Western Bridge Engineers' Seminar

Jacobs Challenging today. Reinventing tomorrow.

City of Kenmore
West Sammamish River Bridge Replacement

Phoenix, AZ
September 6, 2023

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Presentation Agenda

- Project Overview
- Project Challenges
- Design Features
- Construction Challenges
- Lessons Learned

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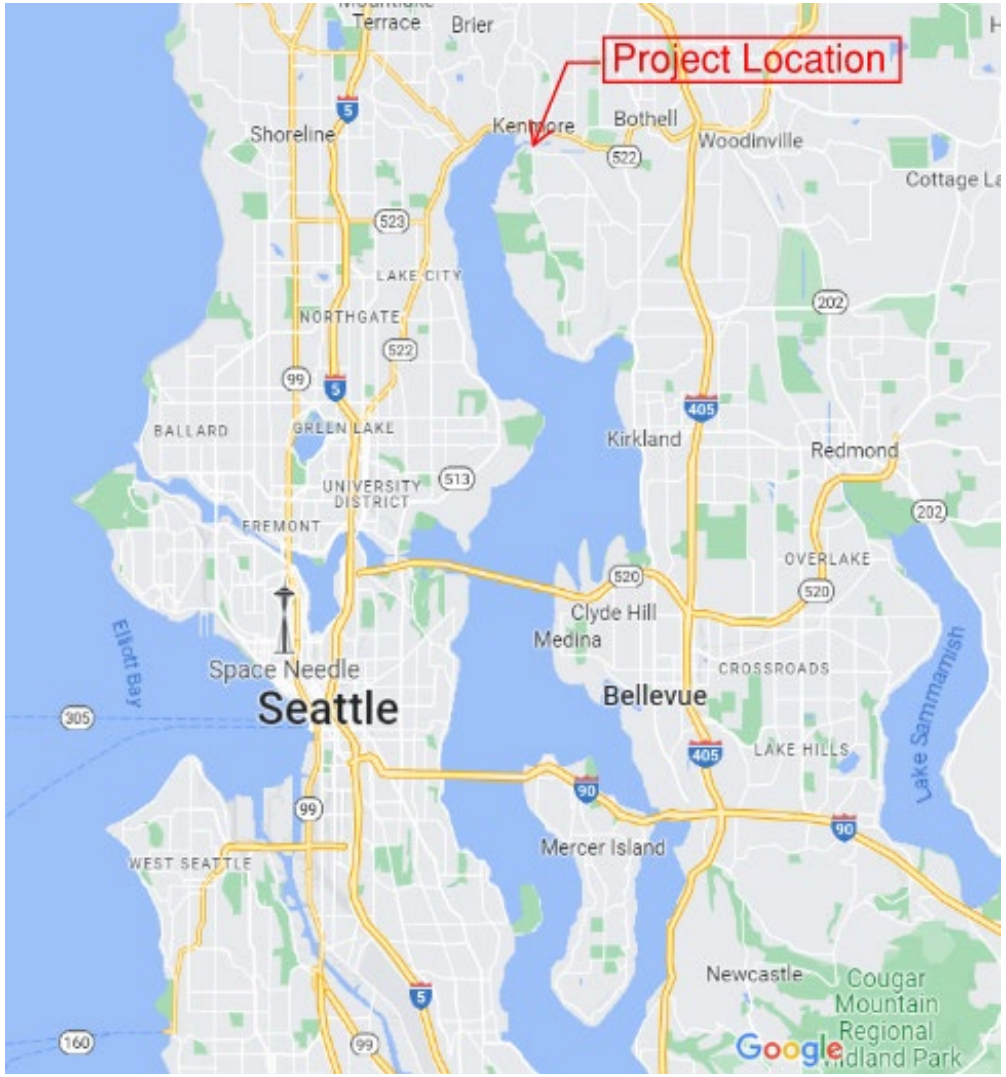
Project Location



