

# **Alaskan Way Viaduct and Seawall Replacement Program**

**Ron Paananen**  
Program Administrator

**WASHTO 2009 Annual Meeting**  
**Seattle, WA**  
**July 11-14, 2009**

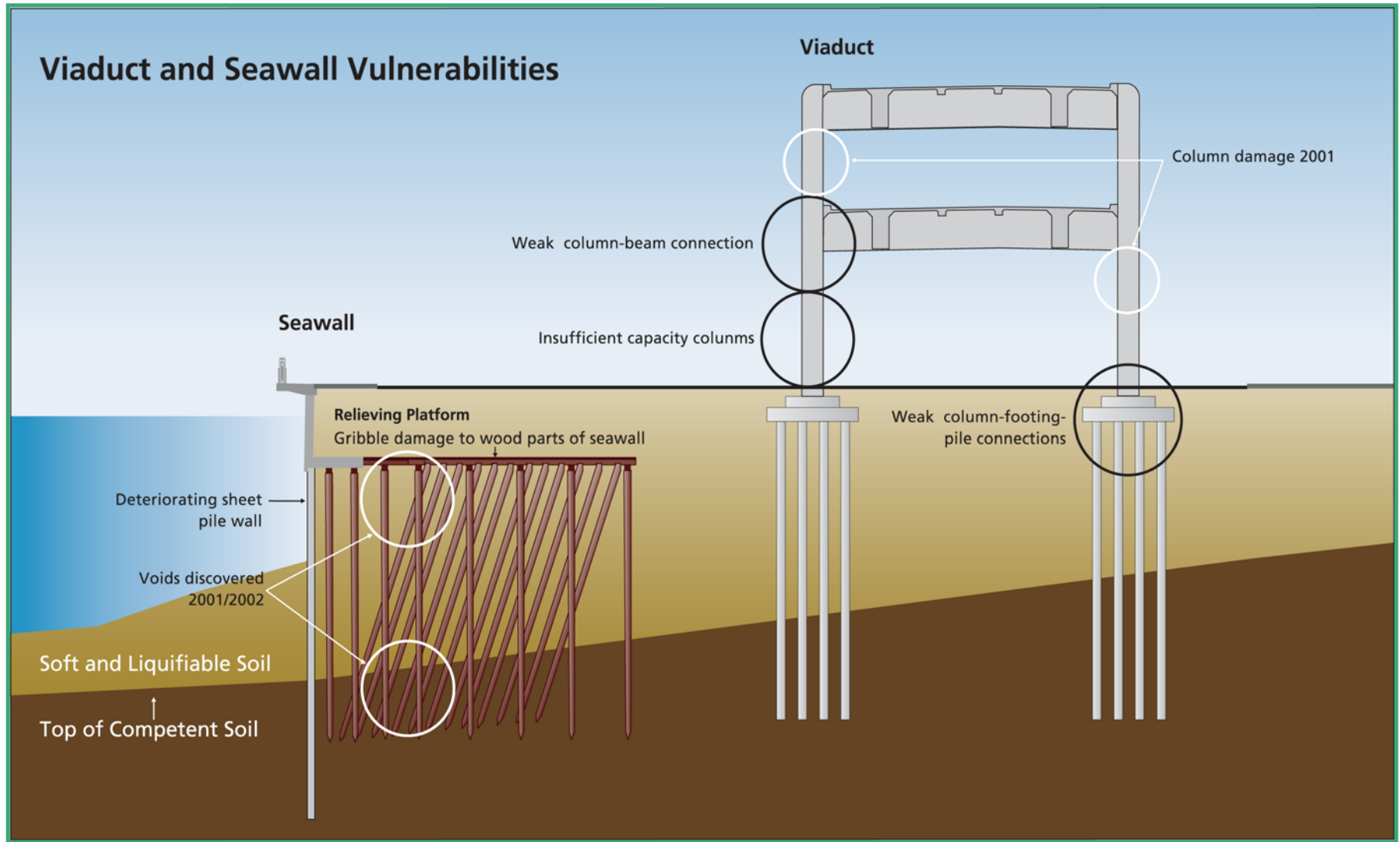


# Project Location

- One of two primary north-south routes through Seattle
- Carries 110,000 vehicles per day, or one quarter of all north-south traffic through the city
- Approximately 4,000 of the 110,000 trips are made by medium and heavy-duty trucks



# Urgent Need



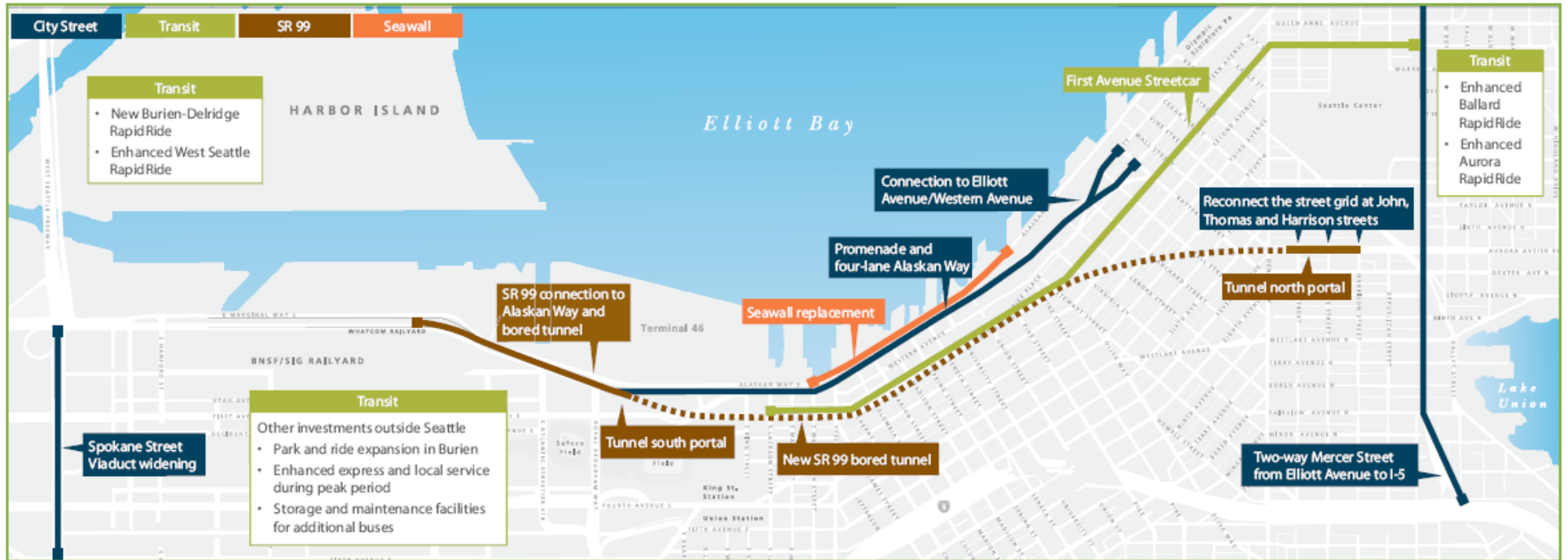
# Recent Recommendation and Legislation

- January: Governor, County Executive and Mayor recommend replacing the viaduct with a deep bored tunnel beneath downtown.
- April: Legislature passes ESSB 5768, which provides funding for the bored tunnel.
- May: Governor Gregoire signs bill designating a bored tunnel as the replacement for the Alaskan Way Viaduct.



*Governor Chris Gregoire signs ESSB 5768 on May 12, 2009.*

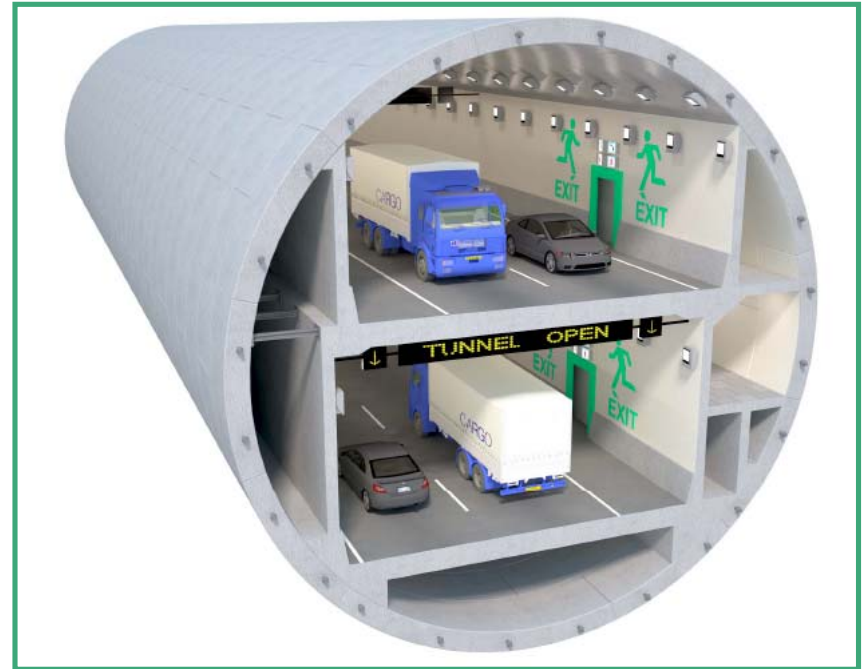
# Program Map



# SR 99 Bored Tunnel

A bored tunnel under First Avenue will be the new SR 99. Some features of the tunnel include:

- Two lanes of traffic, with shoulders, in each direction.
- Approximately two miles long.
- Between 30 and 200 feet underground.
- Least traffic and business disruptions during construction.

