Designing Resilience for the Portland Harbor Superfund Site

EPA's Flood Rise, Seismic, and Climate Change Considerations

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Portland Harbor Design Process 101



• What is design? A detailed plan for how the actual construction work will occur during remedial action.

 Who does it? Potentially Responsible Parties (PRPs) for different areas in the Portland Harbor Superfund Site will create the design plan, but EPA will approve final designs

Portland Harbor Design Process 101



EPA Provides Design
Guidelines to
Potentially
Responsible Parties



Potentially
Responsible Parties
Develop Design for
Area(s)



EPA Approves Design*

*Check-in with community will occur before design approval.

Portland Harbor Design Considerations



- Future use
- Habitat Restoration
- O&M Intensity
- Existing Structures
- Seismic Stability
- Existing Geology
- Flood Rise
- Constructibility
- Time to Construct
- Protectiveness

- Climate Resiliency
- Mobility of Contaminants of Concern (COCs)
- Concentration of COCs
- Materials Handling

Each design must balance many competing considerations.

How do we design for an unknown?



- Engineers need concrete conditions for designing the remedy.
- Identify a set of site specific conditions remedy should be evaluated against. All project areas will use similar events.
 - –Look at historic data, then project likely future occurances of those conditions.
 - –All large infrastructure projects have this challenge, so relevant professional standards exist.

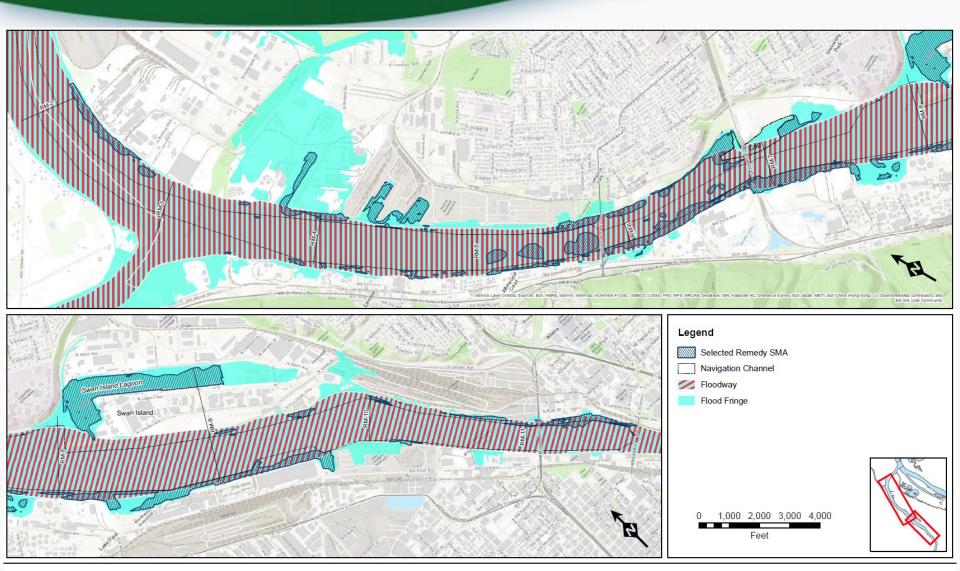
Flood Rise



- All construction in federally regulated floodways must demonstrate that it will **not** cause flood rise
 - –Otherwise, the construction must go through a waiver process that FEMA manages
- All Portland Harbor designs will be required to demonstrate that remedial action will not cause flood rise
 - –Parties must model pre and post construction conditions for today's 100 year storm.
 - -Any change to riverbed has potential to cause flood rise.
 - -Special attention will be given to areas where both sides of the river are being altered.

Federally Regulated Floodway





Questions on Flood Rise?

