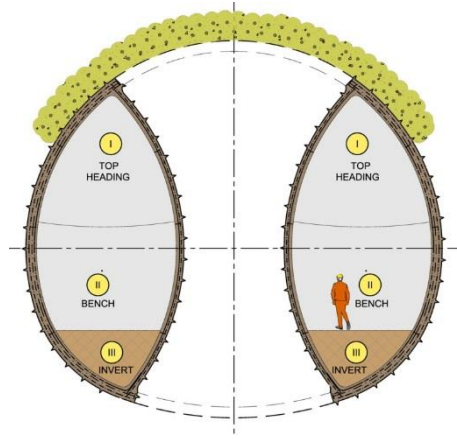
Cut and Cover Station Construction



Cut and Cover Station Construction



Open Cut Station Construction



Mined Station Construction

Underground Stations in Seattle

Cut-and-cover stations:

- Pioneer Square, University Street (DSTT)

Open-cut stations:

- U District, Roosevelt (Northgate Link)
- Capitol Hill, UW (U-Link)
- International District/Chinatown, Westlake, Convention Place (DSTT)

Mined stations:

- Beacon Hill (Central Link)

C-ID Station Construction Constraints

Initial technical challenges

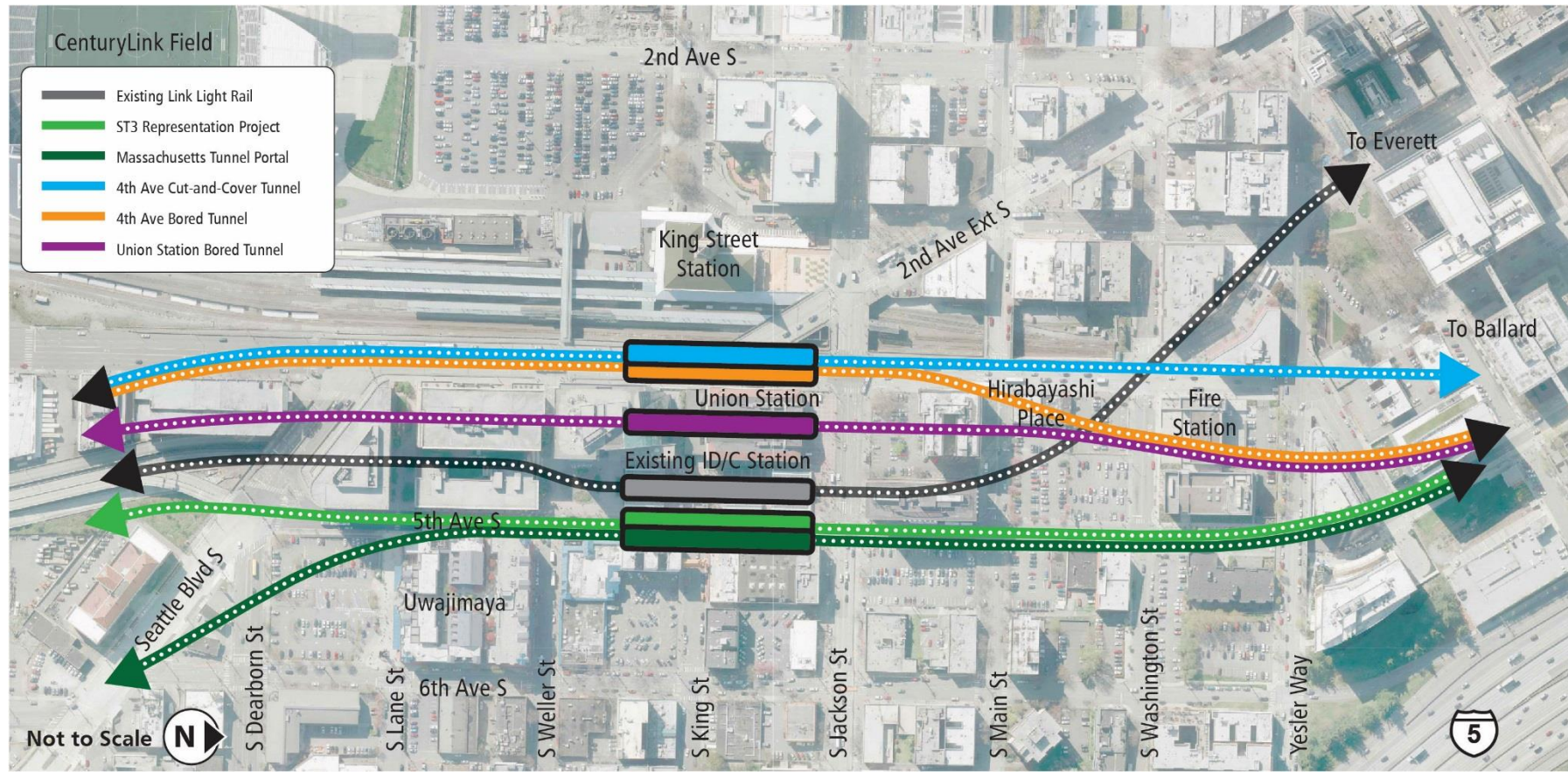
- Limited right-of-way
- Poor soil conditions
- Deep piles under 4th Ave, Union Station, existing ID/C Station
- Conflicts with existing DSTT structures

C-ID community concerns

- ✓ Minimize construction impacts
- ✓ Improve intermodal connections
- ✓ Activate Union Station

Construction constraints

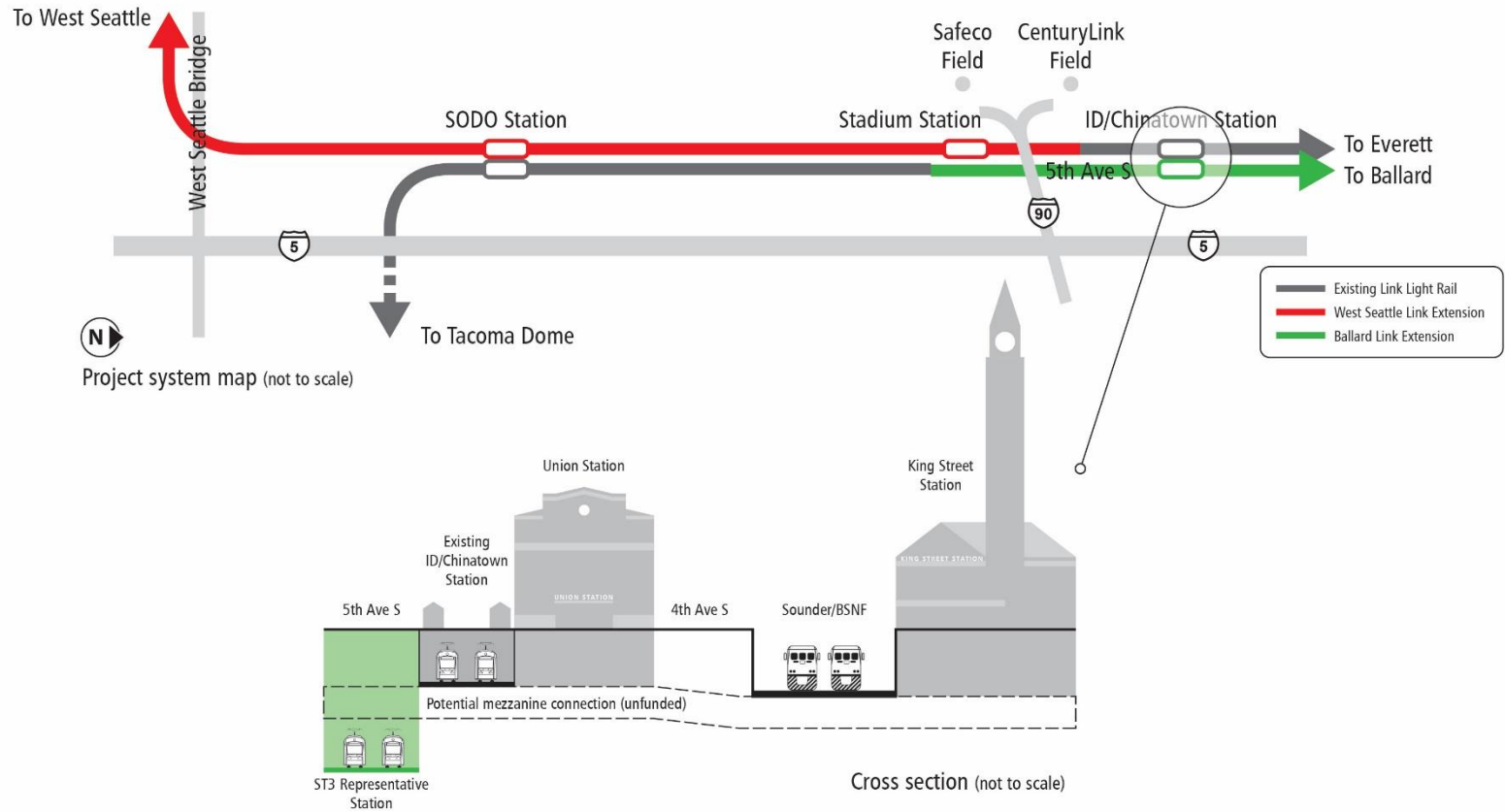
- ✓ Limited right-of-way
- ✓ Poor soil conditions
- ✓ Deep piles under 4th Ave, Union Station, ID/C Station
- ✓ Conflicts with existing DSTT structures