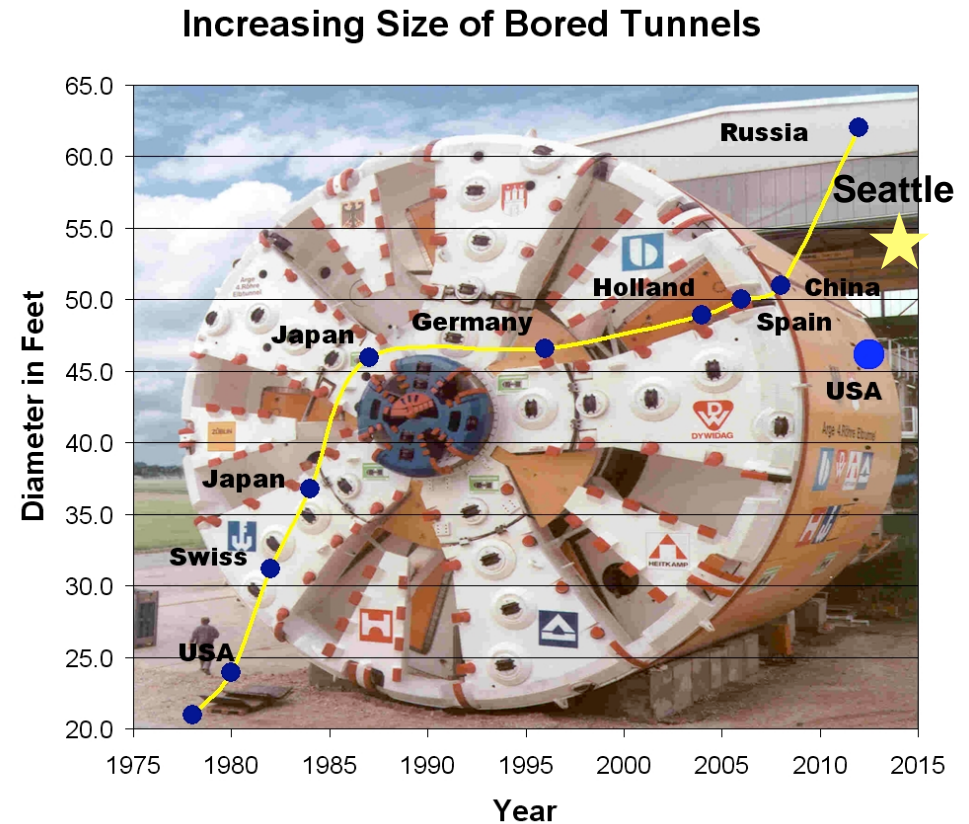


Construction: 2011 – 2015

Status: Environmental Impact Statement and Preliminary Design

# Tunneling technology

- Tunneling technology is rapidly advancing, with tunnel boring machines as large as 62 feet in diameter on order.
- Successful tunnel boring machine projects:
  - Sound Transit Beacon Hill: 21 feet in diameter
  - Hamburg and Moscow: 46.6 feet in diameter
  - Madrid: 50 feet in diameter
  - Shanghai: 50.6 feet in diameter



# Tunneling in Seattle Soils

Numerous tunnel machines, including several in Seattle, have successfully excavated ground conditions similar to those anticipated. Over 150 tunnels have been constructed in Seattle since 1890, mostly in glacial soils. Examples include:

- Sound Transit Beacon Hill:
  - Glacial sand, silt, clay and till up to 160-ft depth.
  - Soils were similar to the hard/dense soils along most of proposed alignment.
- Denny Way CSO:
  - Glacial sand, silt, clay and till up to 160-ft depth.
  - Soils were similar to hard/dense soils along most of proposed alignment.







# Fiscal responsibility

	Proposed project implementation responsibility				Costs
	State	King County	City of Seattle	Port of Seattle	
Moving Forward Projects and Prior Expenditures	\$600 million			\$300 million	\$900 million
SR 99 Bored Tunnel and Systems	\$1.9 billion				\$1.9 billion
Alaskan Way Surface Street and Promenade	\$290 million		\$100 million		\$390 million
Central Seawall			\$255 million		\$255 million
Utility Relocation			\$250 million		\$250 million
City Streets and Transit Pathways		\$25 million	\$190 million		\$215 million
Transit Infrastructure and Services		\$115 million	\$135 million		\$250 million
Construction Transit Service	\$30 million	\$50 million			\$80 million
<b>Total</b>	<b>\$2.82 billion</b>	<b>\$190 million</b>	<b>\$930 million</b>	<b>\$300 million</b>	<b>\$4.24 billion</b>
Transit Operations Annual Cost		\$15 million			\$15 million

# A Brief History



**2001**

Nisqually earthquake damages viaduct

**2002**

Viaduct replacement design begins

**2004**

Draft EIS analyzes five alternatives

**2006**

Supplemental Draft EIS analyzes two alternatives

**2007**

No/no advisory vote leads to new approach

**2009**

Governor signs bill approving bored tunnel alternative

**Public process**

# Reaching a Recommendation

## How did we get there?

- Redefined the project area.
- Established an independent project team.
- Developed a set of six guiding principles.
  - Improve public safety.
  - Provide efficient movement of people and goods now and in the future.
  - Maintain or improve downtown Seattle, regional, the port and state economies.
  - Enhance Seattle's waterfront, downtown and adjacent neighborhoods as a place for people.
  - Create solutions that are fiscally responsible.
  - Improve the health of the environment.



# Reaching a Recommendation

- Formed a Stakeholder Advisory Committee:
  - 29 representatives from various constituencies and community groups.
  - Met 16 times during a 13-month period.
  - Reviewed, deliberated and commented on central waterfront work.
- Evaluated eight scenarios against the guiding principles.



# Reaching a Recommendation

- Narrowed the scenarios to two hybrid alternatives.
  - 1-5, surface and transit hybrid alternative.
  - Elevated bypass hybrid alternative.
- State, county and city departments of transportation completed further analysis on the bored tunnel at the request of the executives and public.
- Based on new analysis, the three executives recommended the bored tunnel.

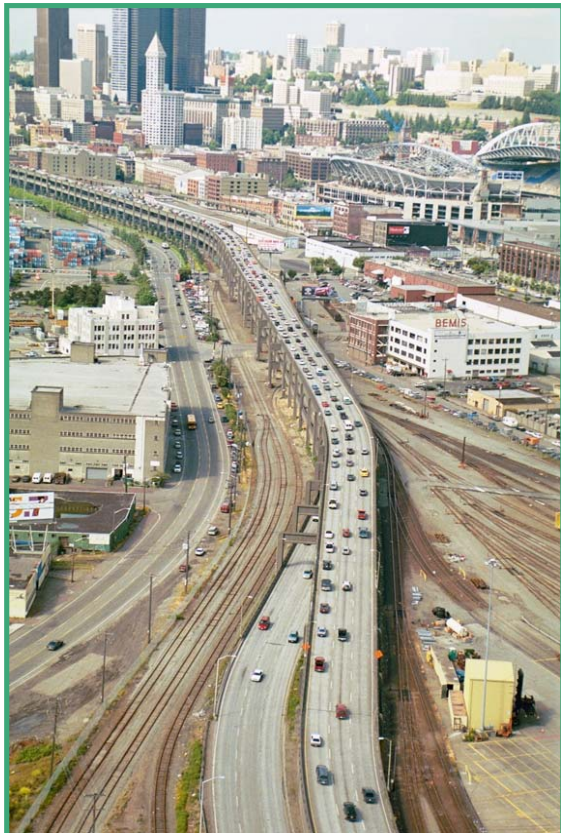


# Next Steps

- Develop additional preliminary engineering and soils exploration.
- Conduct visual surveys of buildings along tunnel alignment.
- Publish second Supplemental Draft Environmental Impact Statement.
- Issue a request for qualifications for bored tunnel design/build contractor.
- Meet with community groups and businesses to finalize design.
- Work with the City, County and Port to coordinate project implementation.