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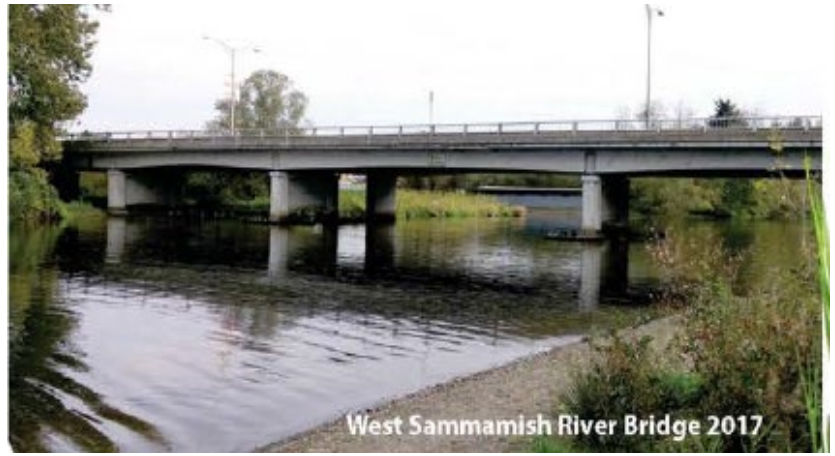
Project Overview

- Old bridge built in 1938
- Bridge settlement & cracks in girders noted in late 2012
- Jacobs to investigate in June 2013
- Condition Assessment & Alt. Evaluation – 2014
- Final Design & Env. Permitting: 2015-2019
- Construction: 2020 – 2022
- Project Cost: $40M
- Project Funding
  - *FHWA HBP - $12M*
  - *Connecting Washington - $12M*
  - *TIB - $7M*
  - *STP - $1.6M*
  - *Additional – utilities, City of Kenmore*



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Project Challenges

- Initial Evaluation of Cracks in Girders
- Scour Evaluation – Underwater Inspection
- Alternative selection – Aesthetics and Clearances
- Environmental Permitting (NEPA, SEPA +16 permits)
- Maintenance of Traffic (20,000 ADT)
- Utility relocations (9 different lines)
- Constructability
  - Limited ROW & adjacent existing NB Bridge in service
  - Limited Fish Window
- Unforeseen events
  - Federal Gov. Shutdown (2018/2019)
  - COVID-19

