LOCAL ACTIONS PROGRAM

TECHNICAL ADVISORY GROUP MEETING #7

February 8, 2021

DEPARTMENT OF ECOLOGY
State of Washington
OFFICE OF CHEHALIS BASIN

AGENDA

- Welcome
- Discuss TAG Work and Next Steps
  - Phasing of next steps and the TAG's role
  - Modeling, including climate change
  - Floodplain storage
  - Additional analyses for structural options
  - Acquisition program
  - Erosion strategy
  - Urban stormwater
- Discuss suggested revisions to planning assumptions and outcomes related to different flood events
- Open discussion on the work completed or future technical work

TAG WORK AND NEXT STEPS

INITIAL TECHNICAL ADVISORY GROUP WORK

- Use of existing models and other information used to predict the cause and extent of flooding
- Climate change predictions to predict future flood conditions
- Additional locations to increase flood storage either through restoration of natural conditions or removal of infrastructure
- Additional approaches to protect high value structures and critical infrastructure such as improving or building new levees, floodwalls, or pump stations
- Ways to address damage from accelerated bank erosion

TAG IDENTIFIED REMAINING ISSUES (JAMBOARD LIST)

- Phasing of next steps
- Identifying the process for reviewing and prioritizing proposed projects.
- Can we recommend any projects as a result of this process?
- How will the TAG be able to respond and/or participate when the Board is making decisions based on this work?
- Summarizing additional studies that will be needed to better refine alternatives.
- Integration of ideas and conceptual layouts for proposed elements.
- Are there additional climate models that we should consider? There is considerable variability in model outcomes depending on available data. Maybe consider additional studies?
- How to integrate additional hydrologic and hydraulic modeling to support both the flood damage and ASRP needs.
- Define a process (including funding) for property acquisitions
- If buyouts and relocations are implemented, who will own the purchased land and who will be responsible for maintaining?
- Has urban stormwater runoff been evaluated due to impervious surface contributions? Stormwater basin planning may help lead to stormwater infrastructure improvements to reduce peak discharges to tributaries and the mainstem

ADDITIONAL ISSUES: PHASING OF NEXT STEPS/TAG ROLE

- Phasing of next steps.
- Identifying the process for reviewing and prioritizing proposed projects.
- Can we recommend any projects as a result of this process?
- How will the TAG be able to respond and/or participate when the Board is making decisions based on this work?
- Summarizing additional studies that will be needed to better refine alternatives.

OFFICE OF CHEHALIS BASIN NEXT STEPS

- OCB will summarize results from advisory group discussions and staff work, identify differing technical and policy perspectives to the Board and a table with the current progress for each work element.
- OCB is not recommending specific projects to the Board but the options (studies or additional analyses) for how specific projects could be pursued if the Board chooses.
- Future involvement of the TAG will depend on Board decisions and interest of TAG members.
- TAG members are welcome to provide individual input to the Board through written correspondence or during Board meetings.

ARE THERE ADDITIONAL CLIMATE MODELS THAT WE SHOULD CONSIDER?

THERE IS CONSIDERABLE VARIABILITY IN MODEL OUTCOMES DEPENDING ON AVAILABLE DATA. MAYBE CONSIDER ADDITIONAL STUDIES?

RECAP OF MODELING (NEAR TERM)

