Preliminary Structural Feasibility
I-5 Lid Feasibility Study Committee
August 22, 2019
WSP
Workshop Purpose and Goals

• Agenda review
• Introductions
• Goals:
  • Address the question “where can a lid be built?”
  • Examine preliminary structural feasibility of lid geometrical layouts and structural assessment
  • Create an engaging workshop that encourages committee dialogue and input
Committee Ground Rules

- Listen to understand one another’s perspectives
- Make space to listen to all the voices in the room
- Minimize interruptions and side conversations
- Follow facilitator’s lead
- Stick to agenda and allotted timeframes
SDON Outreach Update
SDON Outreach Update

Outreach Goals:

• Work with underrepresented community members to inform them of feasibility study
• Hear and document community members’ visions, ideas and concerns for a lid over I-5
• Give them ways to keep informed and updated on the process

Feedback To Date:

• Concerns around equity and access to newly created space were central to support
• Interested to share lid concept with communities and stakeholders, and wanted to continue to be a part of the conversation
Work Plan and Study Committee Look-Ahead
Study Committee Look-Ahead Plan

6/11 2-5 pm

Study outcome: Key study assumptions and guiding principles

Question answered: What are the important key study assumptions?

Meeting purpose: Share, confirm and test key study assumptions and guiding principles

8/22 2-5 pm

Study outcome: Preliminary technical feasibility

Question answered: Where can a lid be built?

Meeting purpose: Examine feasible lid geometrical layouts and structural assessment

10/15 12:30-4:30 pm

Study outcome: Technical assessment, load capacity, and site context analysis

Question answered: What can a lid support?

Meeting purpose: Examine what a lid can support and potential development program test cases

1/23 10 am-2 pm

Study outcome: Economic and financial feasibility assessment

Question answered: How might development programs perform?

Meeting purpose: Examine economic benefit cost analysis, capital cost ranges, financing opportunities and governance options

April TBD

Study outcome: Final I-5 Lid Feasibility Study report

Question answered: What are the next steps?

Meeting purpose: Learn about the final study results and a blueprint for next steps

Dates and times shown are proposed and to be confirmed.
Preliminary Structural Feasibility
Presentation Overview

• General considerations and limitations
• Project approach
• Site overview
• Project technical assumptions
• Lid sub-area development
  • Features/geometrics
  • Structural assessment
• Considerations
• Next steps

Concepts and materials shown are draft ideas for discussion purposes only.
# Project Schedule (This Phase)

General schedule for work being conducted under this study (phase of work)

<table>
<thead>
<tr>
<th>March 2019</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
<th>January 2020</th>
<th>February</th>
<th>March</th>
<th>April</th>
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<tbody>
<tr>
<td><strong>Task 1: Project Administration</strong></td>
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<td><strong>Task 3: Project Financing</strong></td>
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<td><strong>Task 5: Existing Conditions and Context Analysis</strong></td>
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<td><strong>Task 6: Economic and Financial Feasibility (Data Requirements)</strong></td>
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<td><strong>Task 7: Implementation Guidelines</strong></td>
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<td><strong>Task 8: Final I-5 Lid Feasibility Study Report</strong></td>
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Conceptual Project Schedule (Future)

General schedule for work being conducted in later (future) phases

I-5 Lid Feasibility Study

Phase 1 - Feasibility Study

Phase 2 – Planning Process, Program Definition & Public Engagement

Agency Coordination and Regulatory Requirements

Phase 3 – Design

Phase 4 – Environmental Documentation, Permitting & R/W Acquisition

Phase 5 – Construction

I-5 Lid Feasibility Study

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Study Limitations - What’s included?

List of items included in the study...

• Identification of potential impacts and capital cost ranges associated with various lid sub-areas for different levels of development
  • The study will provide the City and project stakeholders with credible information and resources to assess the economic feasibility of the project considering various land use ratios and associated potential infrastructure impacts.