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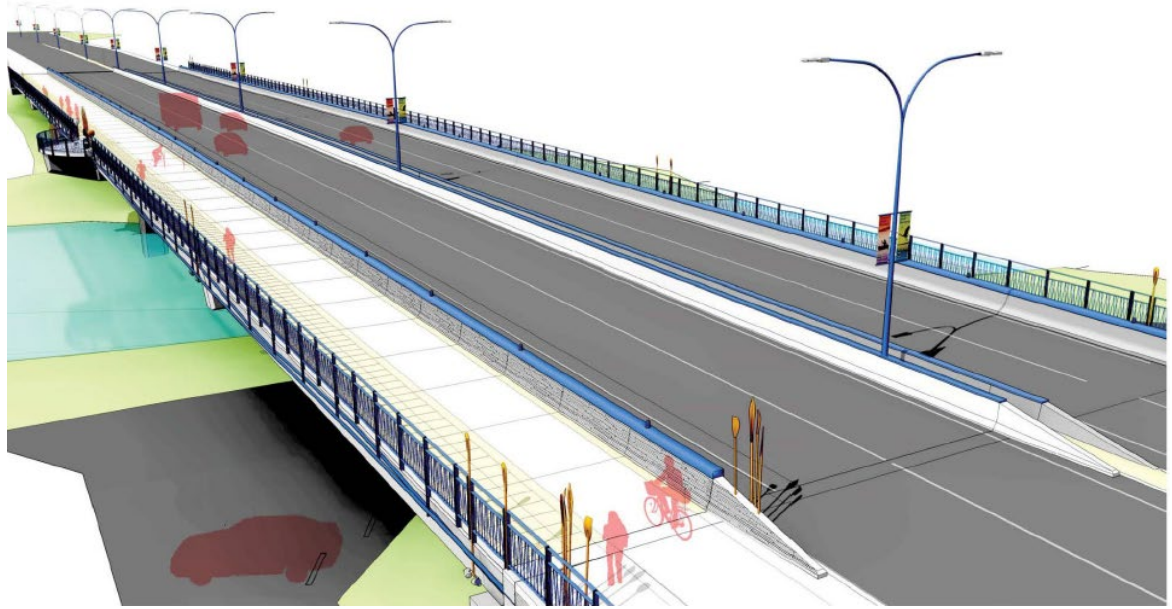
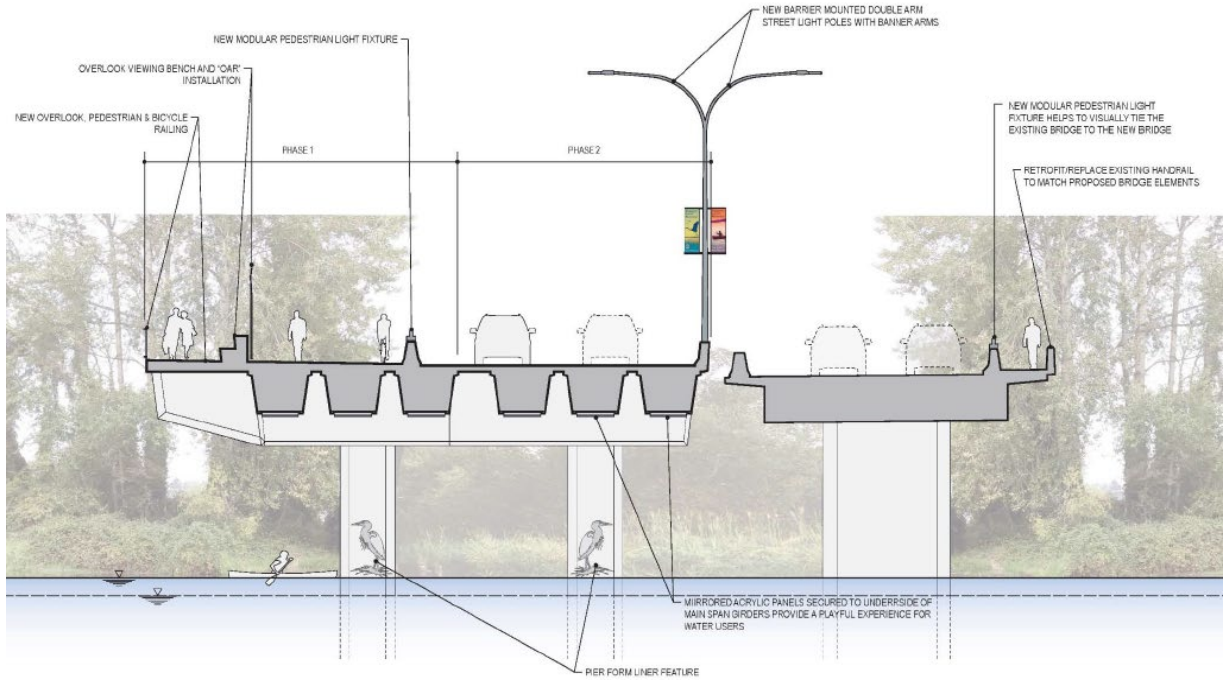
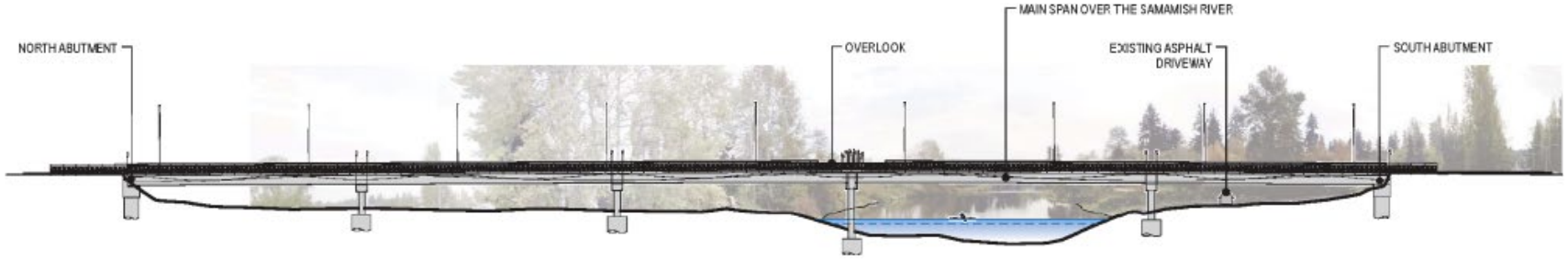
Bridge Design Concept







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Maintaining Traffic – Construction Phase 1