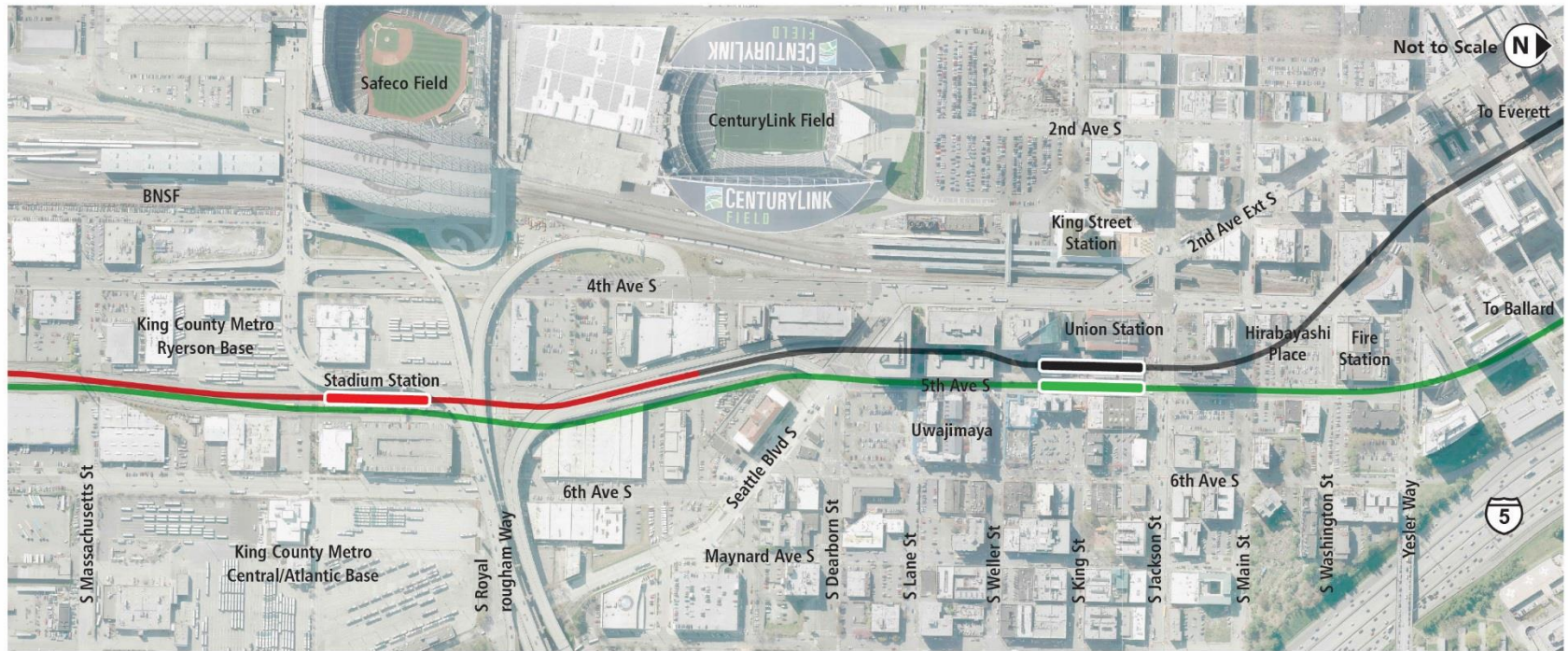
New Chinatown-ID Level 1 Alternatives

Potential C-ID Station Locations

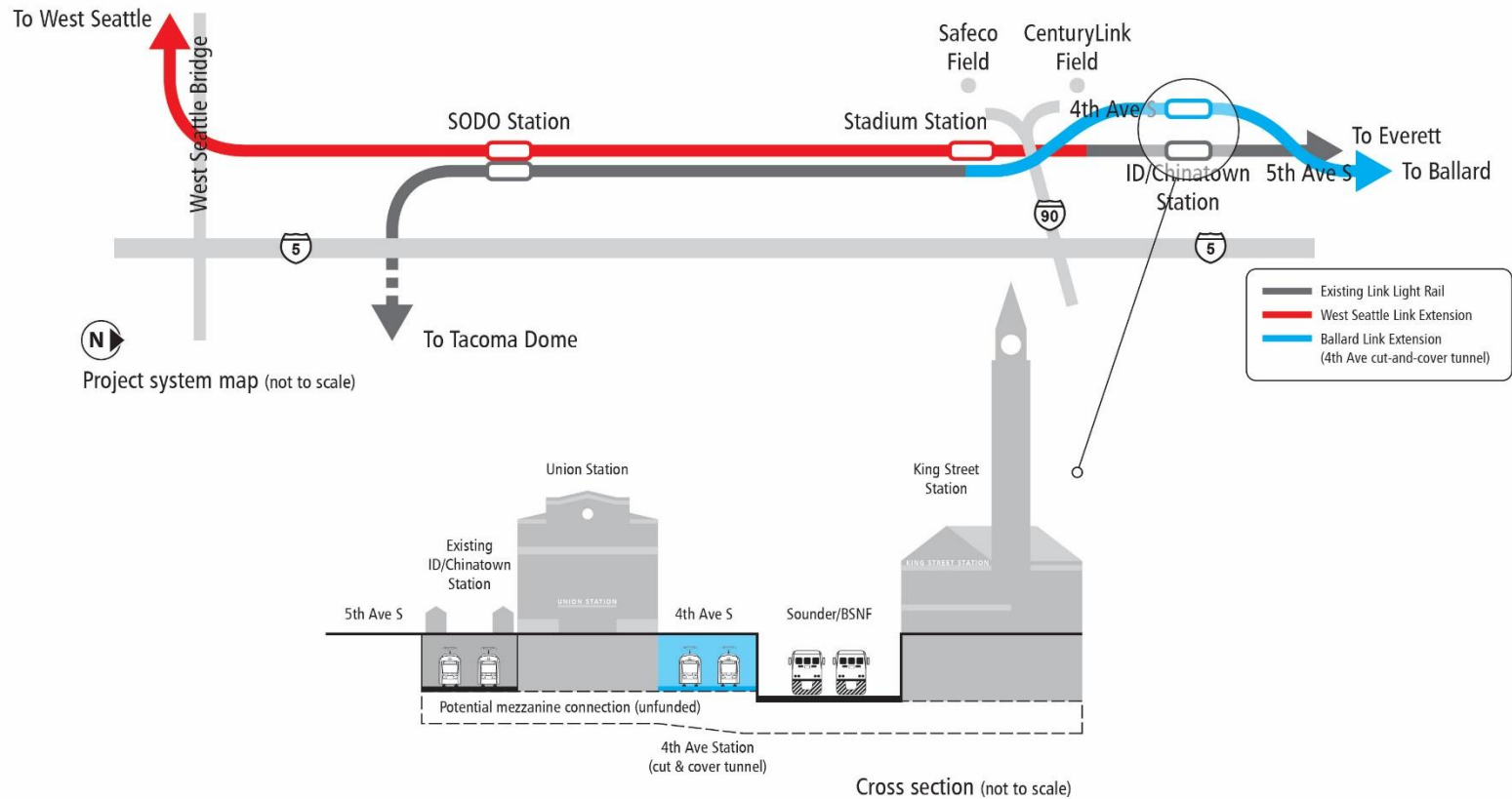
Tunnel / Station Type	5th Ave	4th Ave	Union Station
Cut-and-cover Platform depth:	✓ (40-50')	✓ (30-40')	✗
Bored / mined Platform depth:	✓ (100-120')	✓ (150-200')	✓ (150-200')



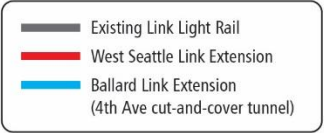
C-ID Station at 5th Ave S



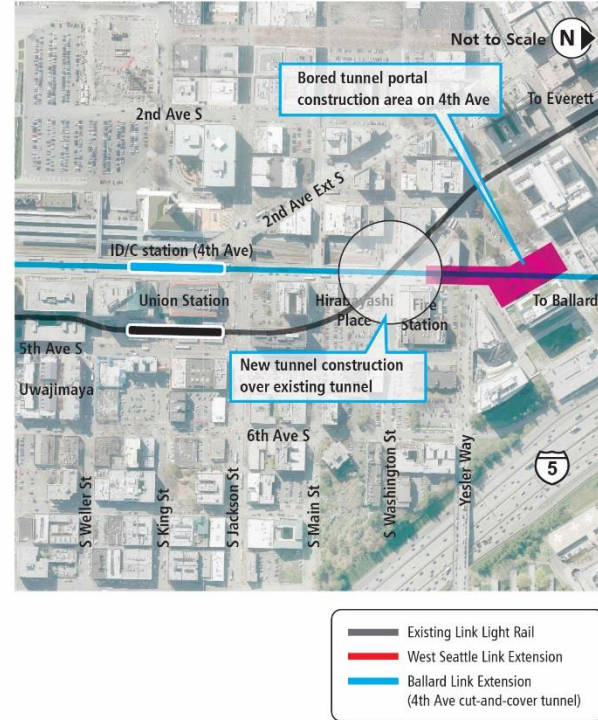
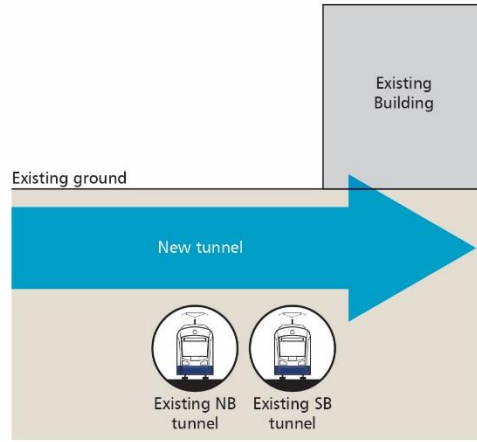
C-ID Station at 5th Ave S