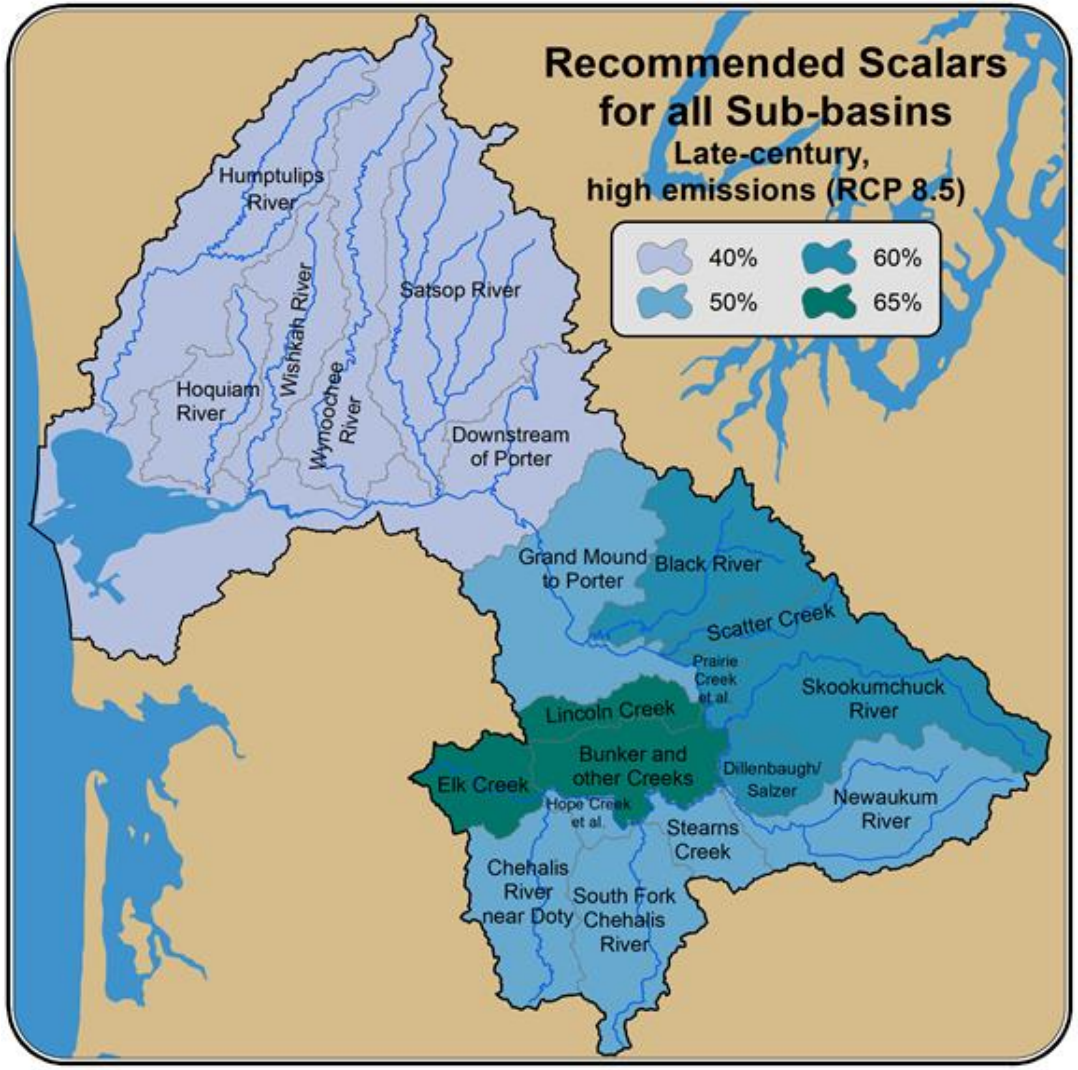
- Use of existing models and other information to predict the cause and extent of flooding
  - Near term, use the existing RiverFlow2D hydraulic model and supplement with additional modeling for tributaries
  - Floodplain extent updates (see climate change)
- Climate change predictions to predict future flood conditions
  - Completed a complementary analysis on precipitation to provide tributary-based information
  - Created floodplain extent and depth data for a higher end scenario (e.g., 50% increase) for the 2080 100-year flood condition

RESULTS FROM PRECIPITATION ANALYSIS

- CIG's analysis shows that there are distinct variations in projected precipitation increases across the basin
- Differences are relatively consistent among all of the climate models evaluated. Changes in upper basin are larger than changes in the lower basin.
- Within the upper basin, projected increases are somewhat lower for the Upper Chehalis and Newaukum Rivers than for the Skookumchuck River and Scatter Creek. Elk Creek and Lincoln Creek are slightly higher.
- The analysis suggests that spatially distributed scaling factors should be used to characterize future flows across the Chehalis basin, as opposed to a uniform scaling factor across all subbasins.