Vehicles

- Southbound traffic remains on existing bridge
- Maintain two southbound lanes
- Occasional closures during weekend/nighttime and non-peak traffic periods

Pedestrians

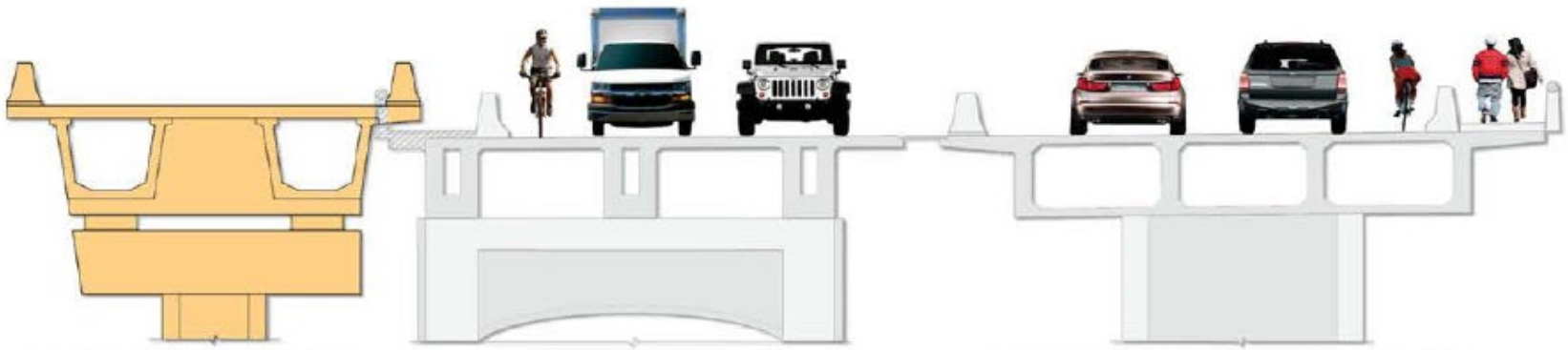
- Pedestrian traffic on east sidewalk only

Bicycles

- Bicyclists continue using traffic lanes

Boats

- Occasional short-term river closures in coordination with the U.S. Coast Guard
- Boat launch to remain open



DEMOLISH WEST BRIDGE SIDEWALK AND CONSTRUCT WEST HALF OF NEW BRIDGE

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Maintaining Traffic - Construction Phase 2

Vehicles

- Southbound traffic shifts to west side of new bridge
- Maintain two southbound lanes
- Occasional closures during weekend/nighttime and non-peak traffic periods

Pedestrians

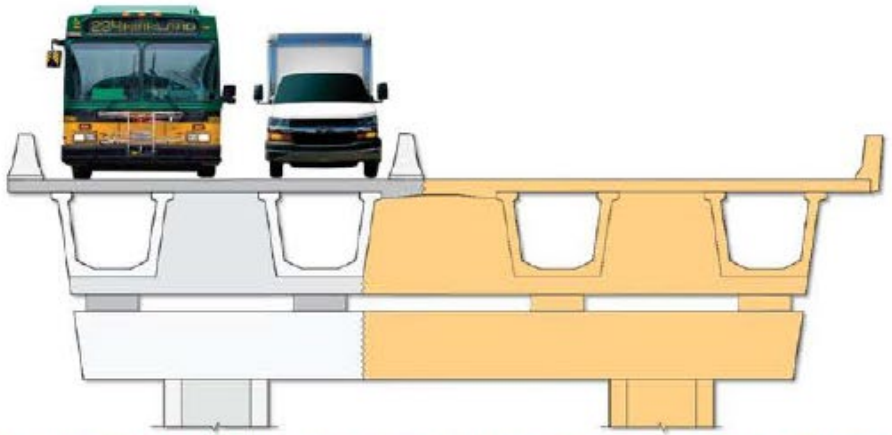
- Pedestrian traffic on east sidewalk only

Bicycles

- Bicyclists continue using traffic lanes

Boats

- Occasional short-term river closures during existing bridge demolition and construction of new bridge in coordination with the U.S. Coast Guard
- Boat launch to remain open