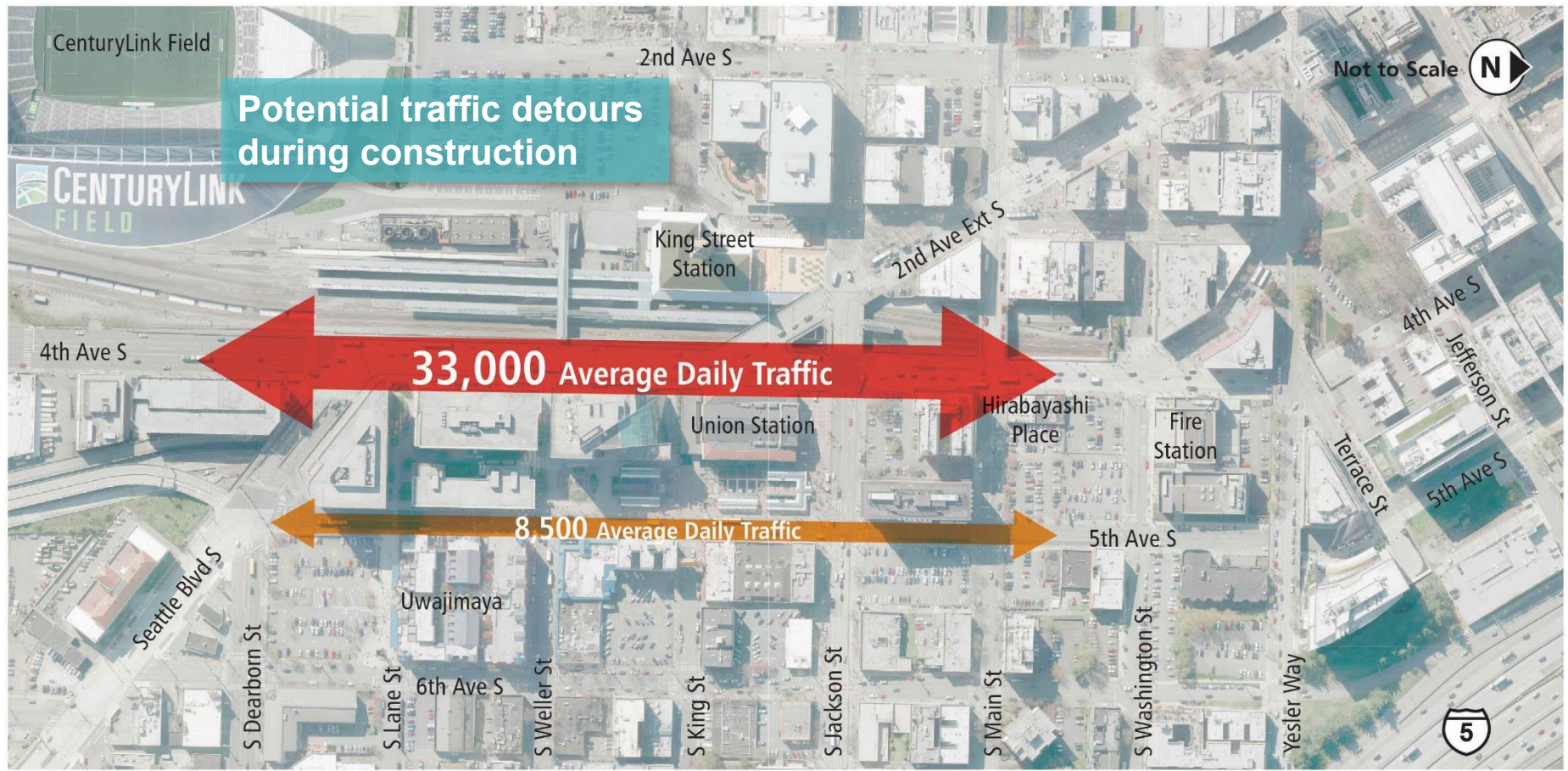
C-ID Station at 4th Ave S Cut-and-cover



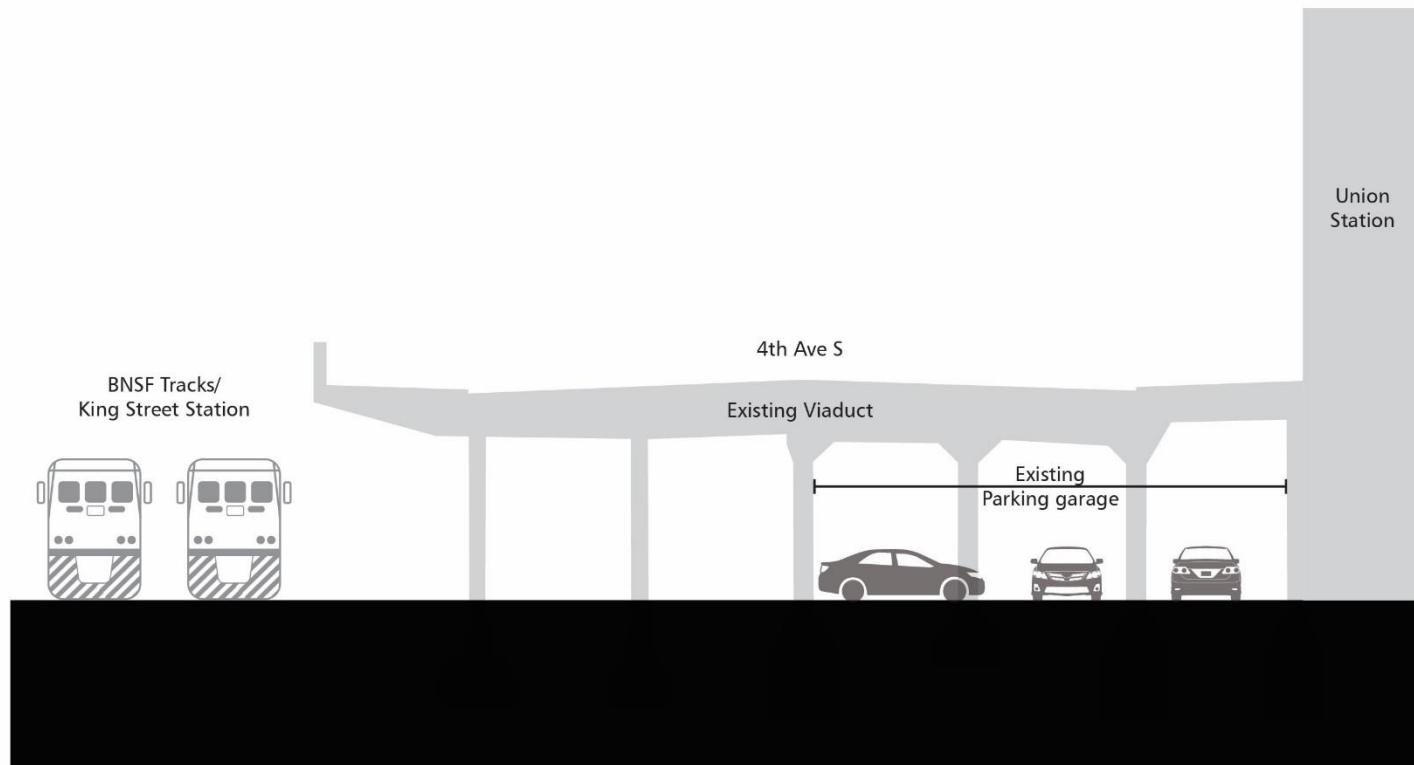
C-ID Station at 4th Ave S *Cut-and-cover*