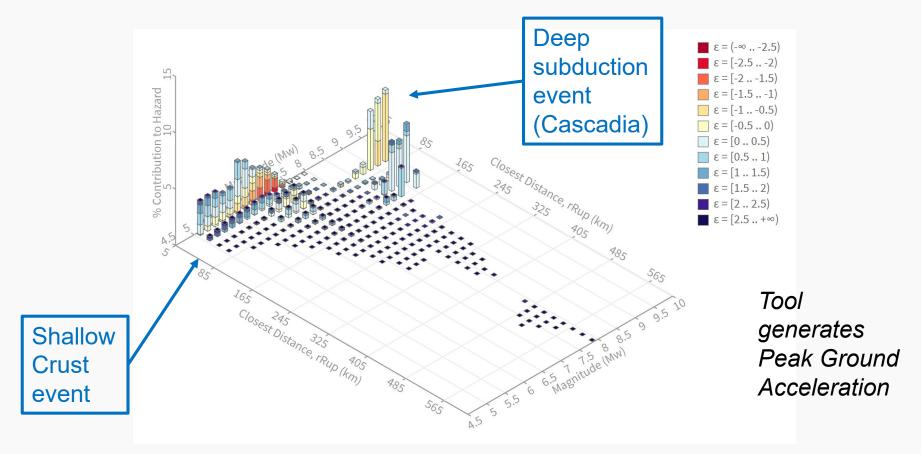
Scoping Seismic Evaluation



- Appropriate level of seismic event to evaluate
 - 475 year "return period" (the worst shaking that is likely to occur in 475 years)
 - Same as wharves and piers
- Potential seismic damage to evaluate during design
 - –Liquefaction of caps
 - -Liquefaction induced spreading of caps
 - Destabilization and displacement of riverbanks and subsurface slopes

Contingency Level Event Portland Harbor Superfund Site





Output from U.S. Geological Survey (USGS) Unified Hazard Tool

Seismic Resiliency



- Remember: EPA is asking designers to evaluate remedy performance for the worst earthquake likely to occur within 475 years
- If this event results in contaminated sediments being exposed, designers will evaluate engineering fixes.
- If engineering fixes aren't feasible, designers to incorporate post-earthquake assessments and repairs into Long-term Operations and Maintenance Plans.

Questions on Seismic Stability?

Climate Resiliency



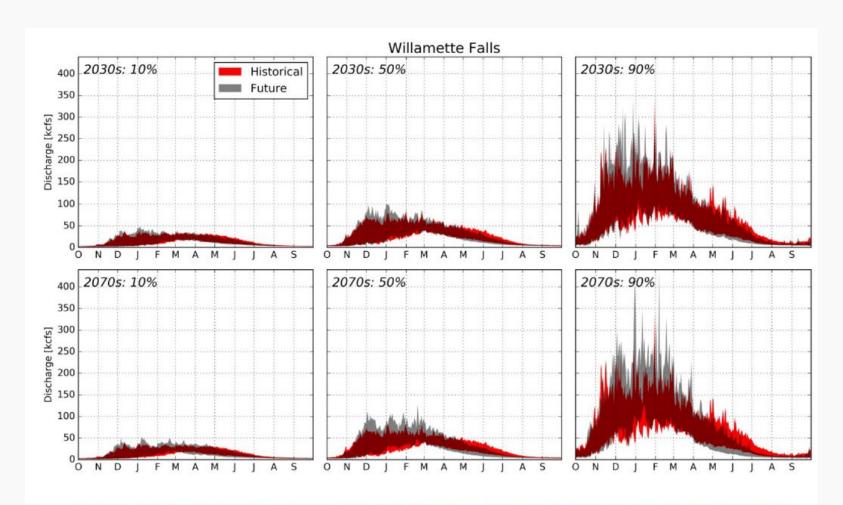


Figure 2. Range of 10/50/90 percentile flows at Willamette Falls for each day of the water year for the historical (1976-2005) and future periods 2030s (WY 2020-2049) and 2070s (WY 2060-2089). Reproduced from Pytlak et al. (2018).

Climate Resiliency Considerations for Remedial Design



Likely impacts to the Willamette River

- -Higher winter flows, lower summer flows
- -Higher sea level which increases backwater effect

Likely impacts to remedy that require evaluation

- Erosion protection measures for caps due to faster flowing water
- -Shoreline stabilization and erosion protection further up contaminated banks due to higher water levels

Climate Resiliency Evaluation



- Planning Horizon 2100 (snapshot in 2100)
- Use reasonably conservative forecast of temperature
 - Intergovernmental Panel on Climate Change and other models
- Rely on existing models of likely rainfall in Western OR
 - Climate Impacts Group at University of Washington
- Rely on agency projections of sea level rise
 - National Oceanic Atmospheric Administration, United States Army Corps of Engineers
- Plug likely rainfall and sea level rise into hydrodynamic model of the Willamette River
 - -U.S. Geological Survey through 2040
- Use resulting flowrates and water elevation as considerations in design



Questions on Climate Resiliency?

Design Considerations Final Thoughts



- Each design must balance a lot of competing issues
- EPA will evaluate each design in the full context of its project area
- Potentially Responsible Parties (PRPs) will remain responsible for any contamination left in place
- Five Year Review process provides mechanism to ensure the remedy remains protective
- **Note:** EPA is planning informal public feedback opportunities for conceptual designs.

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