• Concept level structural design suitable for establishing rough order of magnitude costs
  • Concept level structural design will not be what actually gets built

• Design decisions based on engineering judgement supported by limited analysis
Study Limitations - What’s not included?

List of items NOT included in the study...

- Consultant Team recommendations, or identification of fatal flaws
  - The study will identify a tool set that can be used for planning future phases of work
- Development of design submittals for various engineering discipline review
  - This would need to be performed in future phases of work.
- Addressing traffic and utility impacts (temporary or permanent)
  - This would need to be performed in future phases of work.
- Mitigation of traffic impacts and associated costs
  - This would need to be addressed in future phases of work.
WSDOT Considerations

- WSDOT is working with the City of Seattle to understand the requirements and constraints that would affect freeway lid feasibility in this study area.
- WSDOT recognizes the need to identify long term plans for this segment of freeway, including consideration of its functional adequacy, asset management and seismic resilience.
- WSDOT identifies that we are a long way from knowing project feasibility or cost, and caution against drawing firm conclusions or estimates at this level of detail.
- Any changes in ramp locations would require detailed network analysis of effects on freeway and local street function.
- More work will be needed to determine the best approach to long-term preservation or replacement of existing structures and meeting future seismic resiliency needs.
Project Approach

Outlined below; will be an iterative process. Bolded items have commenced

- **Basemap Development**
  - Preliminary – built on documents received from information requests

- **Lid Sub-Area Development (Geometric Layouts)**
  - Definition of Impacts
  - Definition of Work Zones

- **Lid Sub-Area Structural Assessment** ← Current Status
  - Parametric study based on anticipated spans of the identified lid sub-areas
  - To consider different load conditions: open-space; low-rise, medium rise, and high-rise development

- Interdisciplinary Coordination
  - Directed discipline specific task assignments to approximate costs and impacts

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Site Overview
Structural Assessment Boundary (SAB) & Sub-areas

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I-5 Lid Feasibility Study
Site Overview - General

Concepts and materials shown are draft ideas for discussion purposes only.

<table>
<thead>
<tr>
<th>Component</th>
<th>Area 1</th>
<th>Area 2</th>
<th>Area 3</th>
<th>Area 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>NB I-5 (Elevated Structure)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Overpasses</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Reversible Express Lanes</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>On/Off Ramps</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Tunnels</td>
<td></td>
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<td>X</td>
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<tr>
<td>Freeway Park</td>
<td></td>
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<td>X</td>
<td>X</td>
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<tr>
<td>WSCC</td>
<td></td>
<td></td>
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<td>X</td>
</tr>
<tr>
<td>Walls</td>
<td>X</td>
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</table>

I-5 Lid Feasibility Study

Concepts and materials shown are draft ideas for discussion purposes only.
Site Overview - Structures

<table>
<thead>
<tr>
<th>Structure Type</th>
<th>Area 1</th>
<th>Area 2</th>
<th>Area 3</th>
<th>Area 4</th>
<th>Total</th>
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<tbody>
<tr>
<td>Quantity of Bridges</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>15</td>
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<tr>
<td>Quantity of Walls</td>
<td>8</td>
<td>7</td>
<td>9</td>
<td>9</td>
<td>33</td>
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</tbody>
</table>

- **Bridge Types:**
  - Cast-In-Place Box Girder
  - Cast-In-Place Slab
  - Cast-In-Place T-Beam

- **Wall Types:**
  - Cylinder Walls (5’-6” Dia., 8’-4” Dia., 10’-0” Dia.)
  - Cantilever Retaining Walls

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Site Overview - Vertical Clearances