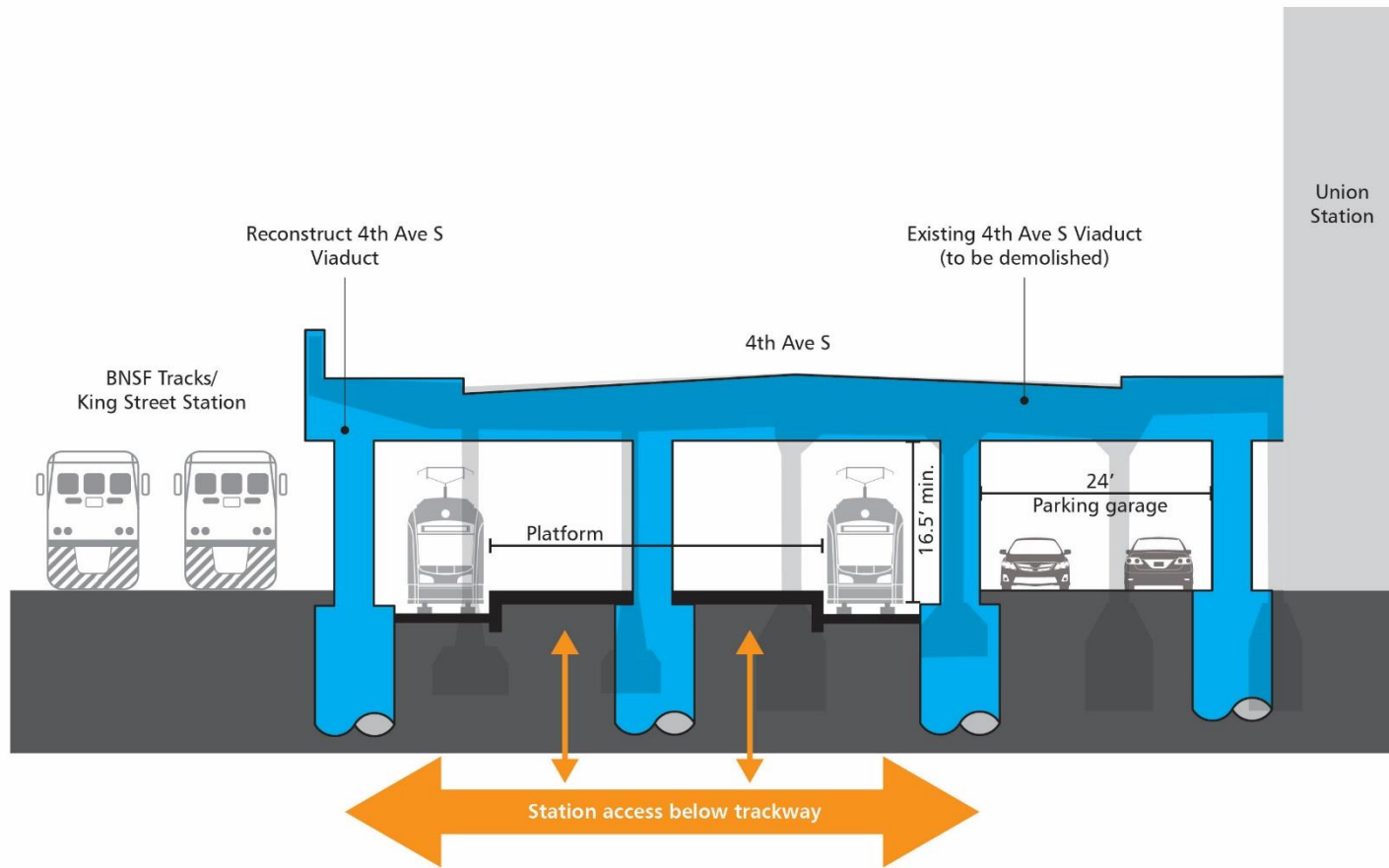
C-ID Station at 4th Ave S Cut-and-cover



Construction impacts/traffic diversion



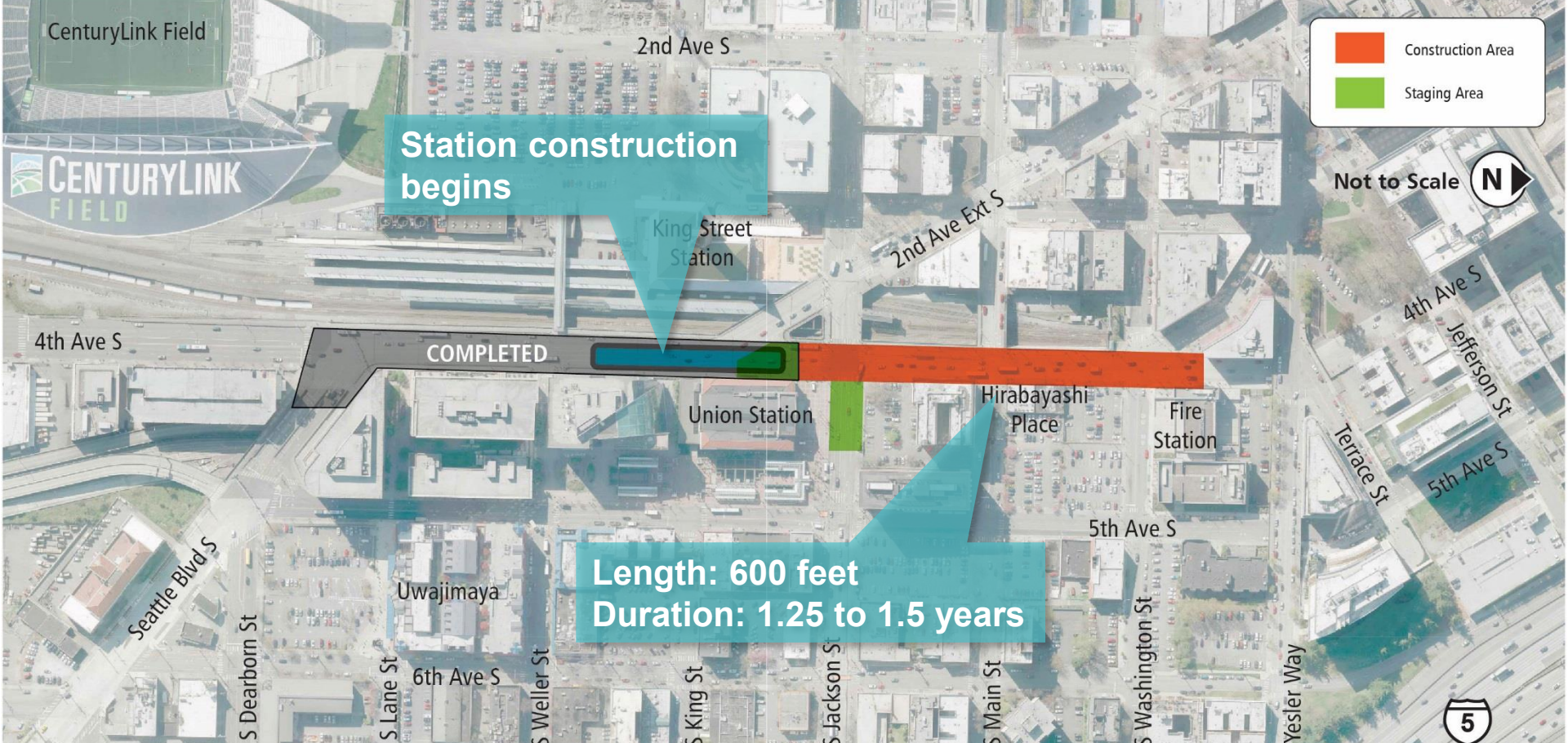
4th Ave Viaduct – *section looking north*



4th Ave Viaduct Rebuild – section looking north



4th Ave Cut-and-Cover construction Phase 1



4th Ave Cut-and-Cover construction Phase 2



4th Ave Cut-and-Cover construction Phase 3

CenturyLink Field

2nd Ave S

Not to Scale



Station construction continues
(1 year)

