“Digging Deeper into the Alaskan Way Viaduct Replacement Program”
Tim Moore PE, SE
WSDOT Mega Projects Bridge Manager
June 12, 2017
Today's FOCUS

• Concrete Innovation
  • Holgate to King
  • South cut-and-cover
  • Bored tunnel
  • South Dearborn street off-ramp
  • The path forward
This is a SAFETY project

The viaduct and neighboring seawall are vulnerable to earthquakes

The viaduct in 1953
Geography vs. drivers
Building a new SR 99 Corridor
Today’s FOCUS

- Why it matters
- **Holgate to King**
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Stage 2: Holgate to King

12 PSG Spans
1900’ Length
(200,000 sq ft)
WF100G to WF74G

WF74G to WF100G

$250/sq ft

Super GIRDERS
Gateway to the SEATTLE TUNNEL
Today’s FOCUS

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Future SOUTH PORTAL
Building the SOUTH PORTAL

- South operations building
- Launch pit
- Cut and cover tunnel
South End Settlement Mitigation

 SESMP – 670 shafts
 South Cut & Cover – 1050 shafts
Today’s FOCUS

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Poor, unconsolidated soils

Till deposits

Cohesionless sand and gravel – regional aquifer

Cohesionless silt and fine sand

Cohesive clay and silt

Till-like deposits

GEOLOGIC Profile
This is available as an interactive map online at www.AlaskanWayViaduct.org and at Milepost 31.
74 ea shafts
Access pit,
February 13, 2015

Repairing
BERTHA
Repairing BERTHA

Mammoet

- Skid track
- 48 rams equalize load
- Strand jacks (2200 tons)

Modular lift tower, Jan. 20, 2015
Lifting Bertha’s cutterhead and main drive unit, March 30, 2015
10 day closure – mined 42 rings (273’)

MPBX 031r1
Bent 97W – Beneath the Viaduct

Note: All points shown are adjusted to show 0.0” ahead of face to isolate movement related to tunneling.
Alaskan Way Viaduct Replacement Program

- Replaceable pre-cutting bits
- Center Plate
- Fixed pre-cutting bits
- Cutterhead scrapers

Regular MAINTENANCE
Near Virginia Street (270’ of Overburden)

Note: All points shown are adjusted to show 0.0” appx 40 feet ahead of face to isolate movement related to tunneling.
Tunneling machine DISASSEMBLY
Tunneling machine

DISASSEMBLY
Tunnel Design

- Electrical rooms
- Egress corridor
- Equipment rooms
- Utility corridor
- Smoke extraction duct
- Pump station
The tunnel behind Bertha, August 18, 2016
BUILDING THE HIGHWAY
inside the tunnel

1. Build road and wall foundations
2. Build northbound roadway walls
3. Build southbound roadway (top deck)
4. Build southbound walls
5. End of tunneling: Build northbound roadway
6. Completed tunnel

Alaskan Way Viaduct REPLACEMENT PROGRAM
Concrete supports for tunnel roadway decks and walls

BUILDING THE HIGHWAY inside the tunnel
BUILDING THE HIGHWAY

inside the tunnel
STP crews build the rebar cage for future roadway walls

Interior roadway construction

BUILDING THE HIGHWAY

inside the tunnel
BUILDING THE HIGHWAY inside the tunnel
• Panel Length 29’-9 1/2”
• Panel Width 8’- 0 ½”
• Panel Depth 14 1/2”
• Total # of Panels 1127 ea.
• f’c = 7.0 ksi
• Prestressed transversely
• Post-Tensioned Longitudinally

NB Roadway Slab

Clear opening – 33’- 4” to deliver and rotate panel (3.5’ added clearance)
Northbound Lower Roadway
Pre-stressed Post-Tensioned Slab with O’Lay

BUILDING THE HIGHWAY
inside the tunnel
Precast Operation at Concrete Tech Corporation

BUILDING THE HIGHWAY inside the tunnel
Today’s **FOCUS**

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- **South Dearborn street off-ramp**
- The path forward
S. Dearborn Street
OFF-RAMP

Future northbound SR 99 off-ramp bridge

Off-ramp bridge column, September 2016
Superelastic nickel-titanium shape memory alloy (SMA) bars
- Reduce residual displacements
ECC mix design specified in special provisions

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<tr>
<th>Material</th>
<th>Proportions</th>
<th>Amount (LB/CY)</th>
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<td>Portland Cement, Type 1</td>
<td>1.0</td>
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<td>Fly Ash, Class F</td>
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<td>Fine Aggregate, Dry</td>
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<td>Water (net)</td>
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<td>Poly-vinyl-alcohol Fibers (Vol %)</td>
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<td>High Range Water Reducer (HRWR)</td>
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<td>Hydration Stabilizer</td>
<td>Optional</td>
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Current design philosophy with conventional concrete and conventional rebar

SMA/ECC Specimen #1

SMA/ECC Specimen #2

S. Dearborn Street
OFF-RAMP
Today’s FOCUS

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• The path forward
Map of state-led/funded improvements

- **South-end replacement**
  - Electrical line relocation: 2008-2009
  - Holgate to King (Stage 1): 2009-2009
  - Holgate to King (Stage 2): 2010-2012
  - Holgate to King (Stage 3): 2012-2014

- **SR 99 tunnel**
  - SR 99 tunnel main contract: 2011-2016
  - North Surface Street Connections: 2019-2021
  - South Access – Surface Street Connections: 2019-2020
  - South Access (drilled shafts): 2014-2014

- **Miscellaneous projects**
  - Trager Building demolition: 2007-2007
  - Viaduct column stabilization near Yesler Way: 2007-2008
  - WOSCA Building demolition: 2009-2009
  - Pier 48 warehouse demolition: 2010-2010
  - Automated viaduct closure gates: 2010-2011
  - Western Building structural work: 2011-2017
  - SR 99 south-end fiber replacement: 2011-2011
  - Alaskan Way widening: 2012-2012
  - Cedarstrand Building demolition: 2012-2012
  - Waterfront viaduct removal: 2019-2019
  - Battery Street Tunnel decommissioning: 2019-2019
  - New Alaskan Way⁴: 2019-2023

- **Mitigation projects**
  - SR 519 Phase 2: 2006-2010
  - Spokane Street Viaduct - Fourth Ave. off-ramp: 2008-2010
  - I-5 active traffic management: 2009-2010
  - I-5 active traffic management sign bridges: 2009-2009
  - I-5 travel time signs: 2009-2009
  - City street intelligent transportation systems: 2009-2010
  - SR 99 intelligent transportation systems: 2010-2011
  - Enhanced transit/demand management: 2010-2011
  - Parking mitigation for central waterfront: 2011-2019

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1. Per City of Seattle’s Waterfront Seattle schedule
2. Per Seattle Tunnel Partners’ most recent schedule
3. Partially funded by the state
4. Per 2014 legislation, additional mitigation funding is being provided by WSDOT from funds outside the AWV Program

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= completed project  = in progress
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**PROGRAM CONSTRUCTION SCHEDULE**
How to REACH US

Website: www.AlaskanWayViaduct.org

Twitter: @BerthaDigsSR99

Email: viaduct@wsdot.wa.gov

Hotline: 1-888-AWV-LINE

Our information center, Milepost 31, is located at 211 First Ave. S. in Seattle’s Pioneer Square neighborhood.