# Alaskan Way Viaduct and Seawall Replacement Program



Follow our progress: [www.alaskanwayviaduct.org](http://www.alaskanwayviaduct.org)

**Back Pocket**

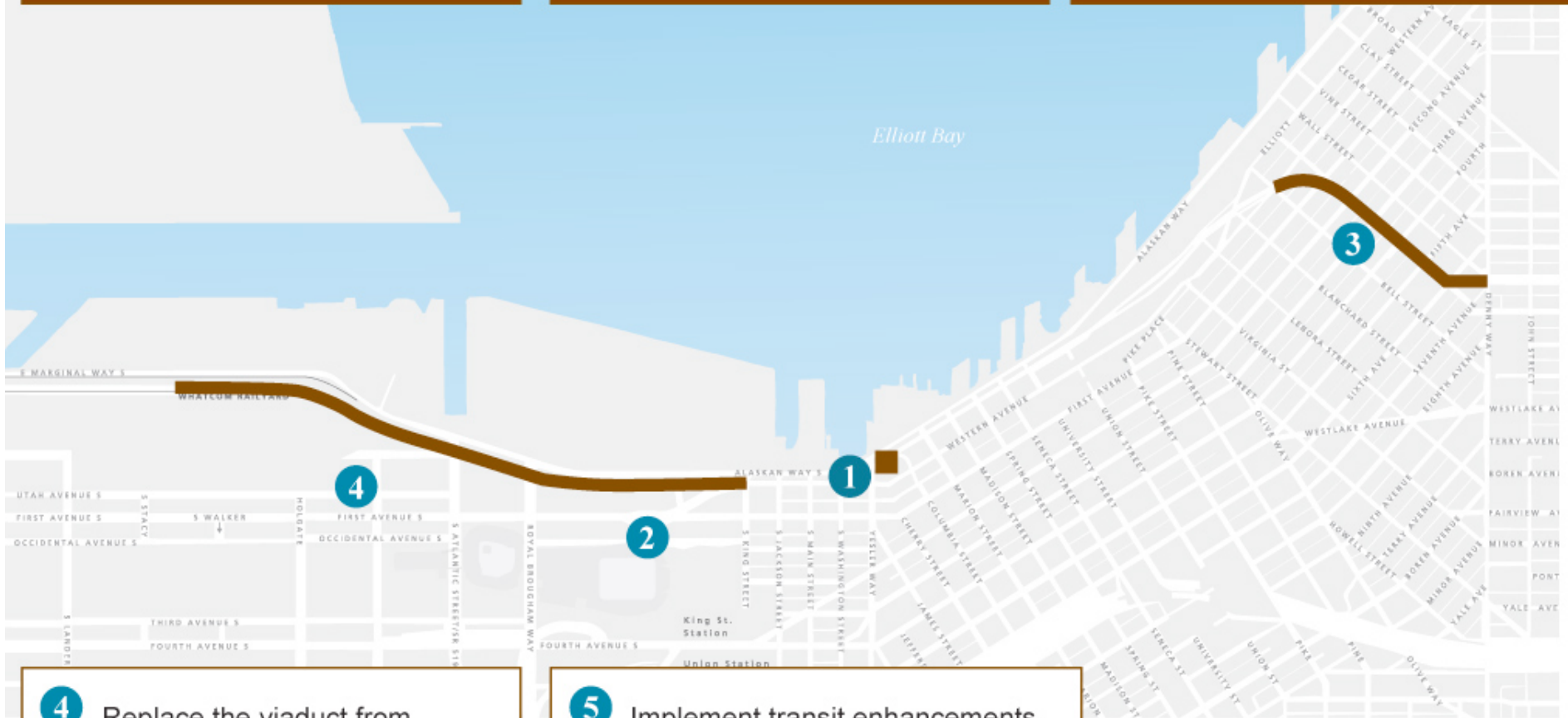
# The Alaskan Way Viaduct & Seawall Replacement Program

## Moving Forward Projects

**1** Stabilize four column foundations between Columbia Street and Yesler Way

**2** Relocate electrical lines between South Massachusetts Street and Railroad Way S.

**3** Conduct regular maintenance and repair existing fire and life safety systems



**4** Replace the viaduct from S. Holgate to S. King streets

**5** Implement transit enhancements and other improvements

## **What scenarios were evaluated?**

- Scenario A: Demand Management and Low Capital
- Scenario B: Surface Boulevard and Transit
- Scenario C: Alaskan and Western Couplet
- Scenario D: 4-Lane Independent Elevated
- Scenario E: 4-Lane Integrated Elevated
- Scenario F: 4-Lane Bored Tunnel
- Scenario G: 4-Lane Cut and Cover Tunnel
- Scenario H: Depressed/Lidded Roadway

## Guiding principles summary

The three executives agreed that any solution for the Alaskan Way Viaduct needed to be grounded in a commitment and integration across six guiding principles:

- Improve public safety.
- Provide efficient movement of people and goods now and in the future.
- Maintain or improve downtown Seattle, regional, the port and state economies.
- Enhance Seattle's waterfront, downtown and adjacent neighborhoods as a place for people.
- Create solutions that are fiscally responsible.
- Improve the health of the environment.

## Letter of agreement

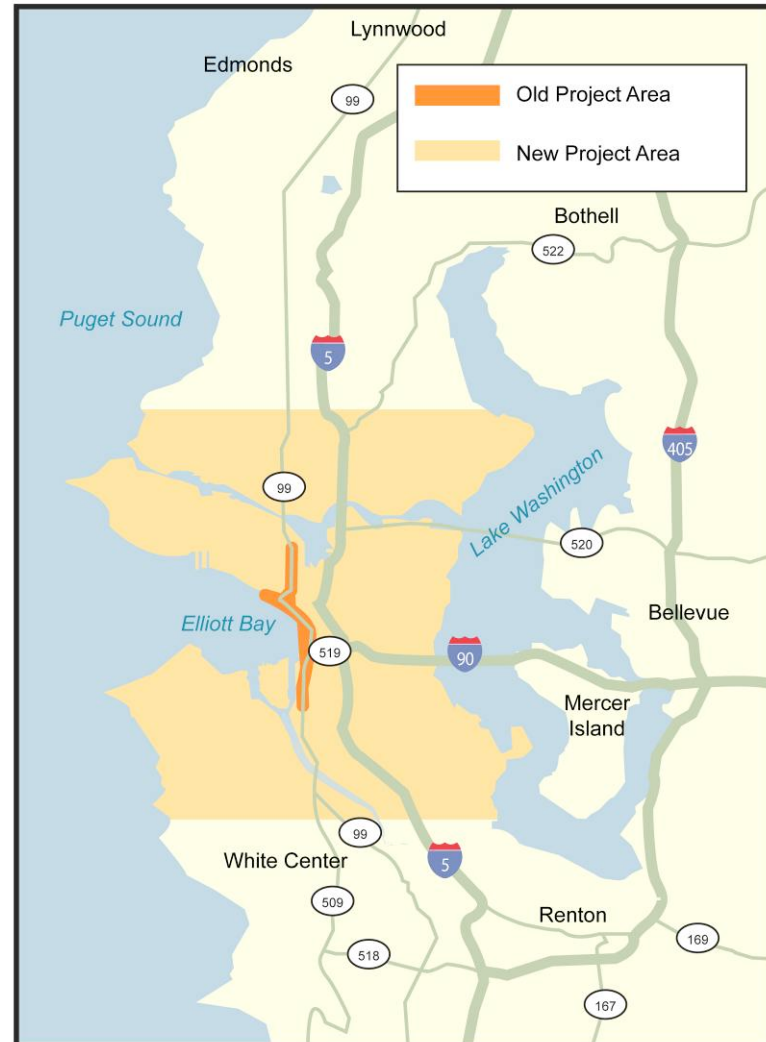
On Jan. 13, 2009, Governor Gregoire, King County Executive Sims and Mayor Nickels signed a letter of agreement signifying their support of the bored tunnel hybrid alternative.



## Systems solution

Upon evaluation of the new project area and with a clear direction to consider the entire system of streets, the three executives recommended that investments be made in:

- Improved city streets
- Enhanced transit service
- New bored tunnel



## Improves city streets

The improvement of City streets throughout Seattle will be important to the success of this solution. Projects underway include:

### **Mercer Street Project:**

- Improves connections from I-5 and the bored tunnel to Queen Anne, Seattle Center, Interbay, Magnolia, and Ballard.
- Enhances connections between high density neighborhoods.

### **Spokane Street Viaduct Project:**

- Enhances critical connections between the Port, West Seattle, I-5, and I-90.
- Improves traffic flow and safety.
- Minimizes conflicts between freight, commuters and rail traffic.