<table>
<thead>
<tr>
<th>Area</th>
<th>Location</th>
<th>Notes</th>
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<tbody>
<tr>
<td>1</td>
<td>Seneca Street Bridge</td>
<td><strong>Over Mainline NB I-5 (15.79-ft)</strong> - left lanes</td>
</tr>
<tr>
<td></td>
<td>Spring Street Bridge</td>
<td>Over Columbia Street (15.26-ft)</td>
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<tr>
<td></td>
<td>Madison Street Bridge</td>
<td><strong>Over Seneca Street Off-Ramp (15.79-ft)</strong></td>
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<tr>
<td>2</td>
<td>7th Avenue Bridge</td>
<td>Over Columbia Street (16.00-ft)</td>
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<td>8th Avenue Bridge</td>
<td>Over University Street On-Ramp (15.17-ft)</td>
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<td>University Street On-Ramp</td>
<td>Over Columbia Street (15.35-ft)</td>
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<tr>
<td>3</td>
<td>Boren Avenue Bridge</td>
<td>Over Pike Street On/Off Ramp (16.00-ft)</td>
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<tr>
<td></td>
<td>Pine Street Bridge</td>
<td>Over Pike Street On/Off Ramp (16.00-ft)</td>
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<tr>
<td></td>
<td>Olive Way Bridge</td>
<td><strong>Over Mainline NB I-5 (15.1-ft)</strong> - left lanes</td>
</tr>
<tr>
<td>4</td>
<td>Yale Avenue On-Ramp</td>
<td>Over Pike Street On/Off Ramp (14.75-ft)</td>
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<td>Denny Way Bridge</td>
<td>Over Pike Street On/Off Ramp (15.83-ft)</td>
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<td><strong>Over Mainline NB I-5 (15.08-ft)</strong> - left lanes</td>
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<td>Over Olive Way On-Ramp (14.75-ft)</td>
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</table>

WSDOT Design Manual M22-01.16 720.03(5)(b)(1): **16.5-ft minimum clearance** for new bridge structures.
Site Overview - Grade Variation

Nothing is flat - generally sloping down to the west and fluctuating north/south.
Other Lid Examples - Grade Variation

I-5 presents greater complexity and impacts in terms of connectivity and access to the lid area.

E.g. Klyde Warren Park, Dallas (TX) over TX 366 downtown Dallas
Project Technical Assumptions

• The LFS will not make any decisions about the future of the I-5 corridor
• Projects constructed by April 2019 are included in the feasibility assessment, projects in planning are not considered to be built
• Existing structures are not being assessed for deficiencies; PSRC 2018 State Facilities Action Plan is the basis for the I-5 asset analysis
• Existing bridges, ramps, walls, or other structures (excluding buildings and tunnels) within the SAB can be removed, modified or replaced, for the purpose of the analysis
  o Removal of ramps (w/o replacement) would require additional analysis, beyond this study, to address potential implications
  o Removal of existing buildings is not permissible
• Geometrical layouts are conceptual and solely for the purpose of exploring the opportunities, constraints, and technical questions that will need to be examined in more detail if there are additional studies to lid I-5. This feasibility study is being conducted in collaboration with the asset owners and will not predetermine the use or function of public assets.
Project Technical Assumptions

- The study will only assess structural modifications to the existing lids at Freeway Park and the Convention Center necessary for potential edge integration with a future lid.
- The existing capacity of I-5 will not be reduced.
- Permanent I-5 lane configuration modifications may be considered:
  - Creates space for lid structure intermediate piers.
  - May create island between on/off ramp and mainline lanes or between HOV and mainline lanes.
- Temporary I-5 Impacts may be permissible:
  - Long duration lane closures; construct piers in the median of I-5.
  - Short duration multiple lane closures; demolition of overpasses and off ramps.
Project Technical Assumptions

• Deliverables – preliminary in nature and for scoping level purposes only.
• Costs can be developed without performing construction engineering or studying potential modifications to I-5 (based on sound engineering judgement and regional project experience)
• Four loading levels:
  o Open space – landscaping and pavilions (up to 3 stories)
  o Low-rise Residential – 7 story (5 over 2) structures
  o Mid-rise Residential/Commercial – 15 to 20 story structures
  o High-rise Residential/Commercial – 45 story structures
• No new subsurface explorations will be performed.
• Existing road network has adequate capacity to support the proposed lid development.
• Existing utility (i.e. storm drain, sanitary sewer, water, electrical, etc.) systems have adequate capacity to support the proposed lid development
Project Technical Assumptions

• Existing utility infrastructure challenges and opportunities that have been identified by utility purveyors have been disclosed to team.