COMPLETE REMAINING WEST BRIDGE CONSTRUCTION AFTER DEMOLITION

EAST BRIDGE - EXISTING NORTHBOUND

DEMOLISH REMAINING WEST BRIDGE AND CONSTRUCT EAST HALF OF NEW BRIDGE

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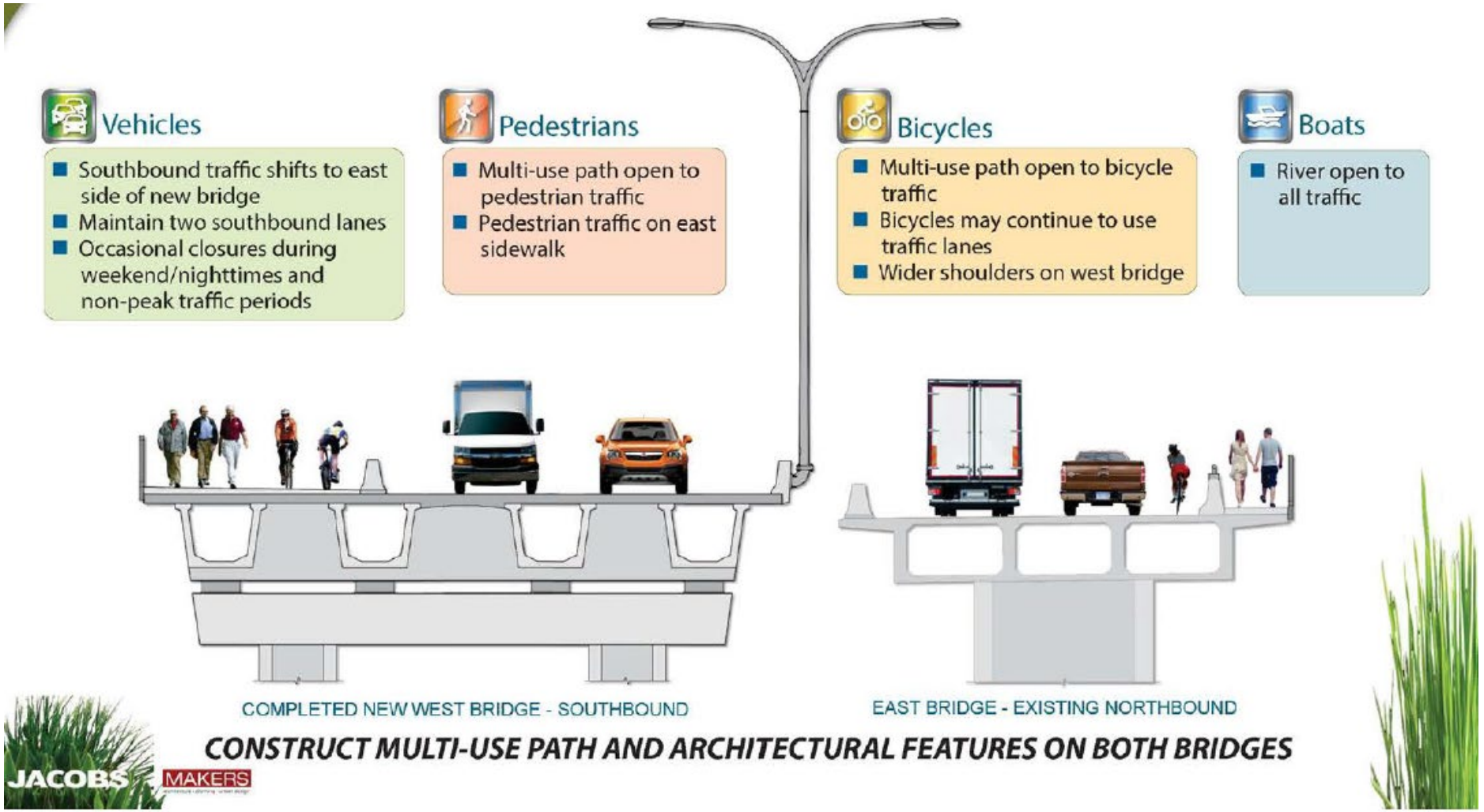
Maintaining Traffic - Construction Phase 3 / Completion