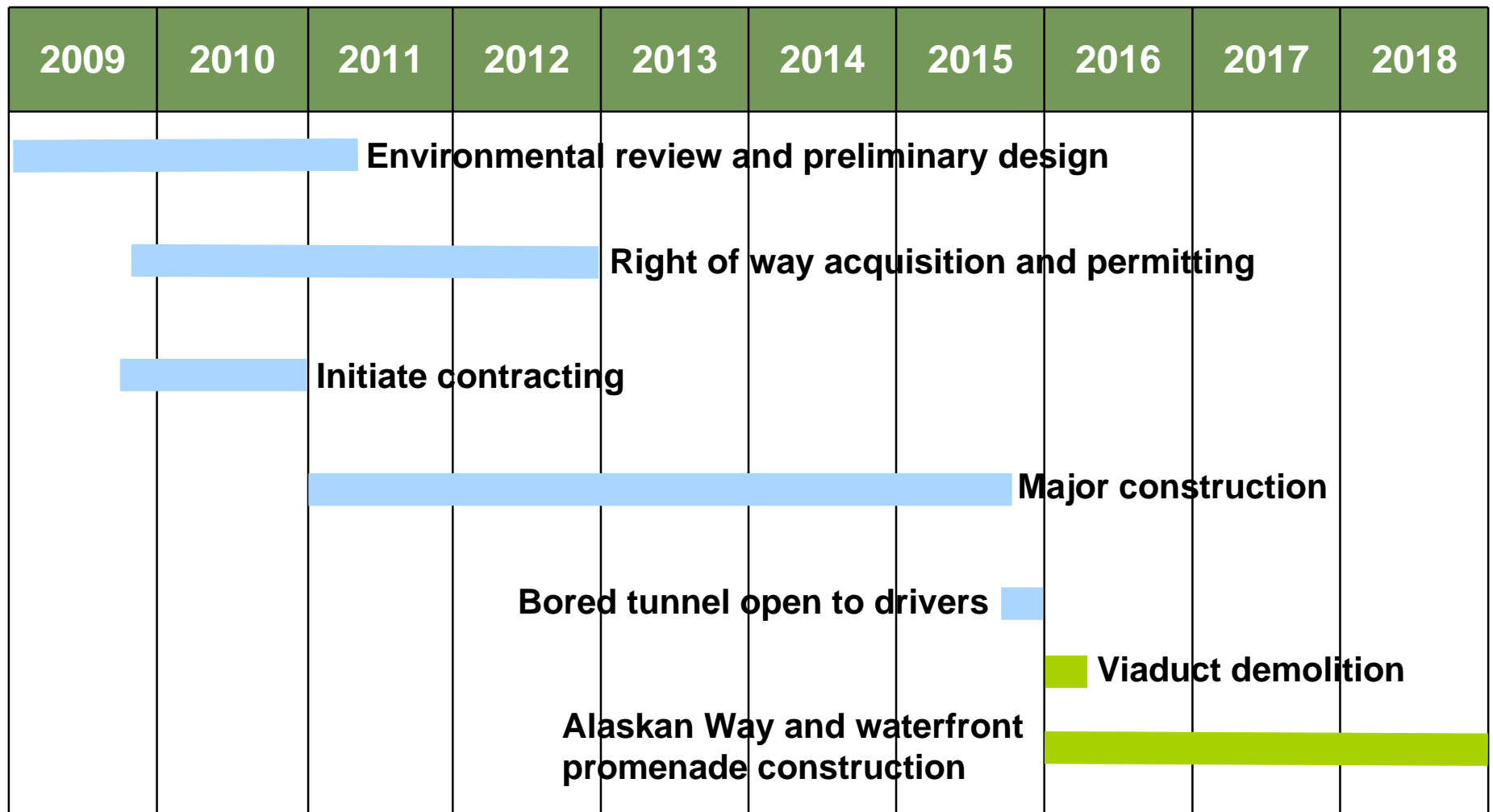
## Enhances transit service

Transit enhancements will provide important mobility during and after construction and are critical to the success of the bored tunnel solution.

- Enhanced service to accommodate demand
  - Additional bus service
  - First Avenue streetcar
- Access to downtown
- Construction mitigation
- Environment



## Bored tunnel project timeline



## Environmental process

Alaskan Way Viaduct and Seawall Replacement Program Elements	SDEIS Project Level Analysis	SDEIS Program Level Analysis only
Bored tunnel and portals	X	
Viaduct removal	X	
Battery Street Tunnel	X	
Alaskan Way surface street		X
Transit		X
Mercer underpass and 6 <sup>th</sup> Avenue	X	
Other surface street improvements (including Mercer West)		X
Waterfront promenade		X
Seawall		X

## **City of Seattle environmental process**

### **Alaskan Way surface street and promenade**

The City will lead waterfront planning, design and environmental review and will coordinate with WSDOT on operations to ensure efficient through movement.

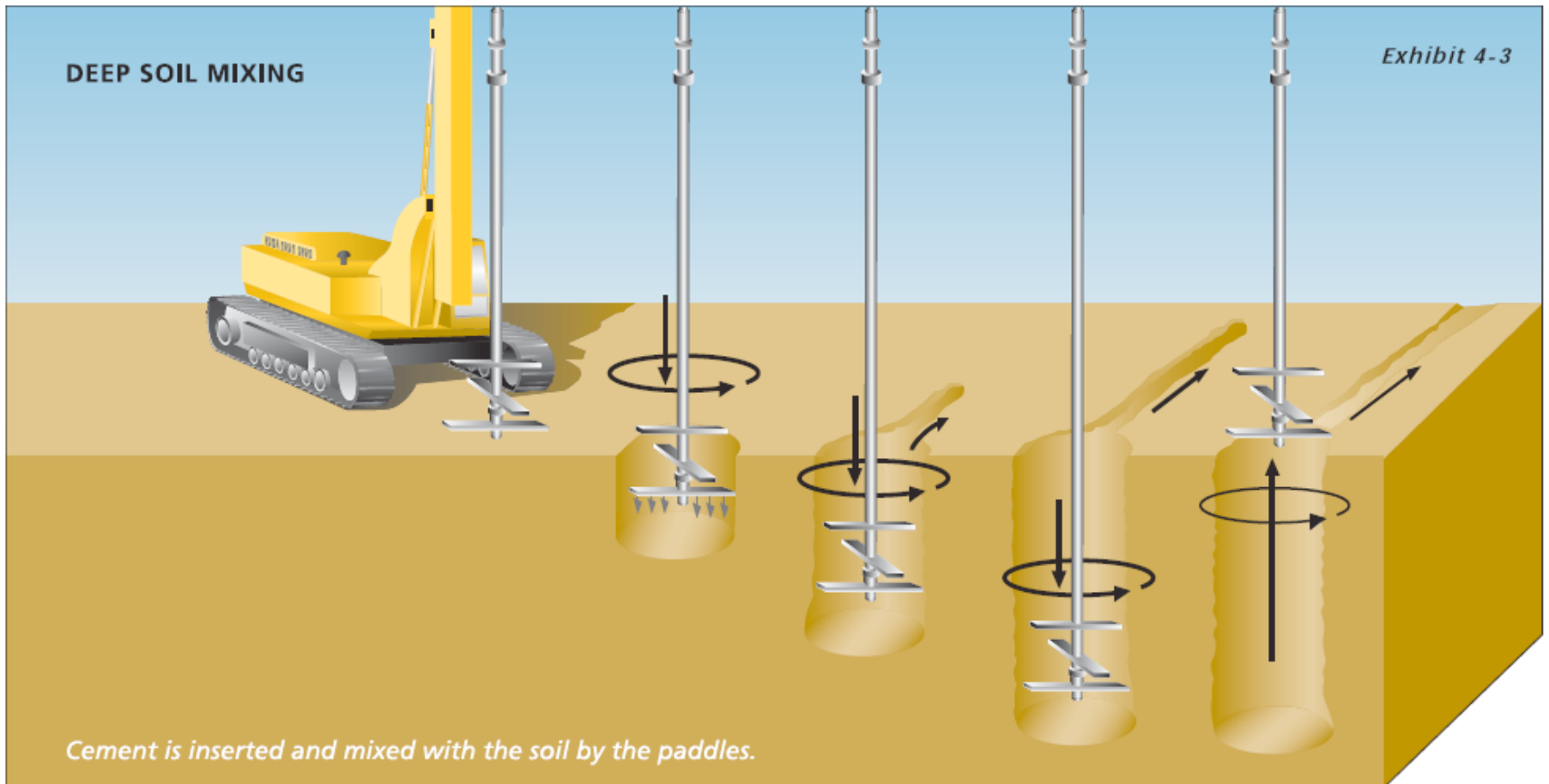
### **Seawall repair or replacement**

The City and Army Corps of Engineers will lead planning, design and environmental review.