King Street
Station

2nd Ave Ext S

4th Ave S

Jefferson St

5th Ave S

4th Ave S

COMPLETED

Union Station

Hirabayashi
Place

Fire
Station

5th Ave S

Terrace St

Seattle Blvd S

Uwajimaya

6th Ave S

Total construction
duration: 4.5 to 5.5 years



S Dearborn St

S Lane St

S Weller St

S King St

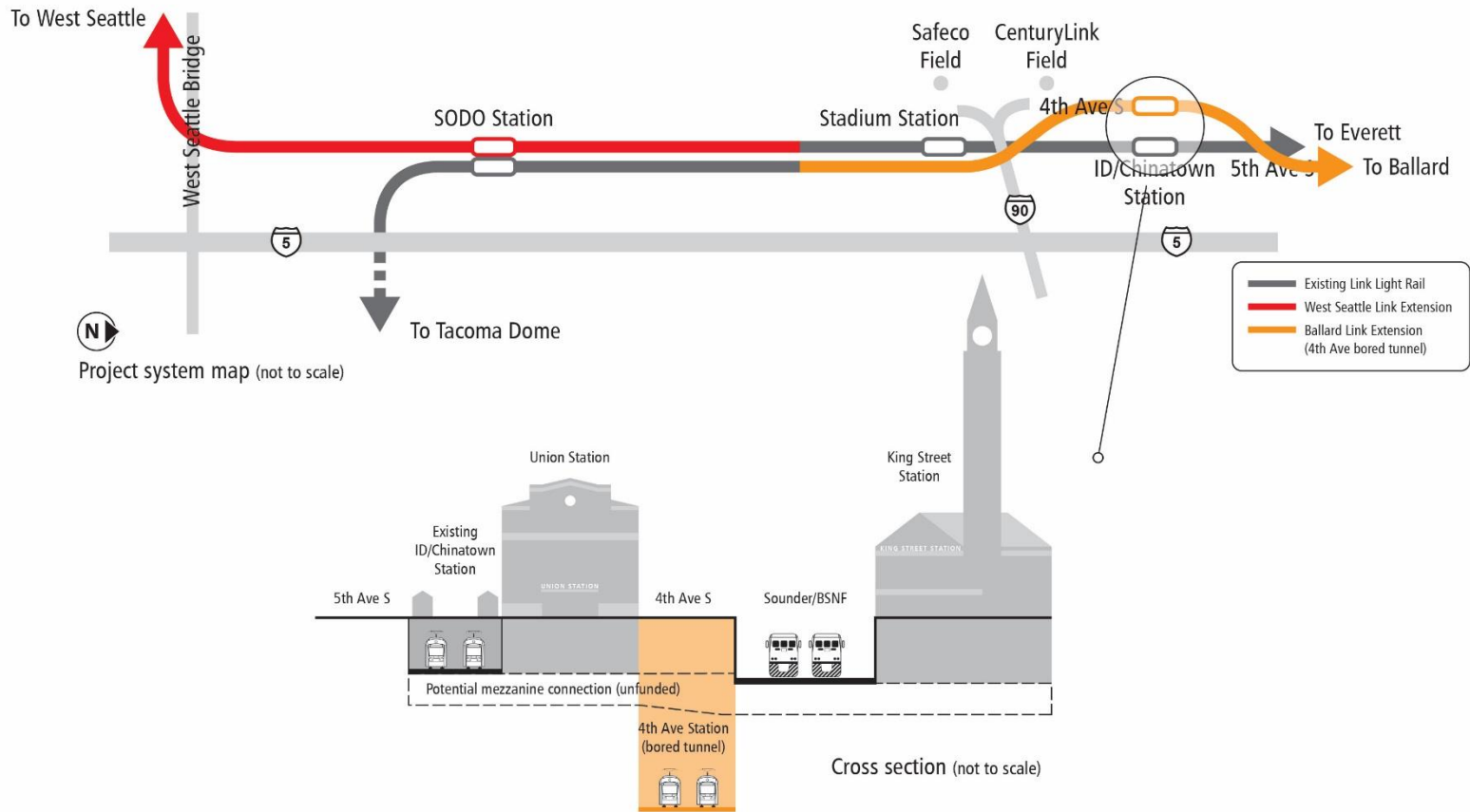
S Jackson St

S Main St

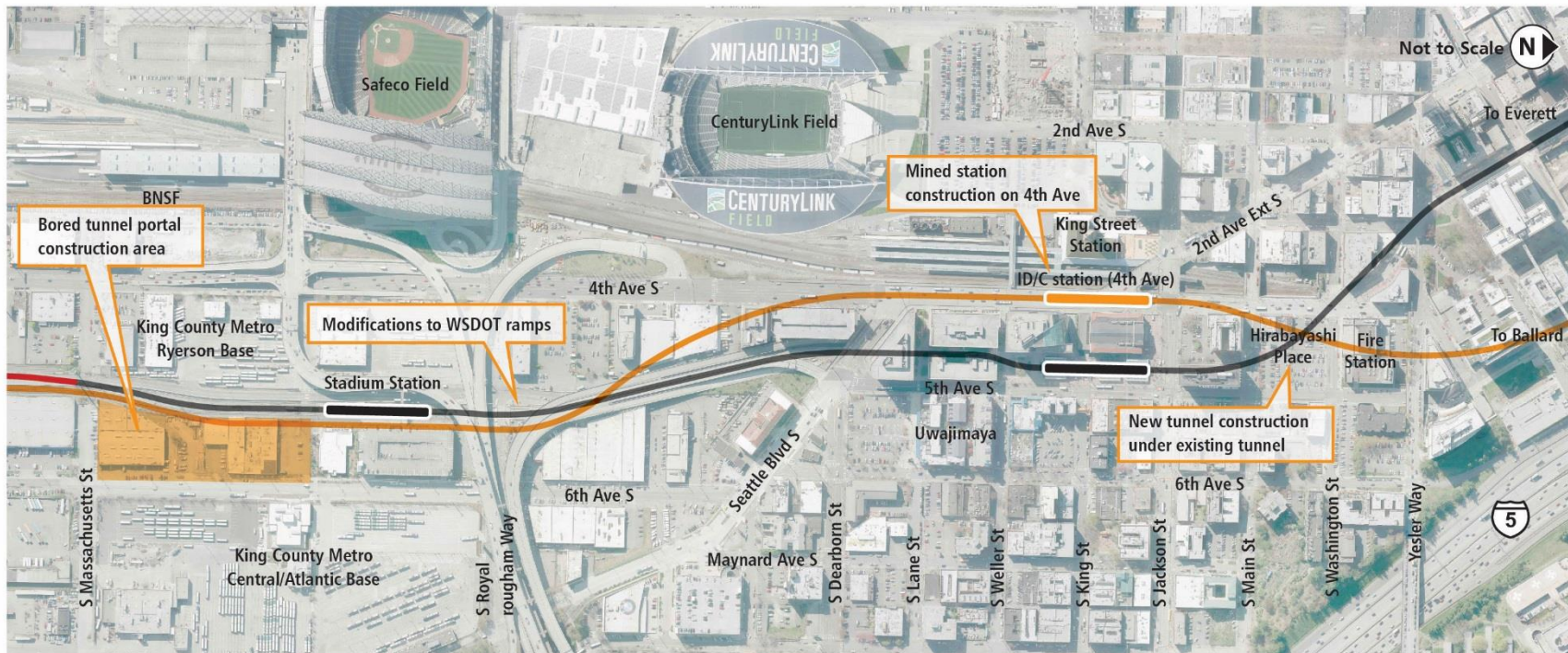
S Washington St

Yesler St

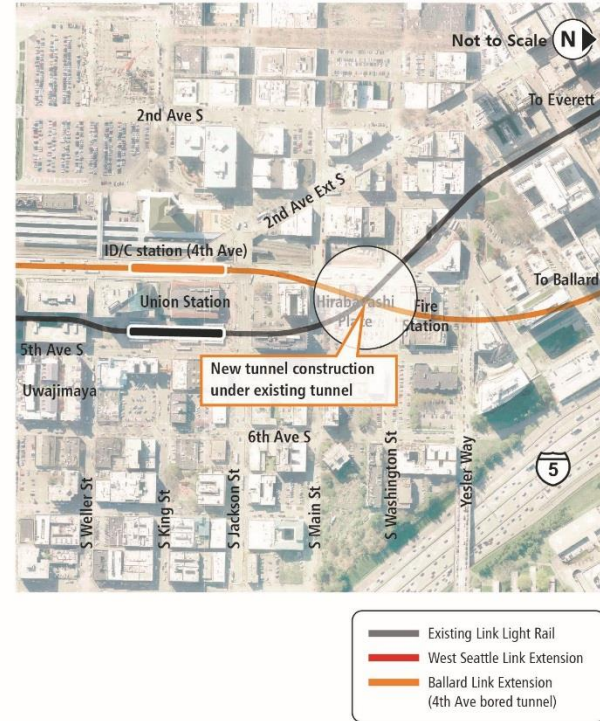
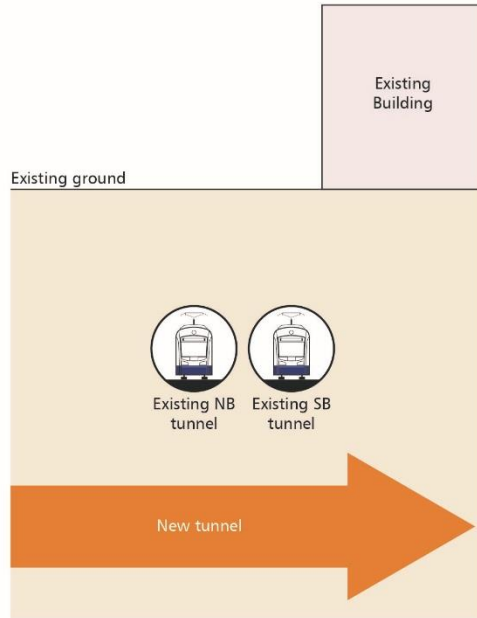
4th Ave Cut-and-Cover construction Phase 4



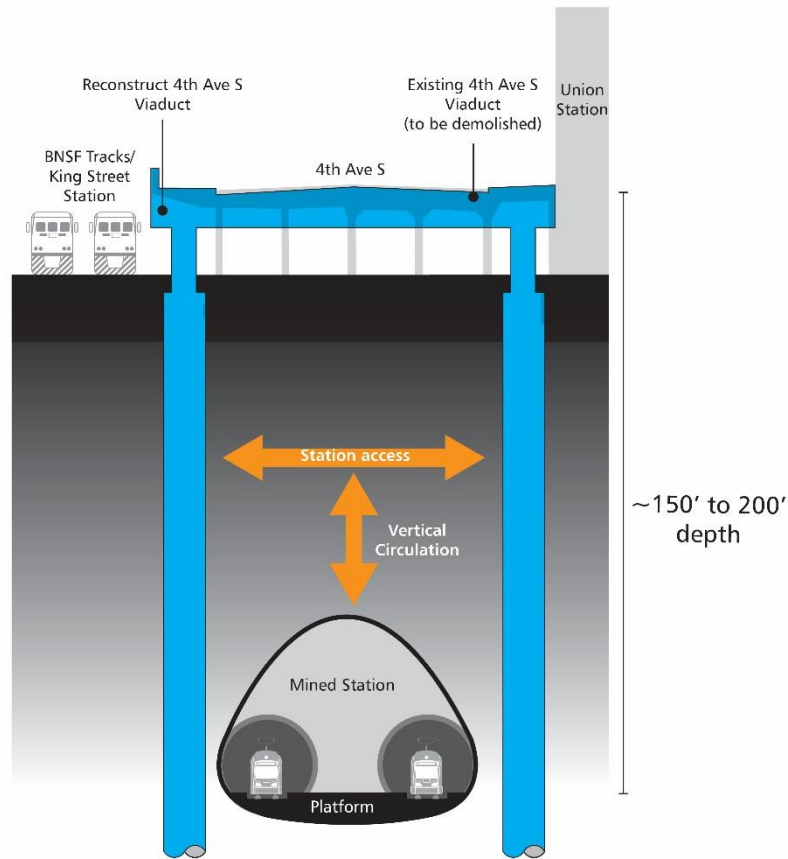
C-ID Station at 4th Ave S Bored tunnel



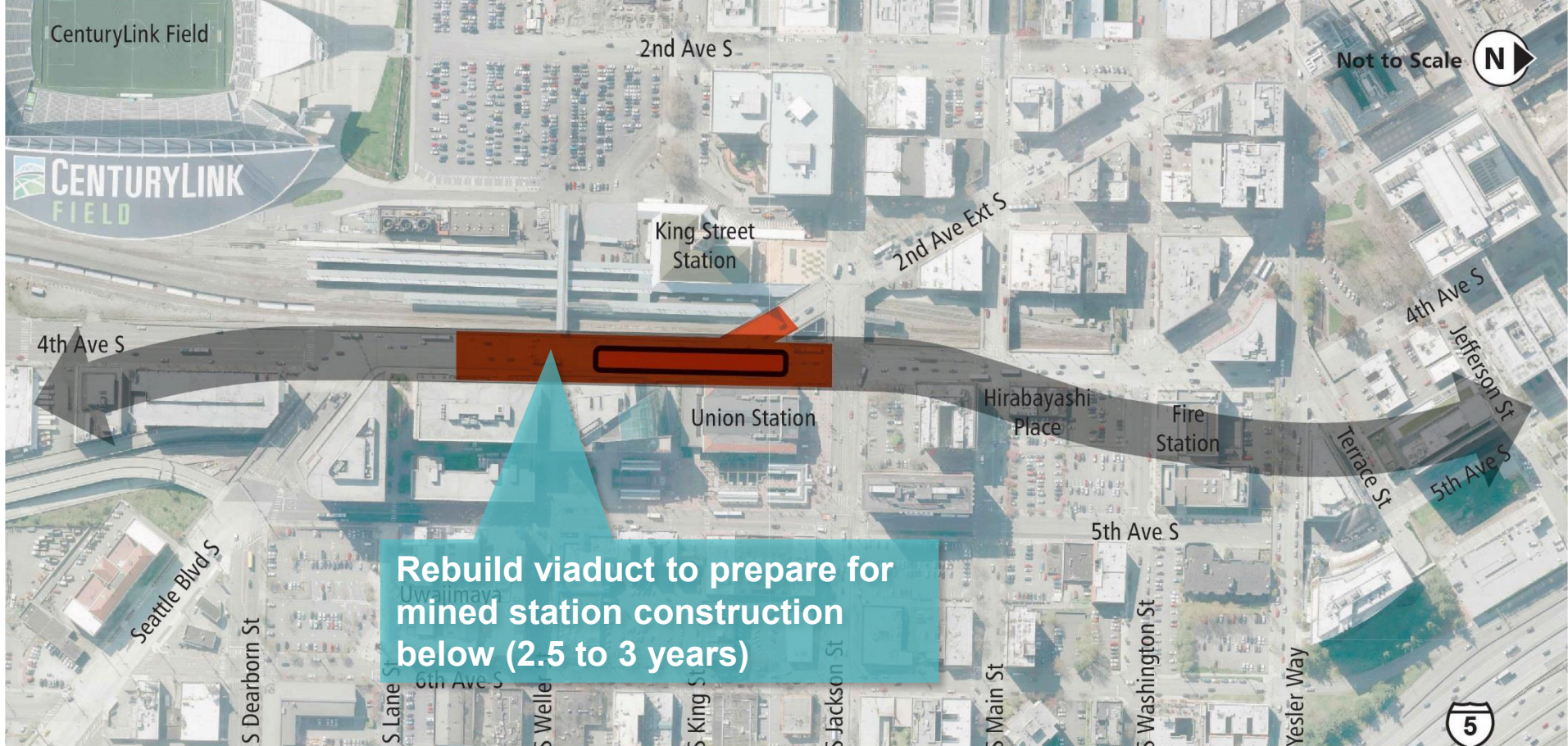
C-ID Station at 4th Ave S *Bored tunnel*