• EIS may be required to complete the SEPA and NEPA process.
  • Complexity of the project and dense urban context may generate significant environmental impacts and/or a high level of controversy.

• Lid sub-areas will require:
  • Lighting
  • Emergency Ventilation System
  • Fixed Fire Fighting System
  • Structure Fire Durability Protection
  • Power and Controls: for lighting and emergency ventilation systems
  • Climate controlled room to house switchgear, switchboards, and related appurtenances
  • Emergency Generator
Project Assumptions

- For high-rise load level, only locations where a structure can be conventionally framed will be considered.

EXAMPLE: 1 & 2 Manhattan West Over 240 ft Span Lid

Lid Sub-area Development

Washington State Convention Center (WSCC)
Freeway Park
U-Link Tunnels
Washington State Convention Center Addition
I-5 North Reversible Lane Tunnel

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I-5 Lid Feasibility Study
Lid Sub-area Development - Area 1

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I-5 Lid Feasibility Study

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Lid Sub-area Development - Area 1

- Freeway Park is eligible and has been nominated to be included in the National Register of Historic Places
Lid Sub-area Development - Area 1

- Considerations:
  - Demolition of Freeway Park Box Gardens & South Edging
  - Demolition of Ramps
  - Modification of Existing Walls
  - Temporary I-5 Traffic Impacts

- Benefits:
  - Maximized Lid Area
  - Simplified intersections with potential road safety benefits

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<thead>
<tr>
<th>Span</th>
<th>Length (feet)</th>
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<tbody>
<tr>
<td>Over James St. Exit</td>
<td>80 - 90</td>
</tr>
<tr>
<td>Over SB I-5</td>
<td>80 - 90</td>
</tr>
<tr>
<td>Over NB I-5</td>
<td>90 - 120</td>
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</tbody>
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Concepts and materials shown are draft ideas for discussion purposes only.
Lid Sub-area Development - Area 1

- Considerations:
  - Partial Demolition of Freeway Park Box Gardens & South Edging
  - Modification of Existing Walls
  - Temporary I-5 Traffic Impacts

- Benefits:
  - No changes in I-5 asset configuration (ie. maintains existing ramps)

- Drawbacks:
  - Minimal and discontinuous lid area
  - Seneca St. off-ramp splits area
  - Complex intersections with potential road safety impacts remain

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Lid Sub-area Development - Area 1

Considerations:
- No Demolition of Freeway Park Box Gardens & South Edging
- Demolition of Ramps
- Modification of Existing Walls
- Temporary I-5 Traffic Impacts

Benefits:
- Does not touch Freeway Park Box Gardens & South Edging

Drawbacks:
- Does not maximize lid area
- Constrained construction methods and staging of equipment
Lid Sub-area Development - Area 2

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Lid Sub-area Development - Area 2

Span | Length (feet)
--- | ---
Over University | 40 – 100
Over SB I-5 | 80 – 125
Over NB I-5 | 80 - 120
Over Hubbell | 40 - 65

- **Considerations:**
  - Partial Demolition of Freeway Park Edges
  - Modification of Existing Walls
  - Temporary I-5 Traffic Impacts
  - Partial Demolition/Replacement of Overhangs

- **Benefits:**
  - Noise Reduction
  - Increases connections
  - Increases area for active uses on Freeway Park

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Lid Sub-area Development - Area 3

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I-5 Lid Feasibility Study

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Lid Sub-area Development - Area 3

