PURPOSE OF MEETING

– **Update** on Corps’ planning process since December open houses
– Explain **next steps**, including when the draft report is scheduled for release to the public for comment
KEY MILESTONES IN A 3x3 STUDY

- Scoping & Alt. Formulation
  - Alternatives Milestone
    - 9 Jan 2019
  - Section 1002 letter to NFS (<90 days after FCSA executed)

- Alternative Evaluation & Analysis
  - Tentatively Selected Plan Milestone
    - 3 Oct 2019

- Feasibility Analysis of Selected Plan
  - Agency Decision Milestone
    - 3 Apr 2020
  - Draft Report Released for Concurrent Review
    - 3 Dec 2019

- Washington-level Review
  - District Final Report Package Transmittal
    - 2 Apr 2021
  - Draft Chief’s Report Released
  - Chief’s Report Signed
    - 3 Oct 2021

Key:
- Decision Milestone Product
- Milestone
- Includes Final Biological Opinion

<3 months | <9 months | ~ 6 months | ~ 12 months | ~ 6 months

-$800k-$
**CORPS FEASIBILITY STUDY PROCESS**

**Scoping**
- Public input addressed
- Data gathering
- Environmental coordination began

**Alternatives Formulation & Analysis**
- Formulate, evaluate alternatives
- Draft Feasibility Report & Environmental Assessment released for public review, comment
- Agency endorsement for further design of recommended plan

**Feasibility-Level Design**
- Further refine recommended plan; develop ~35% designs and cost estimate
- Final Feasibility Report & Environmental Assessment released

**Chief’s Report**
- Report to Congress to seek authorization for Construction
- Environmental compliance complete

Completed: April 2020 – April 2021
Present: April 2021 – Oct 2021
STUDY AUTHORITY AND SPONSOR

– Authority: Section 216 of the Flood Control Act of 1970 (33 U.S.C. § 549a)

– SMART Planning status: 3x3x3 compliant
  • Title IV, Division B of the Bipartisan Budget Act of 2018, Public Law 115-123, enacted February 9, 2018 authorizes the Government to conduct the study at full Federal expense.

– Non-Federal Sponsor:
  Columbia Corridor Drainage Districts Joint Contracting Authority
WHAT IS FLOOD RISK?

Risk = Hazard + Performance + Exposure + Vulnerability + Consequences

Flood Risk (simplified) = Flood Probability x Flood Consequences
FEDERAL INTEREST

Levee System

– All 4 drainage districts were authorized and constructed in either or both the 1936 and 1950 Flood Control Acts.
– Additional work has occurred on the flood control system in all 4 drainage districts in subsequent years

Significance

The study area is a cornerstone to the regional, statewide, and national economy with over $16 billion in annual economic activity generated from businesses and over $7.3 billion in property values within the levee protection area.
– Population At Risk estimated at approximately 60k
– Hundreds of businesses
– 10% of Multnomah County’s jobs
– Drinking water supply to 966,600 customers
– Natural gas pipeline that serves two states
– 2 airports:
  • Portland International Airport (50k passengers/day, 18.4 M/year)
  • US Air National Guard Base
– 3 Interstate highways: I-5, I-205, I-84
– 2 Transit and a Class I freight rail lines
PROBLEMS

Consequences of flood risk
- **Life Safety**: large population at risk; difficult to evacuate
- **NED Economic Losses**: critical infrastructure, structures, contents, vehicles, hazardous materials inundation

Weaknesses in existing system
- Overtopping of existing levees
- Weak points (e.g. Railroad embankment)
- Aging infrastructure
- Pump stations lack of adequate pumps / relief wells
OBJECTIVES & CONSTRAINTS

Objectives (within the PMLS, over the period of analysis)

– Reduce flood damages, in particular to critical infrastructure
– Reduce threats to life safety from flooding, and increase awareness of flood risk
– Increase resiliency of the flood management system
– Increase reliability of the flood management system
– Improve operability of the flood management system
– To the extent practicable, provide opportunities for recreation, natural resources, and cultural resources.