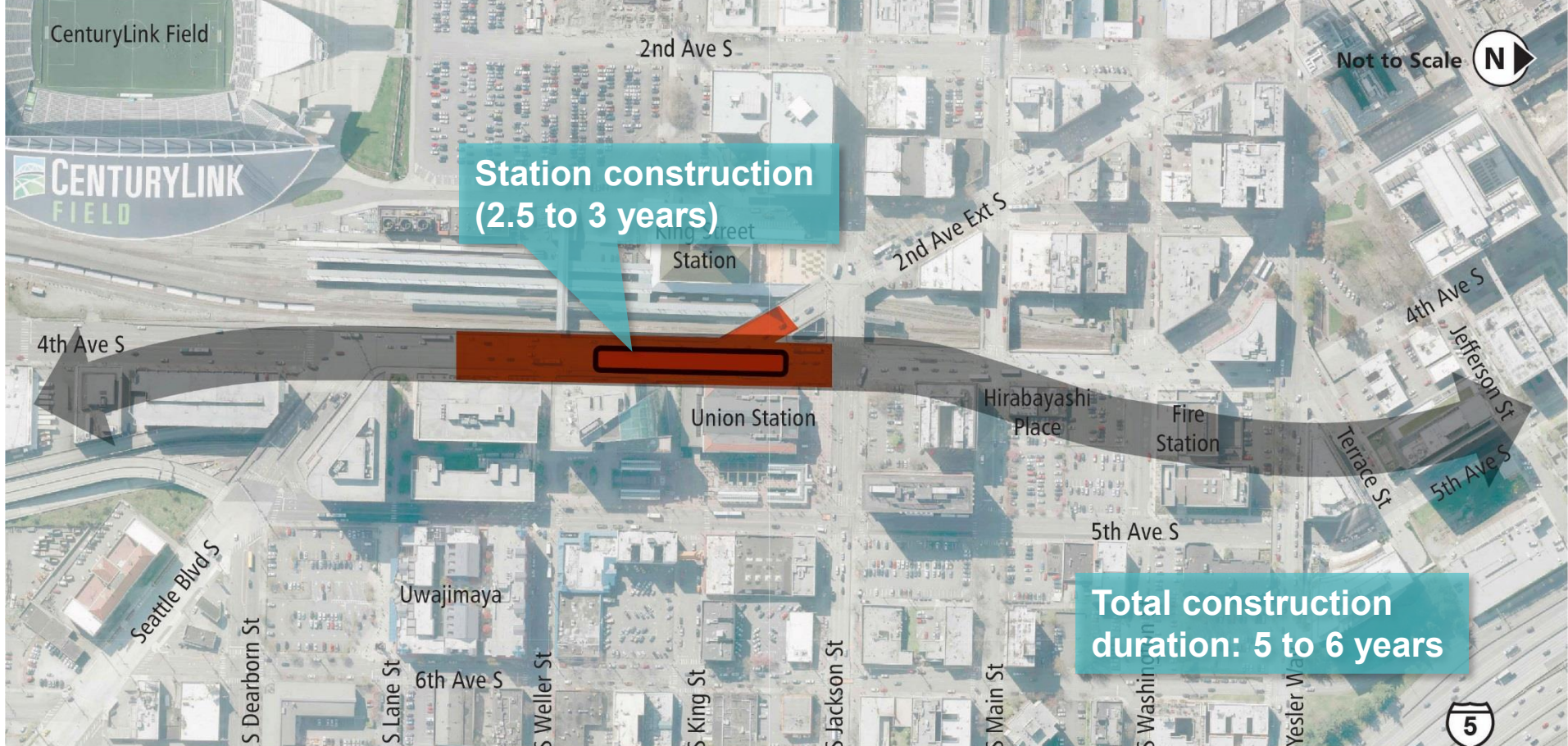
C-ID Station at 4th Ave S *Bored tunnel*



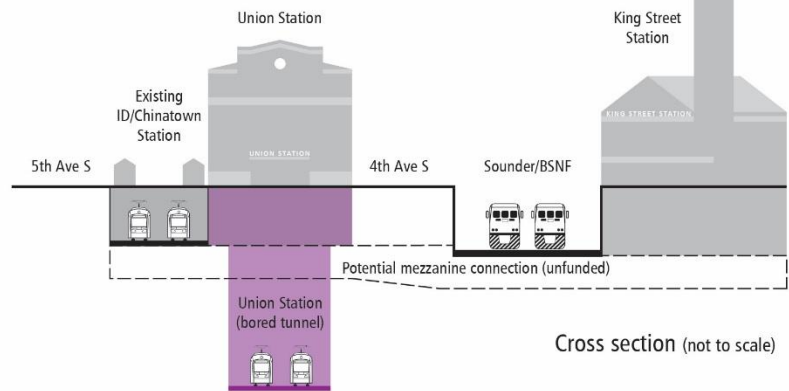
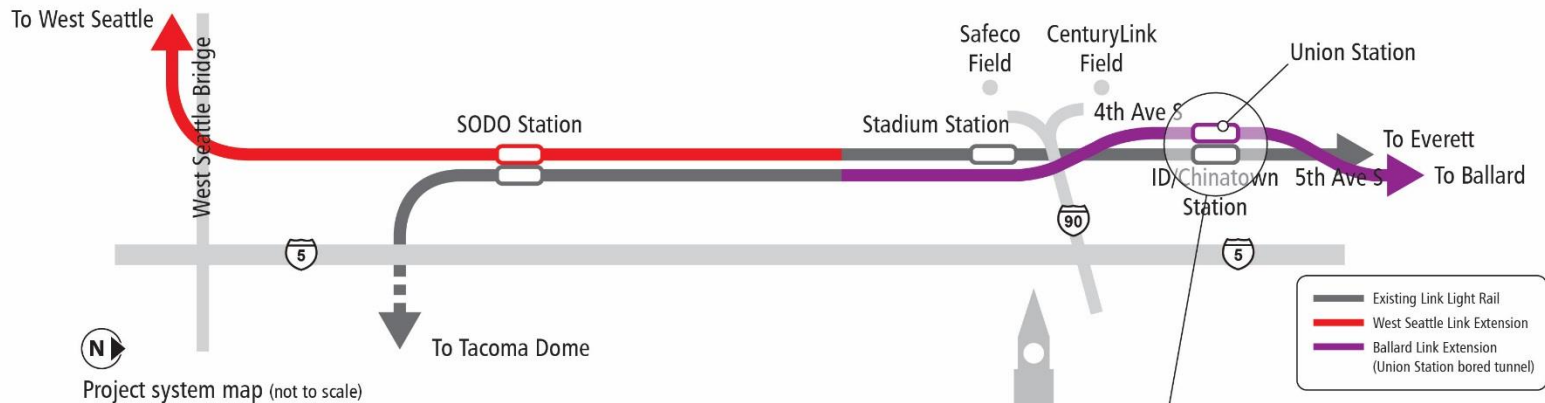
4th Ave Bored Tunnel Mined Station Construction



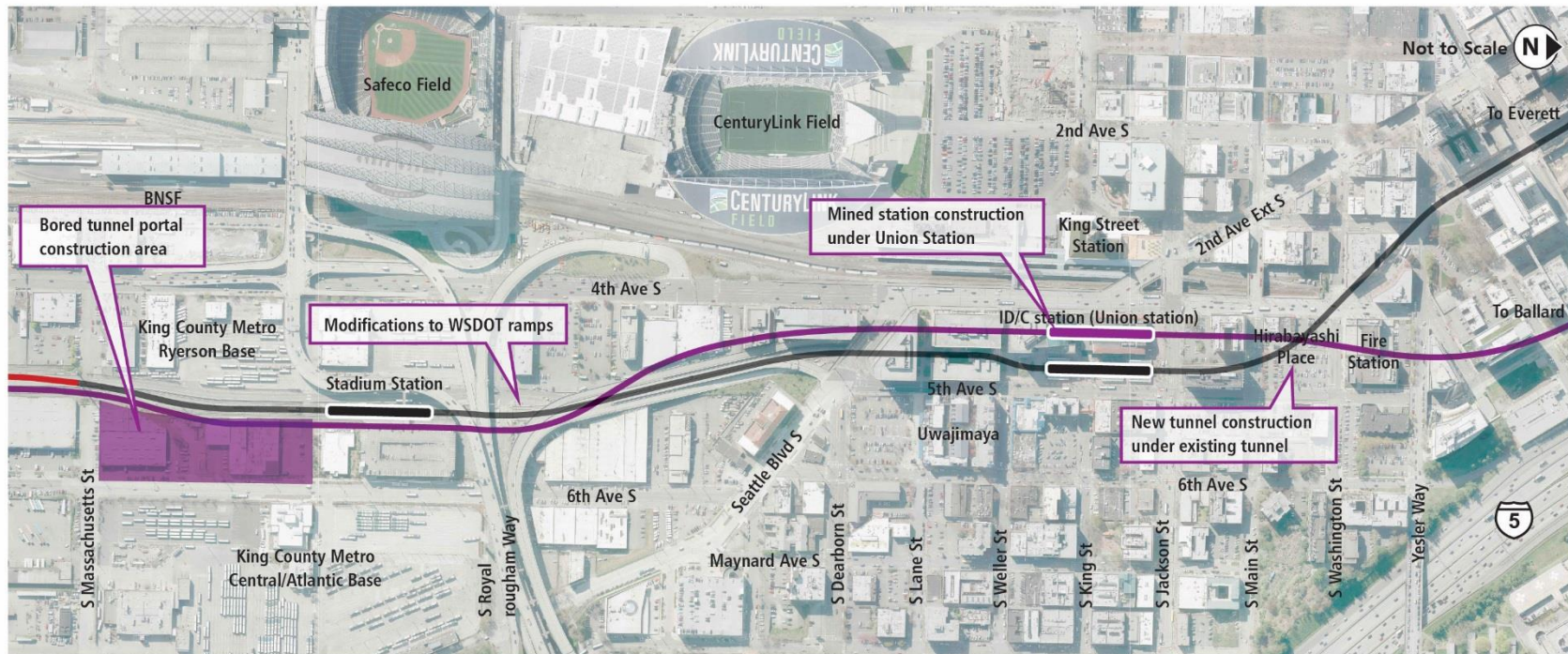
4th Ave Bored Tunnel – Construction Phase 1