Considerations:
- Partial Demolition/Replacement of Overhangs
- Modification of Existing Walls
- Temporary I-5 Traffic Impacts
- Modification of Ramps
- Permanent I-5 Lane Reconfiguration

Benefits:
- Maintains existing ramps

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<th>Span</th>
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<tbody>
<tr>
<td>Pike St. Express Lanes Ramp</td>
<td>50 - 60</td>
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<tr>
<td>Over SB I-5</td>
<td>95 - 145</td>
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<tr>
<td>Over NB I-5</td>
<td>75 - 130</td>
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<tr>
<td>Olive Way Off-Ramp</td>
<td>50 - 70</td>
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Lid Sub-area Development - Area 3

- Considerations:
  - Partial Demolition/Replacement of Overhangs
  - Modification of Existing Walls
  - Temporary I-5 Traffic Impacts
  - Temporary Ramp Impacts
  - Permanent I-5 Lane Reconfiguration

- Benefits:
  - Maintains existing ramps

- Drawbacks:
  - Minimal Lid Area

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Lid Sub-area Development - Area 4

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Lid Sub-area Development - Area 4

- Impacts:
- Benefits:

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<tbody>
<tr>
<td>Pike St. Express Lanes Ramp</td>
<td>50 - 60</td>
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<tr>
<td>Over SB I-5</td>
<td>80 - 105</td>
</tr>
<tr>
<td>Over NB I-5</td>
<td>160 - 170</td>
</tr>
<tr>
<td>Over Olive Way On-Ramp</td>
<td>60 - 160</td>
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</tbody>
</table>

- Considerations:
  - Demolition of Ramps
  - Modification Existing Walls
  - Temporary I-5 Traffic Impacts
  - Permanent I-5 Lane Reconfiguration
  - Temporary Ramp Impacts

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I-5 Lid Feasibility Study
Lid Sub-area Development - Area 4

• Considerations:
  • Modification Existing Walls
  • Temporary I-5 Traffic Impacts
  • Permanent I-5 Lane Reconfiguration
  • Modification of Ramps

• Benefits:
  • Maintains existing ramps
Lid Sub-area Development - Area 4

• Considerations:
  • Modification Existing Walls
  • Temporary I-5 Traffic Impacts
  • Permanent I-5 Lane Reconfiguration
  • Temporary Ramp Impacts

• Benefits:
  • Maintains existing ramps

• Drawbacks:
  • Minimum Lid Area

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## Lid Sub-area Development - Structural

<table>
<thead>
<tr>
<th>Load Level</th>
<th>Dead Load (psf)</th>
<th>Live Load (psf)</th>
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<tbody>
<tr>
<td>Open space</td>
<td>1000</td>
<td>100 or 250</td>
</tr>
<tr>
<td>Low-rise</td>
<td>600</td>
<td>430</td>
</tr>
<tr>
<td>Medium-rise</td>
<td>2,650</td>
<td>1,150</td>
</tr>
<tr>
<td>High-rise</td>
<td>6,815</td>
<td>2,100</td>
</tr>
</tbody>
</table>

Concepts and materials shown are draft ideas for discussion purposes only.
Lid Sub-area Development - Structural

Typical Section – Precast Girder

Typical Section – Steel Plate Girder
## Lid Sub-area Development - Structural

**Table: Precast Girder Span Lengths**

<table>
<thead>
<tr>
<th>Lid Depth &quot;D&quot; (feet)</th>
<th>Girder Spacing &quot;S&quot; (feet)</th>
<th>Load Level (-)</th>
<th>Max Span Length (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>5</td>
<td>Open space</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low-rise</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mid-rise</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High-rise</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>5</td>
<td>Open space</td>
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<td></td>
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<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mid-rise</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High-rise</td>
<td>-</td>
</tr>
<tr>
<td>9.33</td>
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<tr>
<td></td>
<td></td>
<td>Low-rise</td>
<td>130</td>
</tr>
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<td></td>
<td></td>
<td>Mid-rise</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High-rise</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
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<td></td>
<td></td>
<td>Low-rise</td>
<td>85</td>
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<td></td>
<td></td>
<td>Mid-rise</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High-rise</td>
<td>-</td>
</tr>
</tbody>
</table>