Constraints

– Cross-levees must stay in place
– Railroad embankment will not be considered a levee in the same alignment.
– Existing road infrastructure remains unchanged.
INITIAL MEASURES

1. Elevate structures
2. Flood proof buildings
3. Buy outs
4. Relocation of residences/ businesses/ critical infrastructure
5. Widen levees
6. Early warning/flood evacuation systems
7. Increase levee heights (this includes cross levees, mainstem, slough)
8. Maximize/increase flood storage capacity in the Willamette Basin Projects
9. Bigger facility: buy real estate to expand horizontal
10. Add pump capacity
11. Add gates
12. Add ring levees
13. Riprap
14. Improve Flood Fight: access roads, mobility of flood fighters, remove restrictions for equipment
15. Automate operations in the systems
16. Improve permeability: paved parking lot replaced with grid & grass
17. Increase wetlands/retention ponds
18. Complete Seismic retrofits
19. Install Portable pumps similar to Brazil
20. Add redundancy for pump system
21. Install Submersible pump stations
22. Improve/Increase Debris control
23. Relocate MCDD Headquarters out of floodplain (COOP plan)
24. Reroute water/floodwater
25. Construct levee next to railway/ highway to act as drainage seep
26. Aquatic invasive plants control/eradication
27. Recreation trails on top of levees
28. Operate tide gates to increase flow
29. Improve/Increase seepage berms
30. Build additional levees/floodwalls
31. Remove existing levee (Pen 1)
32. Rehab or replace mechanical/structural features: gates, valves, pumps
33. Adjust/ensure levee slopes meet current standards
34. Relocate transportation corridors
35. Utilize setback levees
36. Education on flood risk
37. Install/Improve Signs for evacuation
38. Removal of Levee Vegetation
39. Address existing erosion/control future erosion on levees
40. Reduce Area of Protection
41. Establish "safe zones" for evacuation
   Stem wall
42. Add relief or overflow areas
43. Zoning
44. Secure floating homes
MEASURES RETAINED (13/45)

**Structural**
5. Improve levee performance  
7. Increase levee heights  
10. Add pump capacity  
20. Add redundancy for pump system  
30. Build additional levees/floodwalls  
32. Rehab or replace mechanical/structural features: gates, valves, pumps

**Non-Structural**
6. Early warning system/flood evacuation system  
15. Automate operations in the systems  
26. Aquatic invasive plants control/irradiation  
37. Install/improve signs for evacuation  
41. Establish "safe zones" for evacuation life/safety

**Next steps:** Evaluate interior drainage (4 measures)
Minimal flood risk benefits: If Pen 1 levees didn’t exist during February 1996 flood, decrease in flood levels in would have been negligible. (0.02’)

– Small area relative
– Columbia Slough is too small: does not improve conveyance
Increase levee height between Pen 2 and MCDD
Alternative 4

Replace with Updated Map

Key to Features
- Pump Stations
- Levee Centerline
- Nonstructural
- Structural
- Widen Levee
- Increase Levee Height

Alternative Measures


PORTLAND METRO LEVEE SYSTEM
Alternative 5: Uniform AEP

Key to Features
- Pump Stations
- Levee Centerline

Alternative Measures
- Nonstructural
- Structural
- Widen Levee
- Increase Levee Height
- Bank Protection

Replace with Updated Map
WHAT IS FLOOD RISK?

Flood Risk (simplified) = Flood Probability x Flood Consequences
HOW CAN THE SYSTEM FAIL?

BREACH PRIOR TO OVERTOPPING

OVERTOPPING WITH BREACH

COMPONENT MALFUNCTION OR IMPROPER OPERATION

OVERTOPPING WITHOUT BREACH
PROBABILITY OF LEVEE FAILURE?

- Less fragile
- More reliable
- More fragile
- Less reliable

River elev.

Probability of breach
MODEL RESULTS: FUTURE WITHOUT PROJECT

Levee Failures by Flooding Mode

- Percent of modeled failures

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Overtopping</th>
<th>Fragility</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEN1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEN2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCDD_W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCDD_E</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>SDIC</td>
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<td></td>
</tr>
</tbody>
</table>

Legend:
- Black: Total
- Light Blue: Overtopping
- Brown: Fragility
RAILROAD SEGMENT

– Site of levee breach during 1948 flood
– Unknown condition currently
– Currently assuming no cooperation is possible with railroad, though discussions continue
LEVEE BREACH SCENARIOS

DEPTH

ARRIVAL TIME
LIFE LOSS MODELING

Yellow: Warned, not mobilized
Red: Loss of life
Flooding caused from stormwater runoff, beyond the ability of pump stations to control.
Flooding caused from stormwater runoff, beyond the ability of pump stations to control.
ENVIRONMENT CONSIDERATION