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Bridge Design Details

- **Bridge Superstructure:**
  - Five spans with PC Box Girders (WSDOT UF60G5) for 600 ft long
  - Two lanes of vehicular traffic and 16-ft multipath (bike and pedestrians)
  - Lookout bench with architectural ornaments
  - Architectural railing & LED lighting
- **Bridge Substructure**
  - Site-specific Response Spectra for 1,000-year EQ
  - Designed for Liquefaction/Lateral Spreading
  - Seismic Isolation Bearings on crossbeams
  - Intermediate Piers – rectangular columns on 8-ft dia. drilled shaft
  - Geofoam blocks to mitigate settlement at approaches

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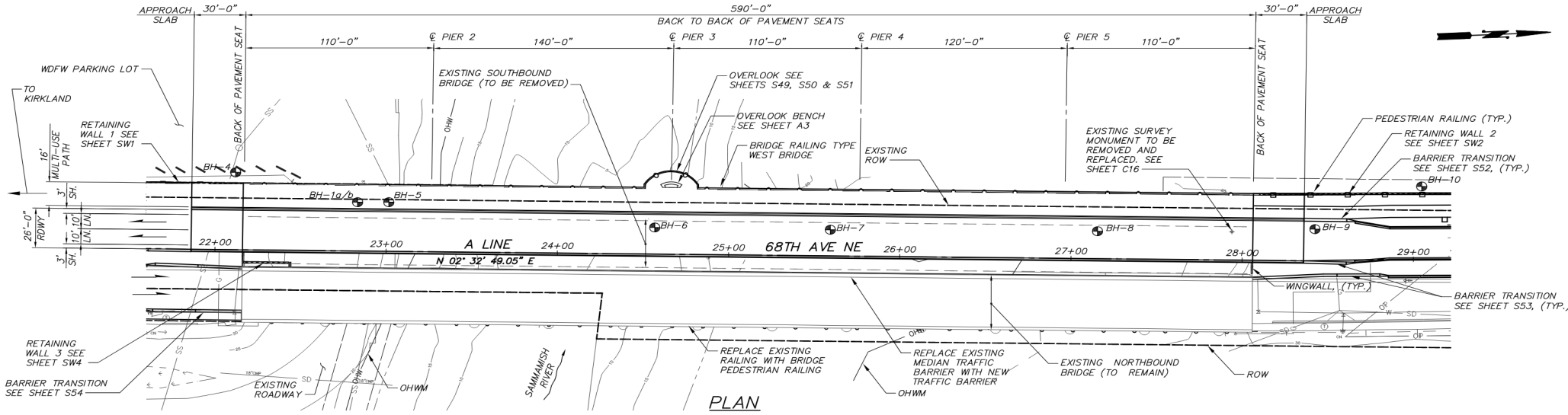
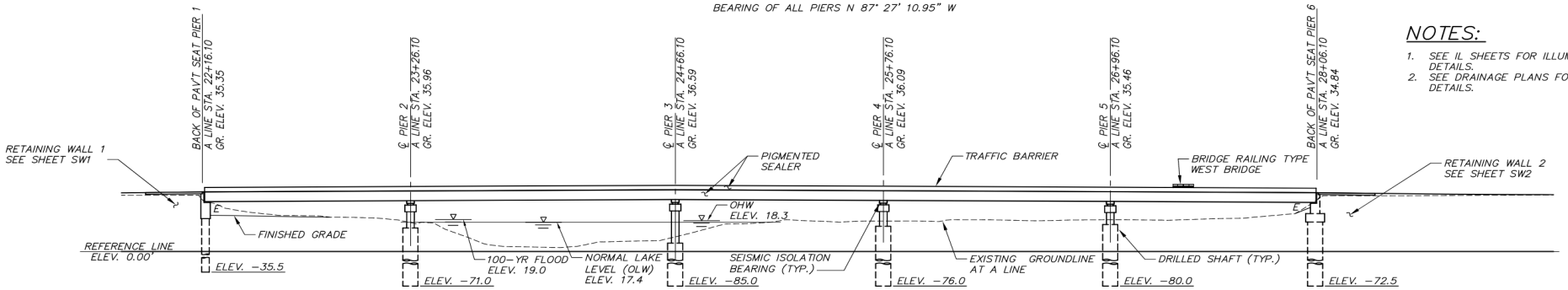
RECORD DRAWINGS

4 E., W.M.



PLAN

BEARING OF ALL PIERS N 87° 27' 10.95" W



NOTES:

1. SEE IL SHEETS FOR ILLUMINATION PLANS AND DETAILS.
2. SEE DRAINAGE PLANS FOR BRIDGE DRAIN DETAILS.

DATUM

NAVD 88

ELEVATION

GRADE ELEV. SHOWN ARE FINISHED GRADES AT TOP OF BRIDGE DECK ON A LINE AND ARE EQUAL TO PROFILE GRADE.