**Table: Steel Plate Girder Span Lengths**

<table>
<thead>
<tr>
<th>Lid Depth &quot;D&quot; (feet)</th>
<th>Girder Spacing &quot;S&quot; (feet)</th>
<th>Load Level (-)</th>
<th>Max Span Length (feet)</th>
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</thead>
<tbody>
<tr>
<td>4</td>
<td>5</td>
<td>Open space</td>
<td>88</td>
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<td></td>
<td></td>
<td>Low-rise</td>
<td>76</td>
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<td></td>
<td></td>
<td>Mid-rise</td>
<td>42</td>
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<td></td>
<td></td>
<td>High-rise</td>
<td>32</td>
</tr>
<tr>
<td>12</td>
<td>5</td>
<td>Open space</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low-rise</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mid-rise</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High-rise</td>
<td>-</td>
</tr>
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<td>13</td>
<td>5</td>
<td>Open space</td>
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<td>Low-rise</td>
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<td></td>
<td></td>
<td>Mid-rise</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High-rise</td>
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<td>Mid-rise</td>
<td>104</td>
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<tr>
<td></td>
<td></td>
<td>High-rise</td>
<td>82</td>
</tr>
</tbody>
</table>
Lid Sub-area Development - Structural

Total new potential lid area...

<table>
<thead>
<tr>
<th>Area</th>
<th>Potential New Lid Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(sq. ft.)</td>
</tr>
<tr>
<td>1</td>
<td>133,640</td>
</tr>
<tr>
<td>2</td>
<td>85,550</td>
</tr>
<tr>
<td>3</td>
<td>293,000</td>
</tr>
<tr>
<td>4</td>
<td>257,640</td>
</tr>
<tr>
<td>Total</td>
<td>769,830</td>
</tr>
</tbody>
</table>

Concepts and materials shown are draft ideas for discussion purposes only.

I-5 Lid Feasibility Study
Lid Sub-area Development - Structural

Maximum load levels based on conventional girder framing and anticipated span arrangements...

LEGEND: Maximum Load Levels
- Red: Up to High-rise Load Level
- Blue: Up to Mid-rise Load Level
- Cyan: Up to Low-rise (5 over 2) Load Level
- Green: Up to Open space Load Level
- Black: Existing Assets

Concepts and materials shown are draft ideas for discussion purposes only.
Lid Sub-area Development - Structural

Maximum load levels do not preclude lid areas from being considered for open space use...

LEGEND:
- Green: Open space Load Level
- Black: Existing Assets
- Pink: Vertical edges above-grade/balcony

~ 5 ft
~ 20-25 ft
~ 10-15 ft
~ 5-10 ft
~ 30-35 ft
~ 10-15 ft
~ 30-35 ft

I-5 Lid Feasibility Study

Concepts and materials shown are draft ideas for discussion purposes only.
## Considerations

<table>
<thead>
<tr>
<th>Consideration</th>
<th>Area 1</th>
<th>Area 2</th>
<th>Area 3</th>
<th>Area 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demolition/Replacement Elevated of I-5 Overhangs</td>
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<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Demolition/Replacement of Overpasses</td>
<td>X</td>
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<td>X</td>
<td>X</td>
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<tr>
<td>On/Off Ramp Modification</td>
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<td>X</td>
<td>X</td>
</tr>
<tr>
<td>On/Off Ramp Removal</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
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<tr>
<td>Wall Removal/Modifications</td>
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<td>X</td>
</tr>
<tr>
<td>Freeway Park/WSCC Modifications</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>I-5 Channelization Reconfiguration</td>
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<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Utilities</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Concepts and materials shown are draft ideas for discussion purposes only.
Consideration - Replace Elevated I-5 Overhangs