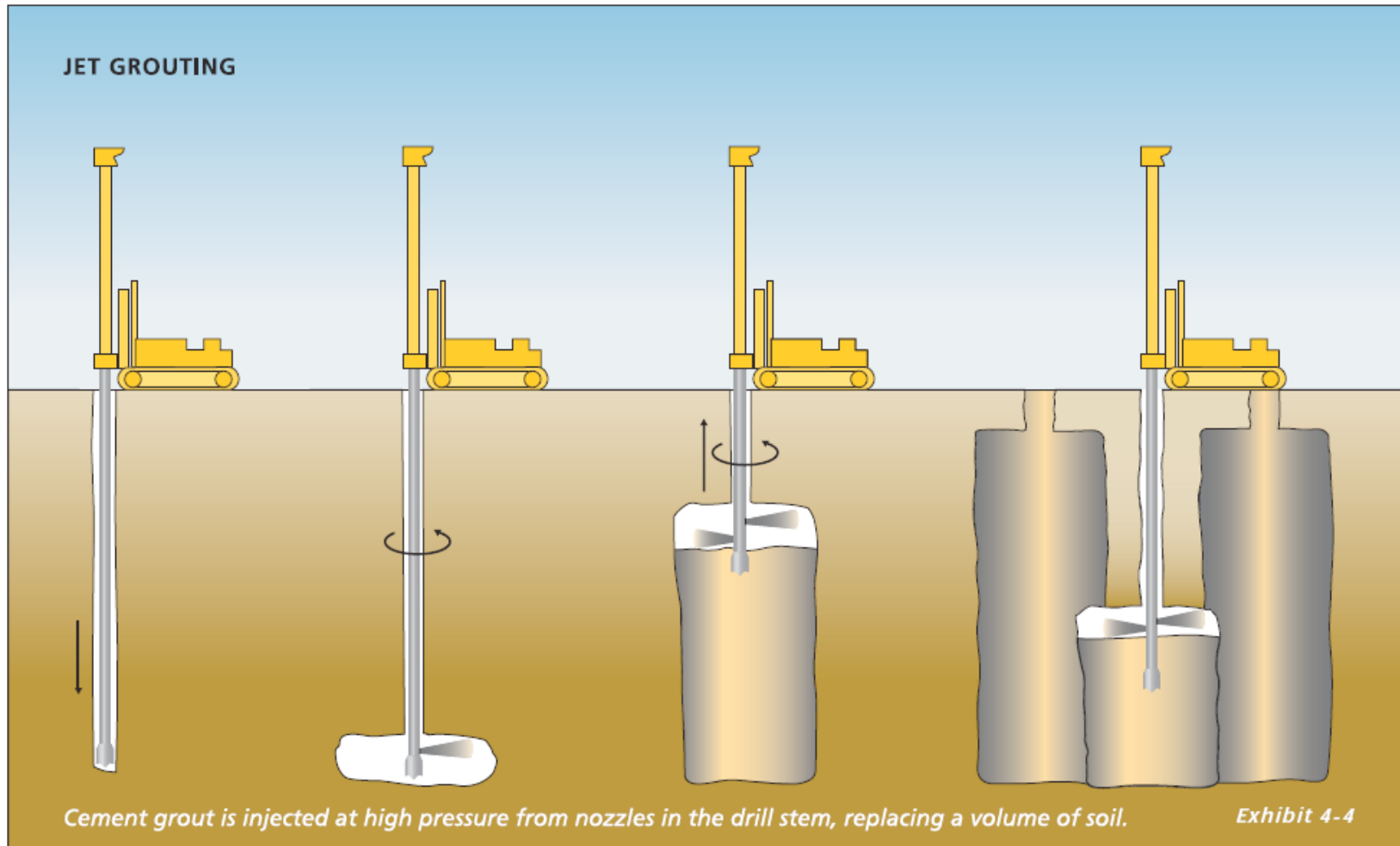
### **Mercer West**

The City will lead planning, design and environmental review for Mercer Improvements between Fifth and Elliott avenues.

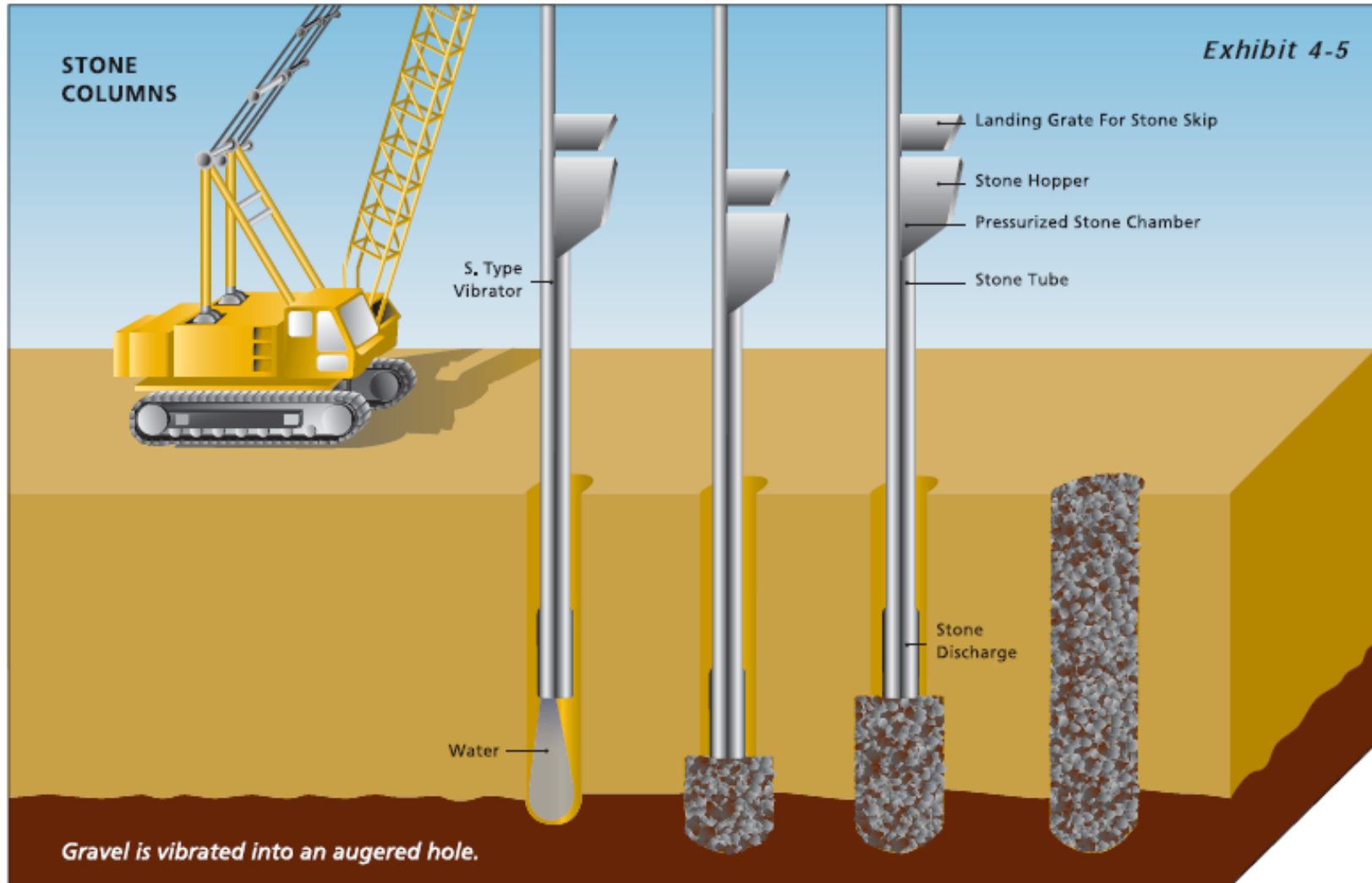
## Soil improvement methods



## Soil improvement methods



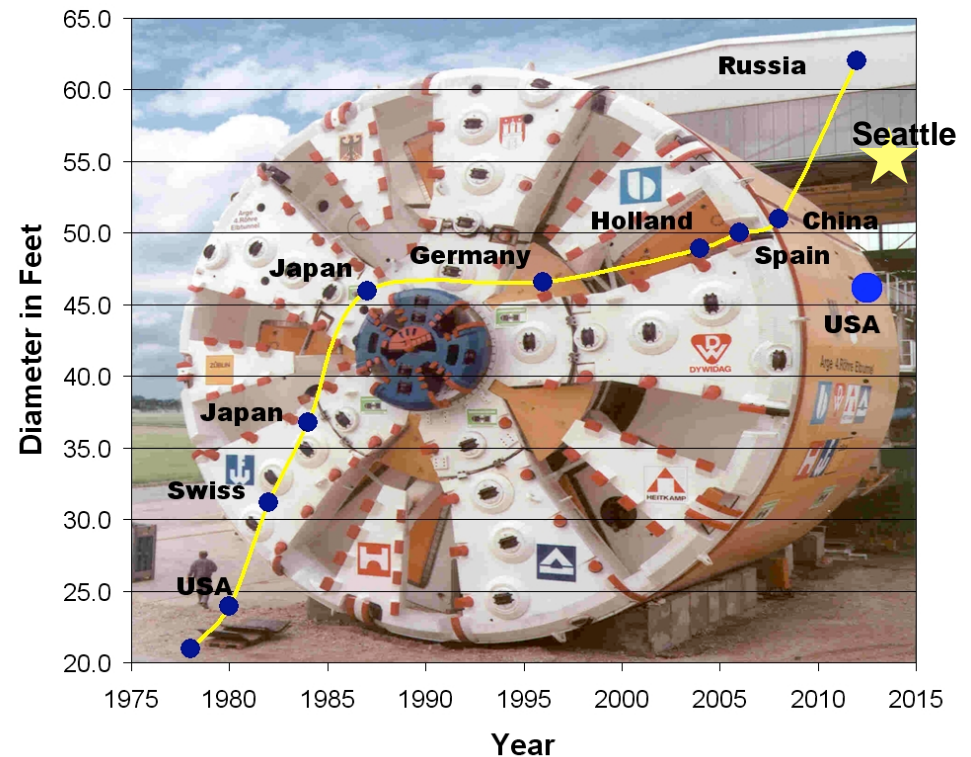
# Soil improvement methods



## Tunneling technology

- Tunneling technology is rapidly advancing, with tunnel boring machines as large as 62 feet in diameter on order.
- Successful tunnel boring machine projects:
  - Shanghai Yangtze River (China): 50.6-foot diameter
  - Fourth Elbe River Tunnel (Germany): 46.6-foot diameter
  - Lefortovo Tunnel (Russia): 46.6-foot diameter
  - Madrid M30 (Spain): 49.9-foot diameter

Increasing Size of Bored Tunnels





## Tunneling in Seattle soils

Numerous tunnel machines, including several in Seattle, have successfully excavated ground conditions similar to those anticipated for the SR 99 bored tunnel.