P.C. TUB GIRDER (UF60G5) CONTINUOUS FOR LIVE LOAD LOADING: HL-93

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CITY OF KENMORE
PUBLIC WORKS DEPARTMENT
KENMORE, WA 98028
425-398-8900

DRAWN BY: JLD
CHECKED BY: JX
DESIGNED BY: XW
APPROVED BY: KSK
DATE: 9/25/2019

NOTE	DESCRIPTION	DATE	BY

JACOBS
1100 112th Avenue N.E., Suite 500
Bellevue, WA 98004

10/01/19

WEST SAMMAMISH RIVER BRIDGE

SHEET 109 OF 219

BRIDGE LAYOUT

S1

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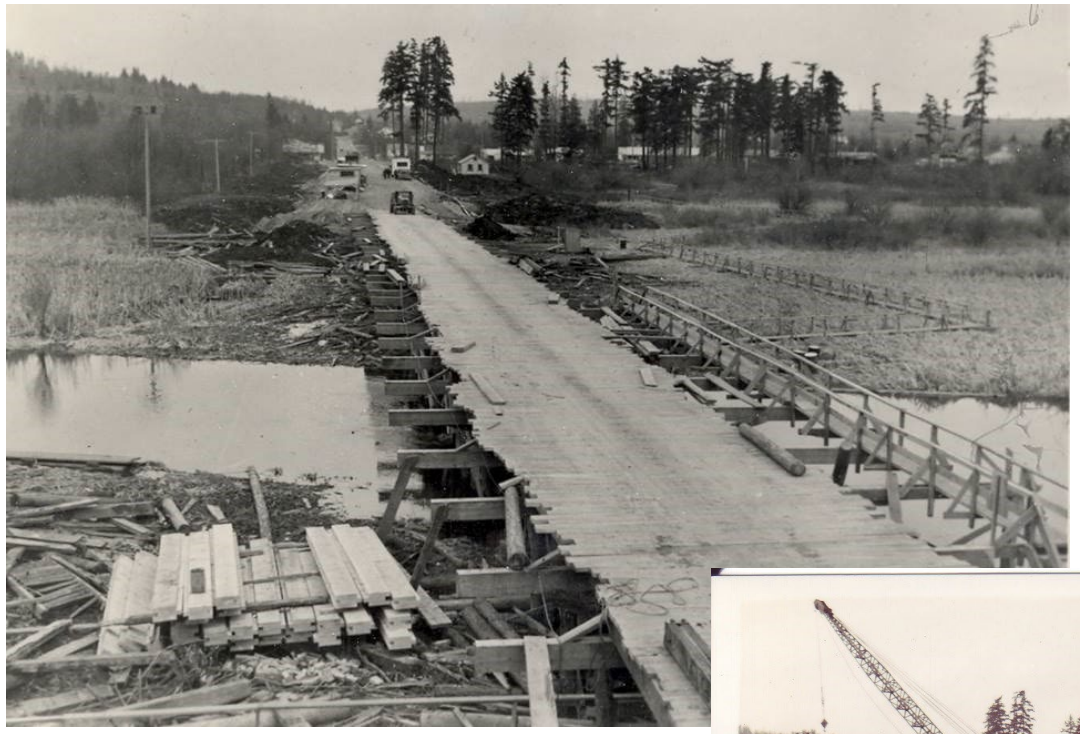
Original Bridge Construction – 1938



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Construction - 2020

- Work Trestle & Cofferdam – In-water window
- Placement of LWM & Drilled Shafts

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Construction

- Bridge Supestructure Demolition (CIP RC Box) – next to existing NB Bridge in service