- **Mainline I-5:** May need to close the shoulder and some lanes along mainline I-5, and demolish and replace existing overhangs, in order to construct the intermediate pier.
  - Long stretches of I-5 (Largest impact on Southbound)
  - Will impact sign bridges and illumination too
Consideration - Overpass Demolition/Replacement

STEP 1

STEP 2

STEP 3

STEP 4

Concepts and materials shown are draft ideas for discussion purposes only.
Consideration - On/Off Ramp Removal

Stage 2 Demolition:
1. Demo freeway park landscape elements, slab, and diaphragms. May require closure of one lane at a time for southbound 6th Avenue exit (2 lanes).
2. During nighttime closure of 6th Avenue exit, remove all precast girders that support freeway park and demo Northbound Spring St. Exit Bridge (57447 E S).
3. Construct Southbound I-5 detour (3 lanes) connecting 6th Avenue exit starting under 6th St. bridge and connecting back to I-5 under Spring St. bridge.
Consideration - On/Off Ramp Removal

Concepts and materials shown are draft ideas for discussion purposes only.

I-5 Lid Feasibility Study

Stage 3 Demo:
1. Shift Southbound I-5 traffic to detour (capacity reduced from 4 lanes to 3).
   Right lane can optionally exit to 6th Avenue.
2. Demo remaining portion of freeway park and Seneca St. off-ramp bridge (5/545N-W).

Note: Southbound I-5 detour could also be configured to accommodate demolition of overpass bridges in the case that any of them needed to be replaced.
Consideration - On/Off Ramp Removal

Stage 1 Demol:
1. Demo freeway park landscape elements, slab, and diaphragms. May require closure of 1-2 lanes at a time.
2. During nighttime closure of all lanes of Northbound I-5, remove precast concrete girders that span over Northbound lanes. Crane could be set up on Hubbell Pl or Seneca St to reduce I-5 closure. Northbound traffic detoured to express lanes.
Consideration - Wall Removal/Modifications

- **Existing Walls**: the abutments may need to be supported on driven piles or drilled shafts in order to not load the existing walls. This requires the abutments to be located behind the walls (within City streets)
  - Disruption to local City streets (traffic; utilities; businesses; residential; etc.) during construction

Concepts and materials shown are draft ideas for discussion purposes only.
Consideration - Freeway Park/WSCC Modifications

- Would require to demolish up to Seneca Street in order to cleanly frame between Seneca and Spring.
- Would require to demolish façade to form clean edges for sub-area 2
- Would require to demolish and reconstruct a portion of Freeway Park to tie in with 8th Avenue
Consideration - Freeway Park/WSCC Modifications

- Existing N-S Walkway and Stair between WSCC Plaza and Pike – Varies from 6.25’ to 10’ wide
Consideration - Freeway Park/WSCC Modifications

• Existing N-S Pedestrian Route

(Looking South)  (Looking South)  (Looking South)  (Looking North at Pike)

(Walking South)
Consideration - Freeway Park/WSCC Modifications

- Walkway Extension and Pedestrian Bridge Concept to provide N-S Pedestrian Route

**Section 1 – Walkway Extension**

**Section 2 – New Pedestrian Bridge**

- Considerations:
  - Removal of trees adjacent to retaining wall along Hubbell
  - Permanent lane configuration modification of Hubbell. May require removal of on-street parking
Consideration - I-5 Channelization Reconfiguration

Concepts and materials shown are draft ideas for discussion purposes only.
Consideration - Utilities

Concepts and materials shown are draft ideas for discussion purposes only.
Next Steps

Outlined below; will be an iterative process. Bolded items have commenced

• Basemap Development
  • Preliminary – built on documents received from information requests

• Lid Sub-area Development (Geometric Layouts)
  • Definition of Impacts
  • Definition of Work Zones

• Lid Sub-area Structural Assessment
  • Additional Framing Options (i.e. trusses)
  • Substructure and foundation design – consideration of seismic loads
  • Lid-to-Building structural interface assessment

• Interdisciplinary Coordination
  • Directed discipline specific task assignments to approximate costs and impacts
    • Technical Team Disciplines - E.g. Look at utility impacts, life safety requirements, etc.
    • Urban Design and Economics Teams – massing and edging
Next Steps - Massing & Edging

How will the lid structure be used and tie into the existing conditions along its edges?