More than 150 tunnels have been constructed in Seattle since 1890, mostly in glacial soils. Examples include:

- Sound Transit Beacon Hill Tunnel, Metro Transit Tunnel and Mercer Street wastewater tunnel (Seattle):
  - Ground conditions of glacial sand, silt, clay and other soils similar to the hard and dense soils along most of the proposed SR 99 bored tunnel alignment.

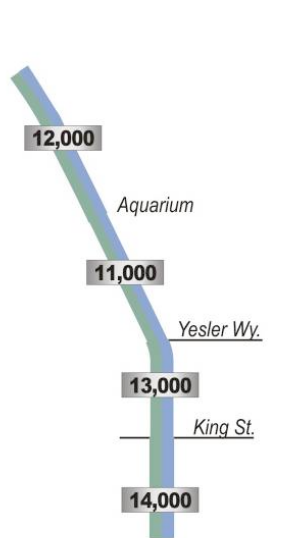
## Bored tunnel soil removal

- Once the contractor has been selected we will determine:
  - Type of boring machine
  - Hauling methods
- Soil removal hauling methods:
  - Truck (Primary method)
  - Barge
  - Rail
- Specific routes and sites for soil disposal will be determined once the removal method has been selected.
- Tunnel boring operation schedule has not been decided but will likely be close to or 24 hours a day, 6 to 7 days a week.

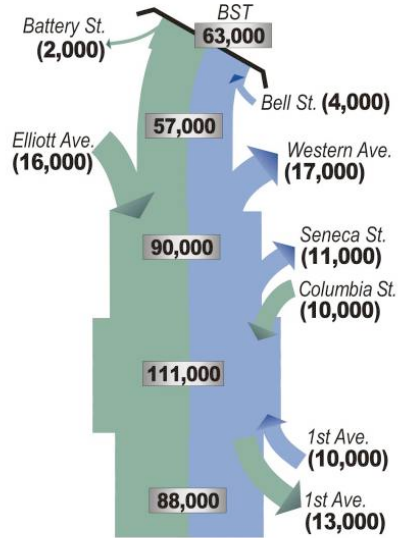
## SR 99 Bored tunnel project – Contracting schedule

Prequalification/Request for Qualifications	August 2009
Statement of Qualifications	October 2009
Short List of Qualified Contractors	Early November 2009
Draft Request for Proposals	Late November 2009
Final Request for Proposals – with stipend	Early 2010
Proposals Due	Fall 2010
Contract Award	December 2010

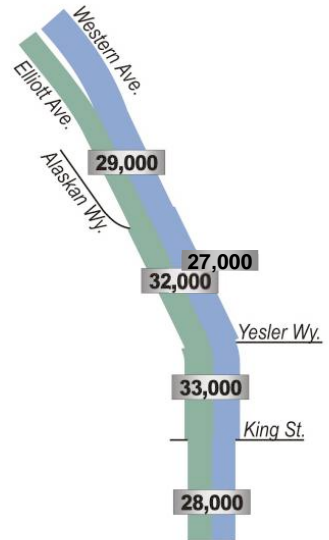
# Traffic volumes in bored tunnel & Alaskan Way



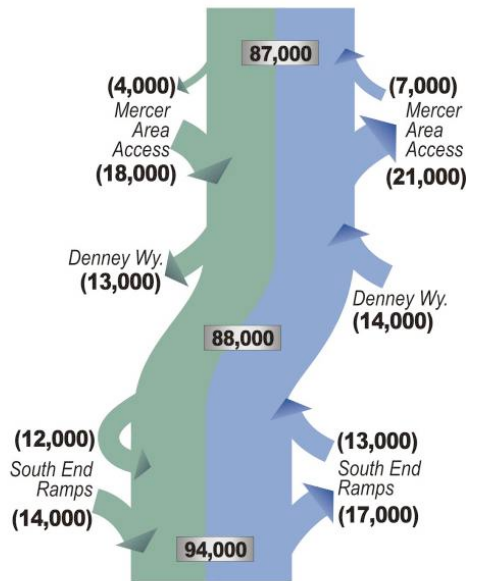
**Alaskan Way  
2008 Daily Traffic**



**SR 99 Alaskan Way Viaduct  
2008 Daily Traffic**



**Alaskan Way  
Projected 2015 Daily Traffic  
Bored Tunnel Scenario**



**SR 99 Alaskan Way Viaduct  
Projected 2015 Daily Traffic  
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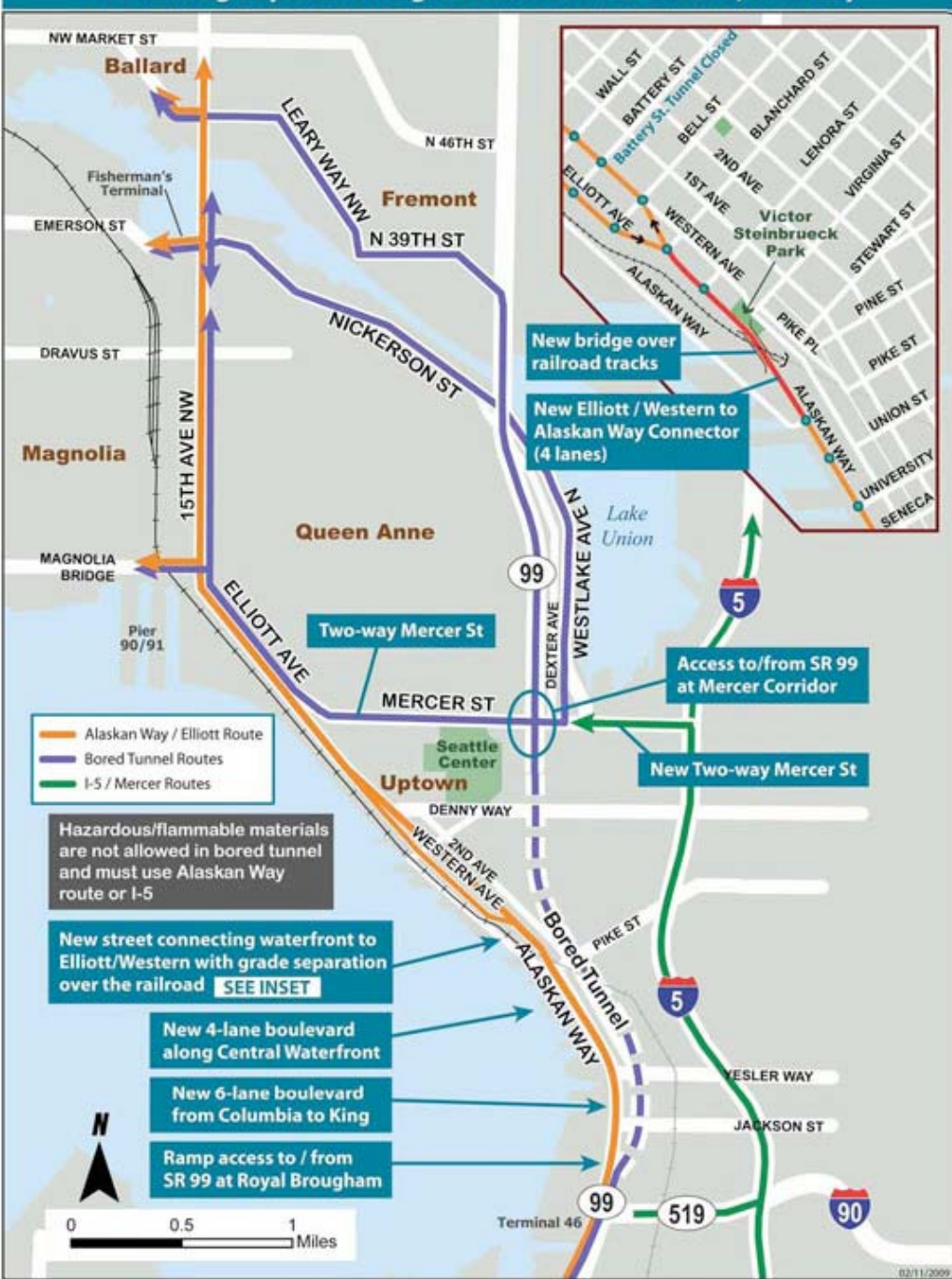
# How Northwest Seattle will access the Bored Tunnel



# New Transit Connections to Downtown from Northwest Seattle



# Maintaining important freight connections to Ballard/Interbay



## Maintaining important freight connections to Ballard/Interbay



- Alaskan Way / Elliott Route
- Bored Tunnel Routes
- I-5 / Mercer Routes

Hazardous/flammable materials are not allowed in bored tunnel and must use Alaskan Way route or I-5

New street connecting waterfront to Elliott/Western with grade separation over the railroad **SEE INSET**

New 4-lane boulevard along Central Waterfront

New 6-lane boulevard from Columbia to King

Ramp access to / from SR 99 at Royal Brougham

New bridge over railroad tracks

New Elliott / Western to Alaskan Way Connector (4 lanes)