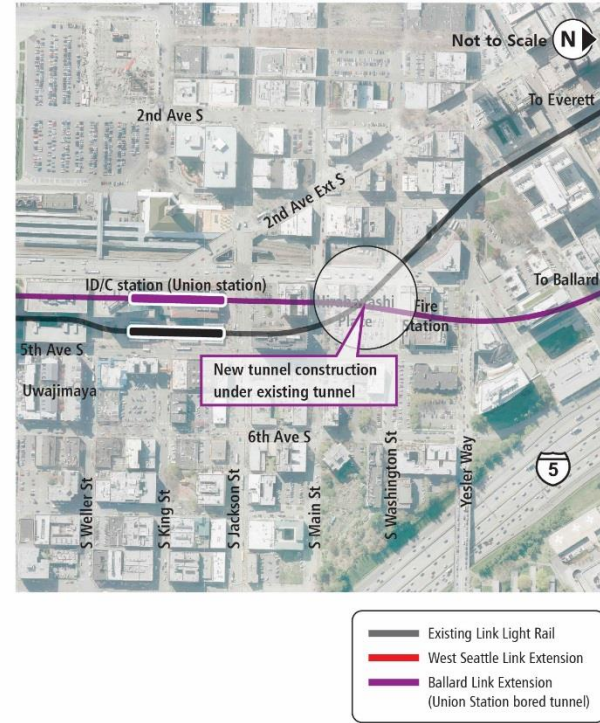
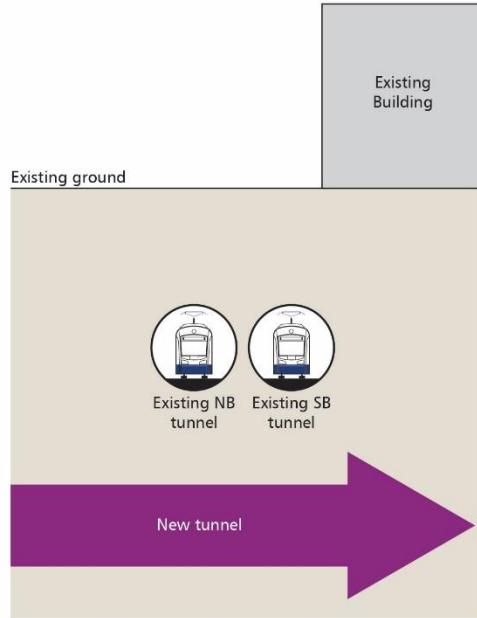
4th Ave Bored Tunnel – Construction Phase 2



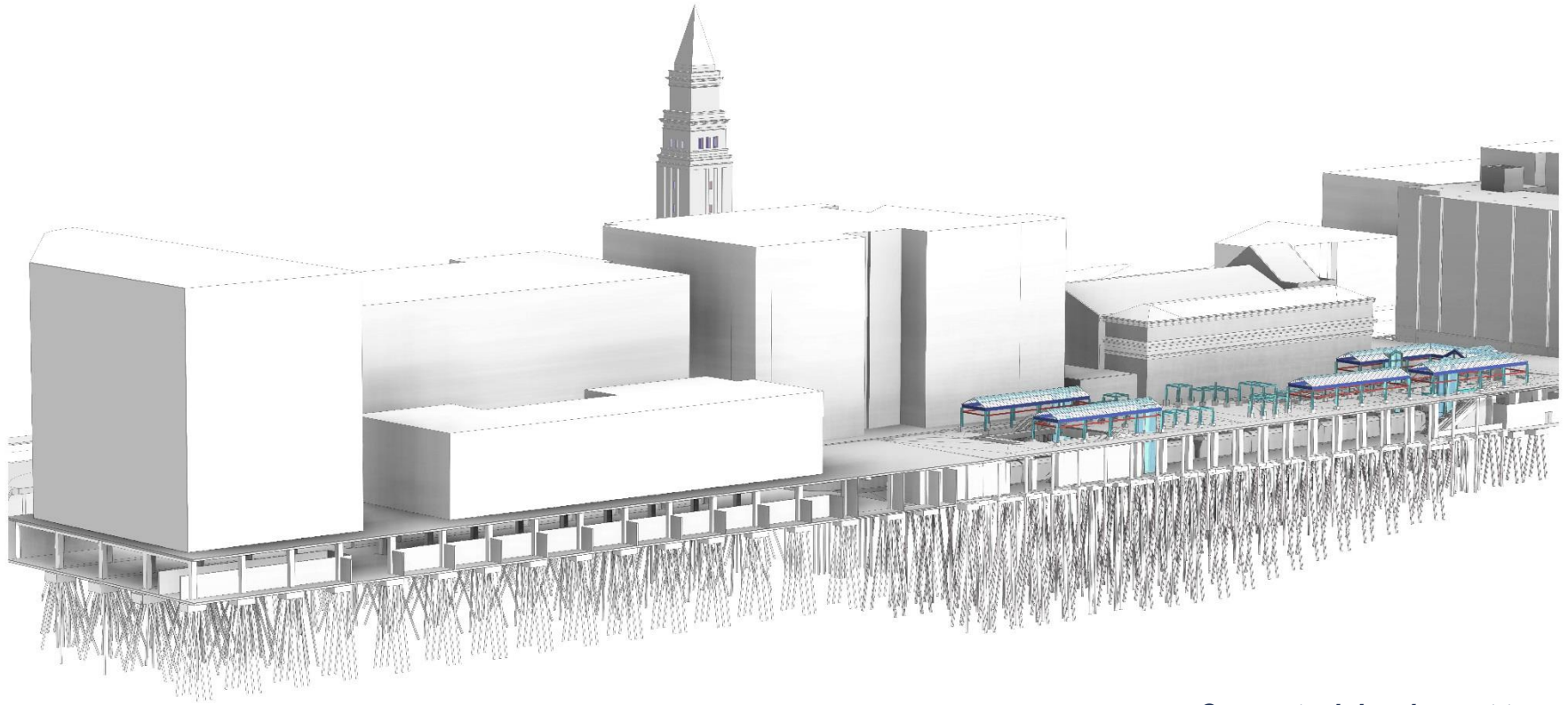
C-ID Station under Union Station Bored tunnel



C-ID Station under Union Station **Bored tunnel**



C-ID Station under Union Station Bored tunnel



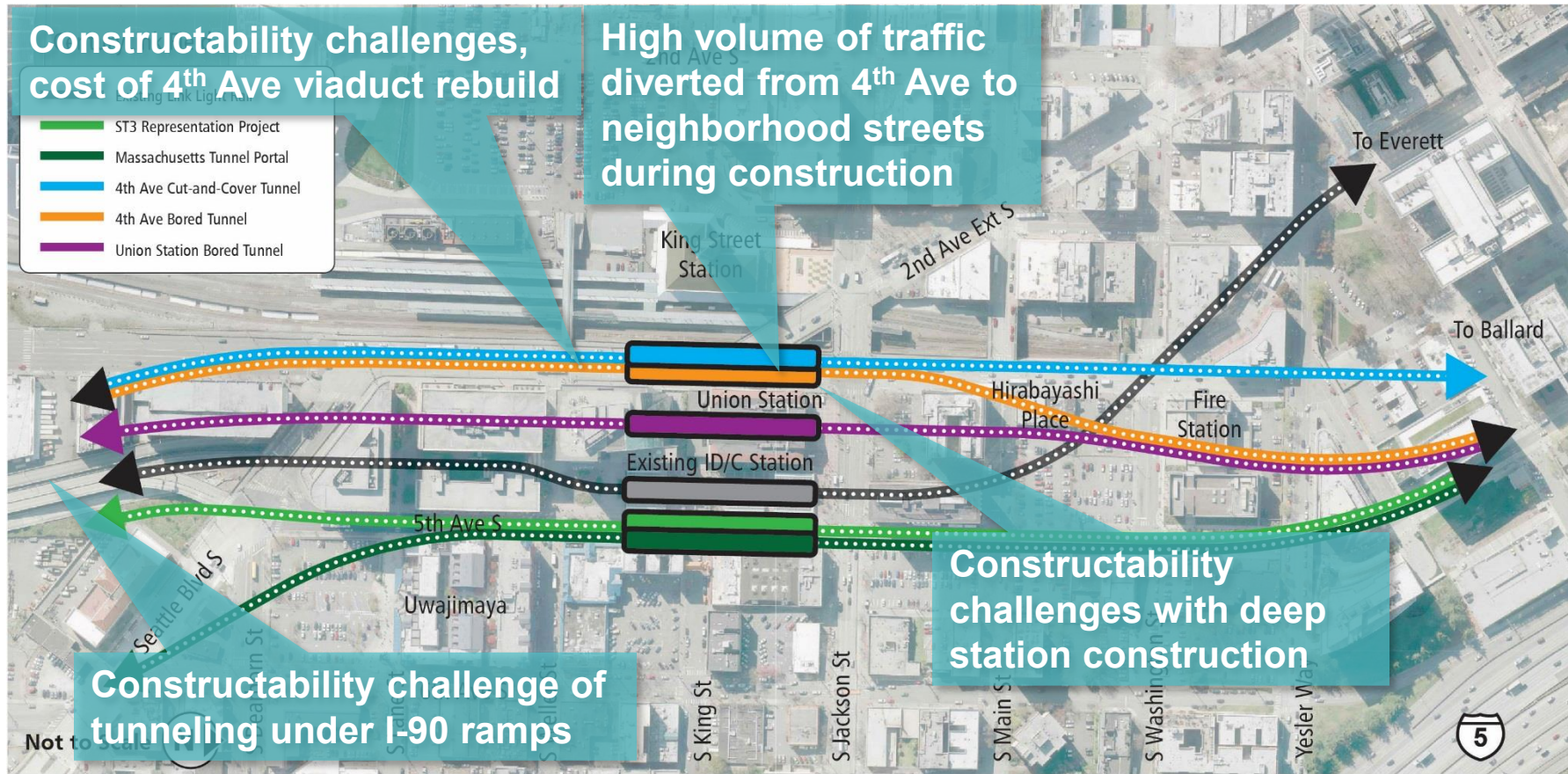
Conceptual drawing not to scale.