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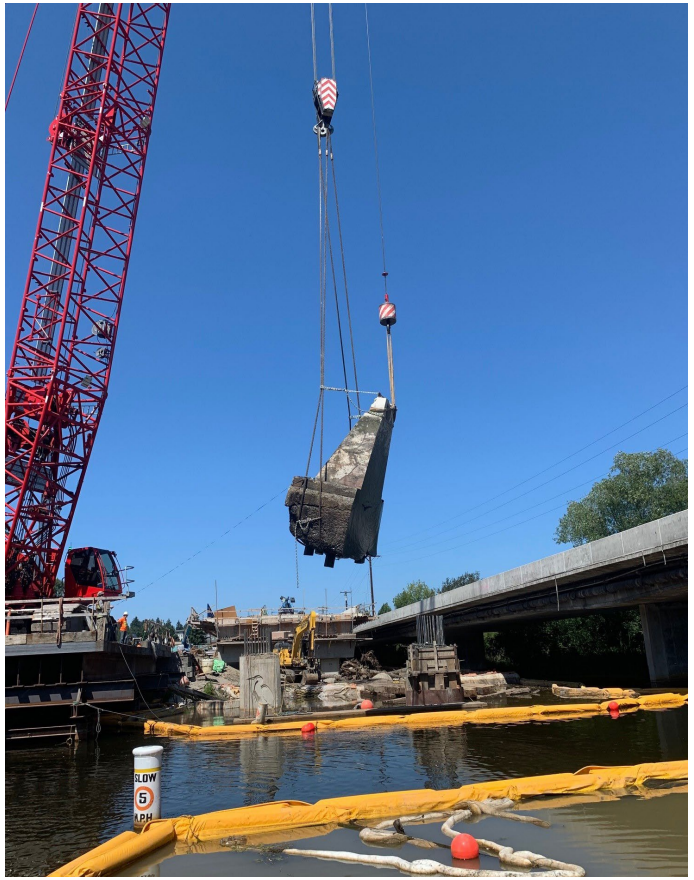
Existing Footing/Pilecap Removal

- Foundations weighed up to 200,000 LBS
- Sawcut under water



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Construction

- New Piers in the water – Constructed during in-water work window

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Seismic Isolation Bearings (Lead Rubber Bearing)

- Displacement-base design for 1,000-year EQ
- Columns too short for Plastic Hinging Zones
- Superstructure too heavy for force-based design

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Conc. Precast Girder Installation

- Transport girders middle of night to avoid I-5 traffic
- 140’ PC Girder, 210 kips

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Conc. Precast Girder Installation

- PC Box Girders (WSDOT UF60G5)

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Construction

- Geofoam blocks to mitigate long-term settlement at approaches

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Clear Cast Stay-in-Place Form - Transparent Acrylic Plastic

- SIP deck forms to accelerate bridge construction

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Aesthetics Enhancement

- 16-ft Wide Multi-use path with Overlook Bench
- Custom Design Metal Railing
- LID Lighting (strip lighting along barriers and benches)

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Aesthetics Enhancement – Cont'd

- "Aloha" formliners on concrete barriers
- Blue Heron formliners on columns

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West Sammamish River Bridge, Kenmore, WA

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Bridge Opening Celebration – 8.11.2022

DAILY JOURNAL OF COMMERCE

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ENGINEERING EXCELLENCE AWARDS

February 6, 2023

Best In State: Gold Award
Complexity

Jacobs

Photo courtesy of Jacobs Engineering Group

The new bridge includes a gathering space at center span overlooking the river.

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Lessons Learned

- Worked as “Extension of the City” in all levels
- Biggest challenge – Navigating thru most complex permitting process
- Detailed construction sequences in constrained area/limited fish window
- Detail traffic control plans – cars/ped/bikes on Road and boats on River
- Public outreach/communication – live-stream traffic and construction activities
- Be flexible – always have Plan B
  - Project delayed due to gov’t shutdown - permitting agency closed
  - Construction delayed due to COVID pandemic – materials and labor

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Lessons Learned – Cont'd

- Innovation
  - Seismic Isolation Bearing (seismic lateral spreading due to liquefaction)
  - Stay-in-place Clear Cast Form - Transparent Acrylic Plastic
  - Geofoam blocks to mitigate long-term settlement
  - Aesthetics Enhancement
    - 16-ft wide multi-use path with architectural railing
    - Lookout Bench with Historic Oars
    - LED Lighting along the multi-use path (strip lighting) and corridor (poles)
    - Custom-deigned formliners on barriers and piers

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Thank you!

Any Questions?