Access to/from SR 99 at Mercer Corridor

New Two-way Mercer St



0 0.5 1 Miles

# Access from West Seattle to areas north of Downtown





# Access from West Seattle to Downtown



# New Transit Connections to Downtown from West Seattle







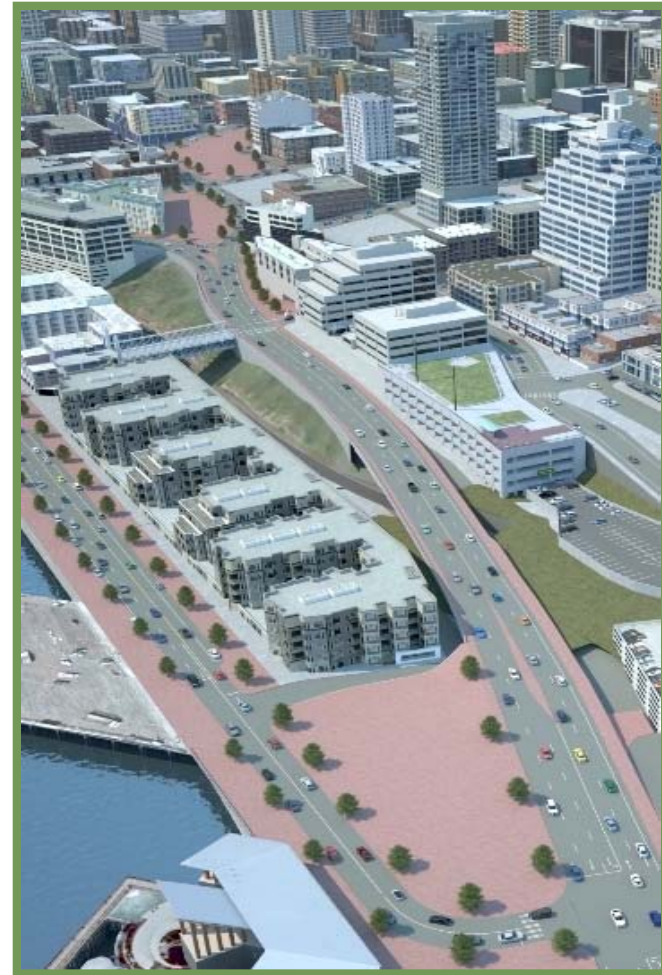




# Connection to Elliott and Western avenues



**Today**



**Future**

## Seattle's downtown waterfront



**Today**



**Future**



# The Alaskan Way Viaduct & Seawall Replacement Program

**Today**



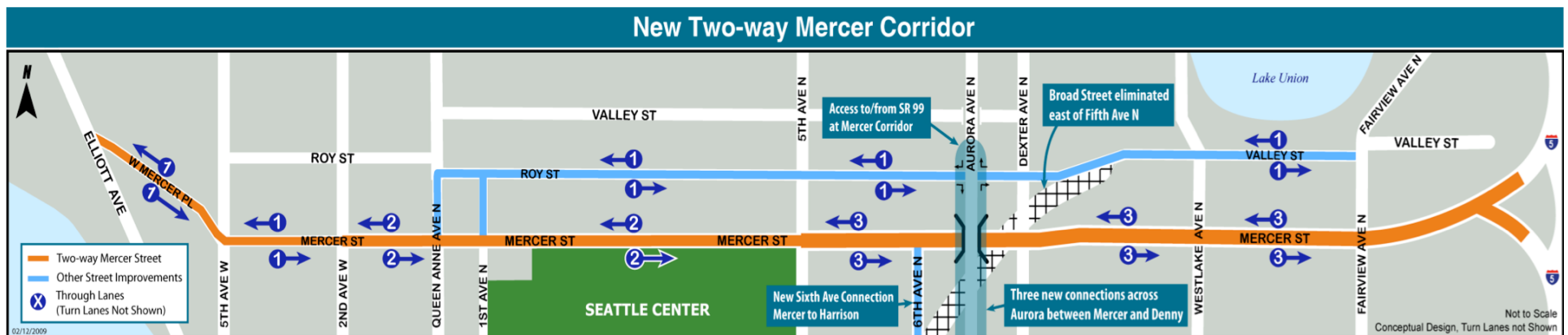
**Future**



## Mercer Corridor Program

- Provides a two-way connection from I-5 and SR 99 to Queen Anne, Seattle Center, Interbay, Magnolia, and Ballard.
- Supports access to and from SR 99 for local and regional traffic.
- Enhances connections between high density neighborhoods.

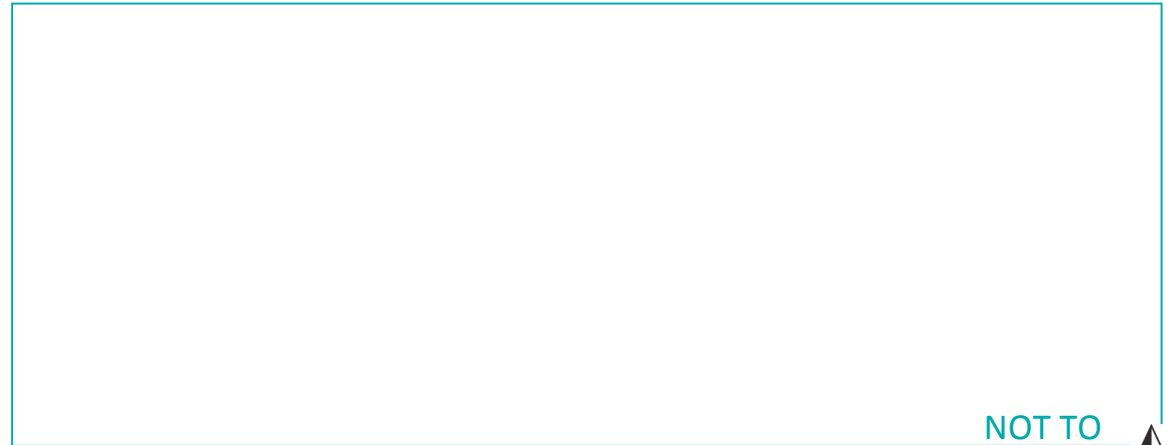
Construction on I-5 to Dexter segment will begin in 3rd Quarter 2009 and be complete in 2012.



## Spokane Street Project

- Provides critical connections between the Port, West Seattle, I-5, I-90 and SR 99.
- Improves westbound traffic flow and safety.
- Minimizes conflicts between freight, rail, commuters and ferry traffic.