Representative examples

NOTE: Study will not program the lid; it will only provide representative massing concepts.
Next Steps - Edging (Landscape)

Need to raise profile approximately 4-feet with allowance of 5-feet of landscaping above top of structure.

**ALTERNATE IDEA:**
Provide inverted tub girders or tub girder trench concept in this span (provide channel for deep landscaping)

Can provide allowance for 5-feet of landscaping above top of structure with no rise in profile.

---

**LEGEND:**
- Seneca Off-Ramp (Assumed to be Removed)
- Inadequate Clearance
- Adequate Clearance over roadway
- Adequate Clearance between roadway
- 3 Span Option

**TUB GIRDER TRENCH CONCEPT**

**INVERTED TUB GIRDER CONCEPT**

---

**NOTE:**
1. Superstructure development concepts shown are based on the low load level (i.e. landscaping/open space).
Next Steps - Edging (On-Lid Development)

Variation in grade from north to south edges of lid structure

LEGEND:
- Terra Firma Building Structure
- Lid Supported Building Structure
- Adequate Clearance over roadway
- Adequate Clearance between roadway
- Lid Structure
- Lid Structure ("paralleling" existing grade)

FLUSH LANDSCAPE
SLOPED LANDSCAPE
BUILT FLUSH TO GRADE
Next Steps - Edging (On-Lid Development)

Variation in grade from north to south edges of lid structure

Legend:
- Terra Firma Building Structure
- Lid Supported Building Structure
- Adequate Clearance over roadway
- Adequate Clearance between roadway
- Lid Structure

Concepts and materials shown are draft ideas for discussion purposes only.
Next Steps - Lid-to-Building Interface

Variation in grade from north to south edges of lid structure

EXAMPLE: 1 & 2 Manhattan West Over 240 ft Span Lid

High-Rise Columns Through Holes in Lid

High-Rise Core Adjacent to Lid

Precast Lid over Railroad

Georgi I. Petrov, Preetam Biswas, Ronald B. Johnson, Aurelie Sebiani &
Charles Bejsak (2018): Superficial Over the Train Tracks - One Manhattan West Tower, Structural
Engineering International. DOI: 10.1080/10168664.2018.1510125
Future Additional Technical Studies

Below is a list of future studies to be conducted under potential future phases of work...

- Traffic Network (transportation) Study
- Fire & Life Safety/Ventilation Study
- Construction Staging & Phasing Study
- Field Explorations (Geotechnical, surveying, etc.)
- Etc...
Closing Remarks

- **Indication** that it is **technically feasible** to construct a lid over Interstate-5 through downtown Seattle.
  - Additional in-depth technical studies, beyond the scope of this feasibility analysis will be necessary

- **Work-to-date is preliminary.**
  - Iterative process with refinements/updates through the course of the study
  - Other considerations required to address overall feasibility, informed by:
    - Urban context
    - Economic & financial feasibility
    - Governance assessment
    - Agency alignment

- Costs (capital, O&M) will be developed and shared by the 1/23 committee meeting
10 Minute Break
Sub-area Analysis and Small Group Discussion
Small Group Discussion

- Work in 3-4 groups of 5 people
- Use the discussion questions and materials at your table
- Each table will have a facilitator
- Technical resource staff will float between groups
- 65 minutes for small-groups and 40 minutes for report-out and discussion
Public Comment
Meeting Close

- Closing remarks
- Next steps and action items