Add information supporting why our actions are minimal
COORDINATION OF PLANS

How would LRC plans fit with the Corps Plan
KEY MILESTONES IN A 3x3 STUDY

- <3 months
  - Scoping & Alt. Formulation
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$800k
DISCUSSION
<table>
<thead>
<tr>
<th>Measure</th>
<th>Reason for screening</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elevate structures</td>
<td></td>
</tr>
<tr>
<td>2. Flood proof buildings</td>
<td></td>
</tr>
<tr>
<td>3. Buy outs</td>
<td></td>
</tr>
<tr>
<td>4. Relocation of buildings / infrastructure</td>
<td></td>
</tr>
<tr>
<td>8. Maximize/increase flood storage capacity in the Willamette Basin Projects</td>
<td>Only reduces flood affects caused by the Willamette River; outside study authority and operational authority for WVP.</td>
</tr>
<tr>
<td>9. Bigger facility</td>
<td>Outside the study footprint, governance; does not meet objectives.</td>
</tr>
<tr>
<td>11. Add gates</td>
<td>Does not meet objectives; does not fit hydraulic conditions of this area</td>
</tr>
<tr>
<td>12. Add ring levees</td>
<td></td>
</tr>
<tr>
<td>13. Riprap</td>
<td></td>
</tr>
<tr>
<td>14. Improve Flood Fight</td>
<td></td>
</tr>
<tr>
<td>16. Improve permeability</td>
<td>Would need to have a high percentage of impermeable parking lots to make a difference in flood events, groundwater table is high.</td>
</tr>
<tr>
<td>17. Increase wetlands/retention ponds</td>
<td>Ground water is high, probably won't have retention capability</td>
</tr>
</tbody>
</table>
## SCREENED OUT MEASURES

<table>
<thead>
<tr>
<th>Measure</th>
<th>Reason for screening</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. Complete seismic retrofits</td>
<td>Cost prohibitive</td>
</tr>
<tr>
<td>19. Install very large portable pumps</td>
<td>Cost prohibitive</td>
</tr>
<tr>
<td>22. Improve/increase Debris control</td>
<td></td>
</tr>
<tr>
<td>23. Relocate MCDD Headquarters</td>
<td></td>
</tr>
<tr>
<td>24. Reroute water/floodwater</td>
<td>No opportunities to do bypass channel.</td>
</tr>
<tr>
<td>25. Construct levee next to railway/highway</td>
<td>Other measures meet same intent.</td>
</tr>
<tr>
<td>27. Recreation trails on top of levees</td>
<td></td>
</tr>
<tr>
<td>28. Operate tide gates to increase flow</td>
<td>Primarily for ecosystem restoration, no significant flood attenuation; does not meet objectives. Could be utilized under separate authority</td>
</tr>
<tr>
<td>29. Improve/increase seepage berms</td>
<td></td>
</tr>
<tr>
<td>31. Remove existing levee</td>
<td>Primarily for ecosystem restoration, no significant flood attenuation; does not meet objectives.</td>
</tr>
<tr>
<td>33. Ensure levee slopes meet standards</td>
<td></td>
</tr>
</tbody>
</table>

**Screening criteria**
- Carried out by non-Federal entity?
- Meets primary planning objective?
- Avoids planning constraints?
- Technically feasible?
<table>
<thead>
<tr>
<th>Measure</th>
<th>Reason for screening</th>
</tr>
</thead>
<tbody>
<tr>
<td>34. Relocate transportation corridors</td>
<td>Cost prohibitive. The Sponsor can continue to communicate/coordinate with transportation agencies as they develop future plans</td>
</tr>
<tr>
<td>35. Utilize setback levees</td>
<td>Does not meet project purpose; would be effective in increasing the floodway/plain</td>
</tr>
<tr>
<td>36. Education on flood risk</td>
<td></td>
</tr>
<tr>
<td>38. Removal of levee vegetation</td>
<td></td>
</tr>
<tr>
<td>39. Erosion control</td>
<td>Not specific enough to evaluate: replaced by measures 13, 33.</td>
</tr>
<tr>
<td>40. Reduce area of protection</td>
<td>Does not meet project purpose</td>
</tr>
<tr>
<td>42. Stem wall</td>
<td>Redundant with other measures</td>
</tr>
<tr>
<td>43. Add relief or overflow areas</td>
<td>Limited room, minimal flood attenuation benefit.</td>
</tr>
<tr>
<td>44. Zoning</td>
<td>Non-Federal Action</td>
</tr>
<tr>
<td>45. Secure floating homes</td>
<td></td>
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**Screening criteria**

- Carried out by non-Federal entity?
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