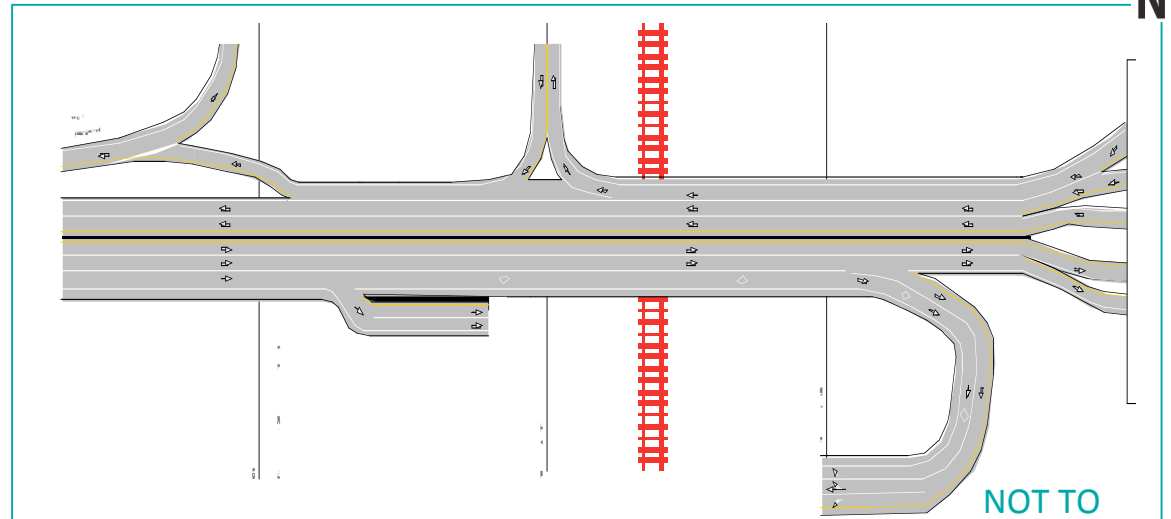
BEFORE



NOT TO  
SCALE

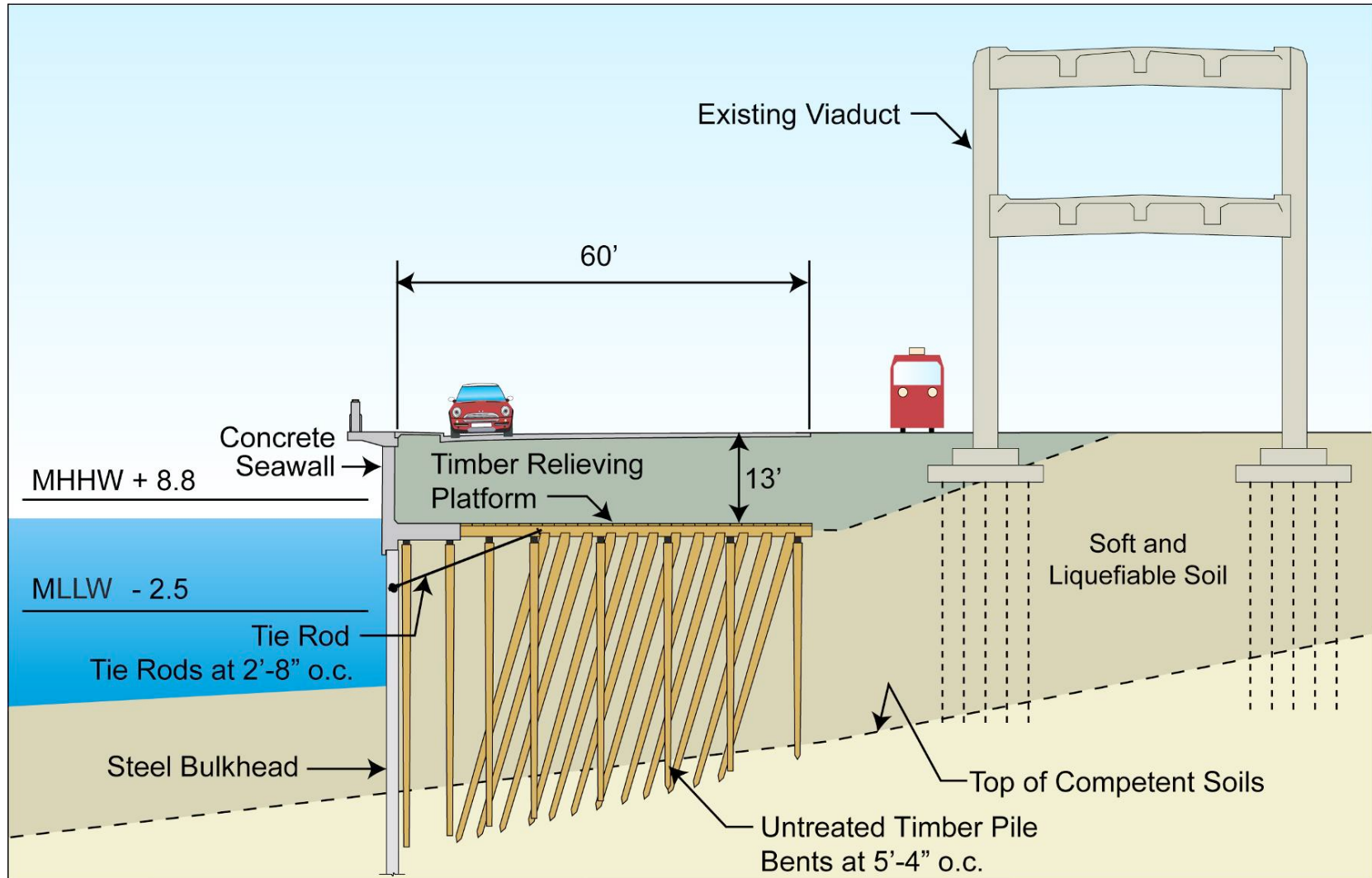


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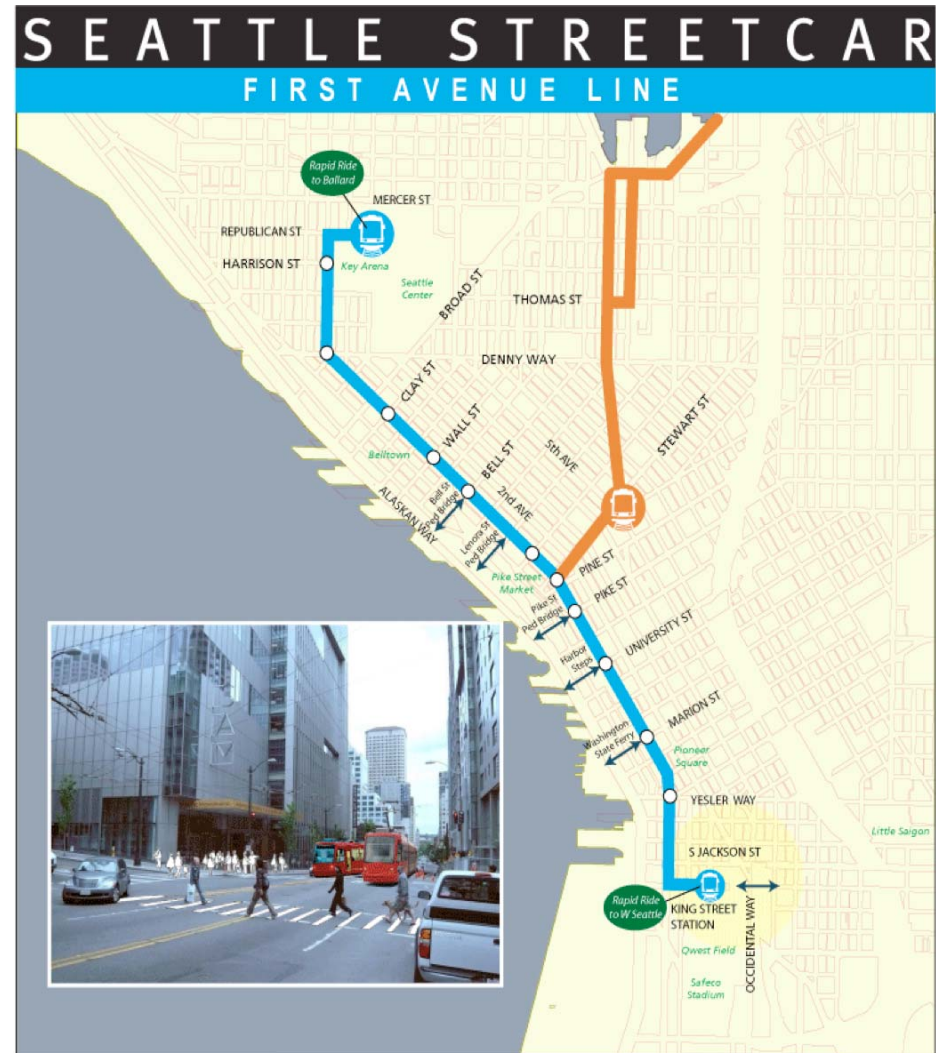
NOT TO  
SCALE

# Replacing the Seawall (Washington to Pine)



## First Avenue Streetcar

- Connects to the First Hill Streetcar.
- Connects to Ballard and West Seattle RapidRide lines.
- Connects to Amtrak, Commuter Rail and Light Rail at King Street Station.
- Provides easy access to Colman Dock.
- Connects major activity centers: Seattle Center, Pike Place Market and the stadium area.



## How is the bored tunnel different from the cut-and-cover tunnel?

Bored Tunnel	Cut-and-Cover Tunnel
<ul style="list-style-type: none"><li>• Stacked with two lanes in each direction.</li><li>• Constructed beneath First Avenue.</li><li>• Top of tunnel is 30 to 200 feet below the surface.</li><li>• Viaduct can stay open to traffic while the tunnel is being built.</li><li>• Construction is estimated to take 4.5 years.</li><li>• Limits impacts to waterfront businesses.</li></ul>	<ul style="list-style-type: none"><li>• Stacked with three lanes in each direction.</li><li>• Constructed along the waterfront.</li><li>• Top of tunnel is 10 feet below the surface.</li><li>• Viaduct would have been closed for 3.5 years under the “short” construction plan.</li><li>• Construction was estimated to take 7 years under the “short” construction plan.</li><li>• Would cause major impacts to waterfront businesses.</li></ul>

# Boston's Big Dig vs. Viaduct Replacement

## Boston's "Big Dig" Central Artery/Tunnel Project

- Substantially larger and more complex.
- Included multiple tunnels and bridges.
- Built while traffic was maintained through the construction zone.
- Initial project cost estimate did not include added scope, mitigation and environmental requirements, inflation and appropriate allowance for risk and escalation.
- Numerous management changes.

## Alaskan Way Viaduct and Seawall Replacement

- Significantly smaller project area.
- Project includes one bored tunnel.
- Construction impacts will be minimized because the new corridor can be built while SR 99 remains open.
- Project costs include risk and uncertainties.
- WSDOT has an excellent record of delivering projects on time and budget.
- Each jurisdiction has specific leadership roles and will be held accountable.

	Alaskan Way Viaduct Program	Big Dig Projects
Total project length	3 miles	8 miles
Number of tunnels	1	3
Length of tunnels	2 miles	5 miles
Total lane miles	14 miles	>161 miles

## SR 99 Bored Tunnel Estimated Cost

Risk-based estimating nationally recognized as a best practice for mega-projects

Cost  
(Millions)

Construction estimate (bored tunnel only)	\$944
Construction management and administration	\$118
Preliminary and final design	\$118
Risk	\$418
Escalation (per Global Insight)	\$166
Right of way costs	\$149
<b>TOTAL</b>	<b>\$1,913</b>