Piles under Union Station/IDS complex

Constructability challenges, cost of 4th Ave viaduct rebuild

- ST3 Representation Project
- Massachusetts Tunnel Portal
- 4th Ave Cut-and-Cover Tunnel
- 4th Ave Bored Tunnel
- Union Station Bored Tunnel

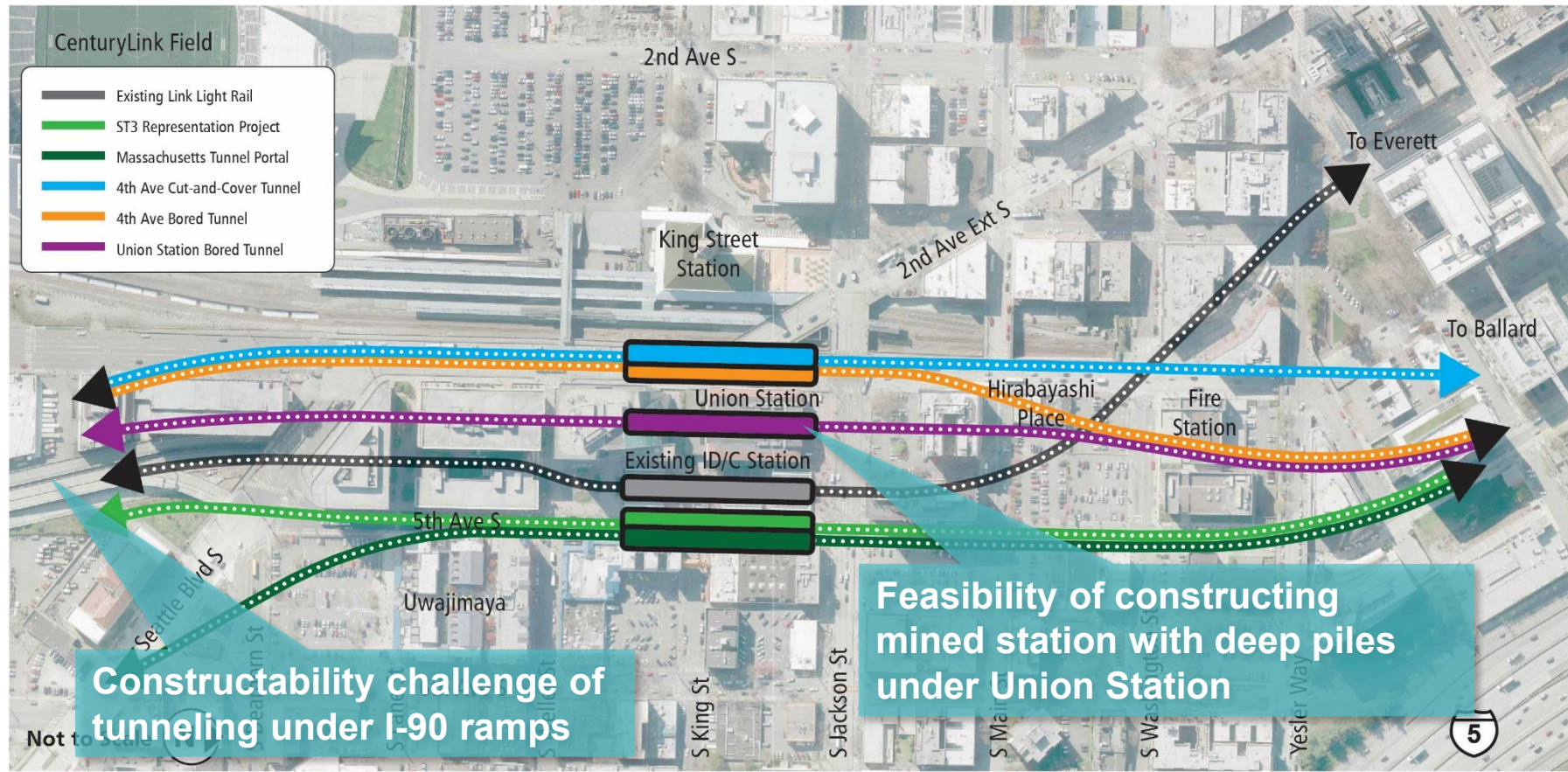
High volume of traffic
diverted from 4th Ave to
neighborhood streets
during construction



Constructability challenge of
tunneling under I-90 ramps

Constructability
challenges with deep
station construction

4th Ave Bored Tunnel – Key Findings



Union Station Bored Tunnel – Key Findings

C-ID Level 1 Alternatives – Evaluation Results

Evaluation Criteria and Measures																									
	Reliable Service	Travel Times	Regional Connectivity	Transit Capacity	Projected Transit Demand	Regional Centers Served	ST Long Range Plan Consistency	Mode, Route, and Station Locations (per ST3)	Potential ST3 Operating Plan Effects	Engineering Constraints	Constructability Issues	Operational Constraints	Qualitative Capital Cost Comparison	Historically Underserved Populations	Station Land Use Plan Consistency	Station Proximity to Urban Centers/Villages	Bus/Rail Integration	Bicycle/Pedestrian Connectivity	Station Area Development Potential	Protected Natural Resources	Burden on Underserved Populations	Traffic Circulation/Access	Freight Access	Business/Commerce	
5 th Ave Cut-and-Cover Tunnel and Station (ST3 Baseline)	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	
5 th Ave Bored Tunnel / Cut-and-Cover Station	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	
5 th Ave Bored Tunnel / Mined Station	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	○	○	⬤	○	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	
4 th Ave Cut-and-Cover Tunnel and Station	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	○	○	⬤	○	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	○	○	○	
4 th Ave Bored Tunnel / Mined Station	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	○	○	⬤	○	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	○	○	○	
Union Station Bored Tunnel / Mined Station	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	○	○	⬤	○	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	⬤	
⬤ Higher Performance													⬤ Comparable Performance										○ Lower Performance		

C-ID Level 1 Alternatives – Evaluation Results

Evaluation Criteria and Measures

Complex engineering, difficult and higher cost construction associated with deep mined stations, 4th Avenue viaduct rebuild

Closer proximity to Sounder, but less convenient LRT transfers

	Reliable Service	Travel Times	Regional Connectivity	Transit Capacity	Projected Transit Demand	Regional Centers Served	ST Long Range Plan Consistency	Mode, Route, and Station Locations (per ST3)	Potential ST3 Operating Plan Effects	Engineering Constraints	Constructability Issues	Operational Constraints	Qualitative Capital Cost Comparison	Historically Underserved Populations	Station Land Use Plan Consistency	Station Proximity to Urban Centers/Villages	Bus/Rail Integration	Bicycle/Pedestrian Connectivity	Station Area Development Potential	Protected Natural Resources	Protected Built/Social Environment	Burden on Underserved Populations	Traffic Circulation/Access	Freight Access	Business/Commerce
5th Ave Cut-and-Cover Tunnel and Station (ST3 Baseline)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
5th Ave Bored Tunnel / Cut-and-Cover Station	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
5th Ave Bored Tunnel / Mined Station	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
4th Ave Cut-and-Cover Tunnel and Station	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
4th Ave Bored Tunnel / Mined Station	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Union Station Bored Tunnel / Mined Station	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

Reduced construction impacts offset by 4th Ave traffic detour impacts

Detours from 4th Avenue during construction affect traffic, freight







Feasibility of mined station construction under historic building with deep piles

Performance

☐ Comparable Performance

☐ Lower Performance

Chinatown-ID Alternatives Summary – Level 1

Alternatives with more potential	5 th Ave Cut-and-Cover Tunnel and Station (ST3/Baseline) 	<ul style="list-style-type: none"> • Baseline for comparison
	5 th Ave Bored Tunnel / Cut-and-Cover Station 	<ul style="list-style-type: none"> • Reduces extent of cut-and-cover construction impacts • Moved forward to Level 2
Alternatives with greater challenges	5 th Ave Bored Tunnel / Mined Station 	<ul style="list-style-type: none"> • Reduces extent of cut-and-cover construction impacts • Deep mined station construction technically challenging (platform 100 – 120' deep)
	4 th Ave Cut-and-Cover Tunnel and Station 	<ul style="list-style-type: none"> • 4th Ave viaduct rebuild; potential major traffic, freight, and transit mobility impacts • Construction detours could impact neighborhood streets • 4th Ave viaduct rebuild; requires third party funding • LRT service disruptions during construction over existing tunnel • Constructability challenge of tunneling under I-90 ramps
	4 th Ave Bored Tunnel / Mined Station 	<ul style="list-style-type: none"> • 4th Ave viaduct rebuild (at station); potential traffic, freight, and transit mobility impacts • Construction detours could impact neighborhood streets • Deep mined station construction under 4th Ave (platform 150 – 200' deep) • Property impacts of TBM portal site in E-3 busway
Not practical concept	Union Station Bored Tunnel / Mined Station 	<ul style="list-style-type: none"> • Deep piles under Union Station, existing ID Station and adjacent buildings require deep mined station (platform 150 - 200' deep) • Deep station precludes easy ped connections to IDS and King St. stations • Risk of settlement damage to landmark US building • Lacks construction staging and access shaft sites