RESULTS FROM PRECIPITATION ANALYSIS

- The 2080 high end climate change simulations were updated to use spatially distributed scaling factors based on the maximum change projected among 12 global climate models (GCMs).
- Results using these high-end scalars can be considered as a complement to the results with the 26% scaling used for the SEPA DEIS.
- The 26% increase is comparable to the average precipitation increase among the 12 GCMs evaluated.



FLOODPLAIN DELINEATION WITH CLIMATE CHANGE

- Purpose: Prepare an approximate delineation of the late-century 100-year floodplain in the Chehalis Basin
- Action: Update and refine existing models or construct new models:
  - Use spatially distributed climate change scalars (40-65%)
  - Model the floodplains for mainstem Chehalis River and the following tributaries
    - Wishkah River (RM 0 to 13)
    - Wynoochee River (RM 0 to 17)
    - Satsop River (RM 0 to 6)
    - W Fork Satsop River (RM 0 to 3)
    - E Fork Satsop River (RM 0 to 5)
    - Black River (RM 0 to 11)
    - Lincoln Creek (RM 0 to 5)
    - Skookumchuck River (RM 0 to 22)
    - Salzer Creek (RM 0 to 5)
    - Newaukum River (RM 0 to 11)
    - Scatter Creek* (RM 0 to 20)
    - N Fork Newaukum River (RM 0 to 11)
    - S Fork Newaukum River (RM 0 to 20)
    - Stearns Creek (RM 0 to 5)
    - E Fork Stearns Creek (RM 0 to 6)
    - W Fork Stearns Creek (RM 0 to 2)
    - Deep Creek (RM 0 to 6)
    - Bunker Creek (RM 0 to 10)
    - Lake Creek (RM 0 to 13)
    - S Fork Chehalis River (RM 0 to 22)
    - Stillman Creek (RM 0 to 3)
    - Elk Creek (RM 0 to 6)

COMPARISON BETWEEN CURRENT MODELING OF CLIMATE CHANGE EFFECTS AND WSDOT ANALYSIS

River	Location (River Mile)	WSE 100-year Existing	WSE 100-year 26% Universal Increase		WSE 100-year 50% Spatial Increase		WSDOT	WSDOT + 25% Increase	
		Elev (ft NAVD)	Elev (ft NAVD)	Diff (feet)	Elev (ft NAVD)	Diff (feet)	Elev (ft NAVD)	Elev (ft NAVD)	Diff (feet)
Newaukum	2.27	186.9	188.1	1.2	189.0	2.1	191.0	191.6	0.6
	1.92	186.6	187.8	1.2	188.7	2.1	188.1	189.5	1.4
	1.66	186.4	187.4	1.0	188.2	1.8	187.4	189.7	2.3
	0.1	186.1	187.0	1.0	187.8	1.8	186.4	188.0	1.6
Chehalis	77.17	186.8	187.3	0.5	187.6	0.8	187.6	189.5	1.9
	76.36	186.1	187.1	1.0	187.9	1.8	186.9	188.8	1.9
	74.82	184.6	185.9	1.3	187.1	2.5	184.8	187.2	2.4
	72.58	179.6	182.8	3.2	184.9	5.3	183.1	185.3	2.2
	71.72	179.5	182.3	2.8	184.4	4.9	181.7	184.0	2.3
	71.48	179.5	182.3	2.8	184.4	4.9	181.7	183.9	2.2
	69.52	179.3	182.3	3.0	184.3	5.0	180.4	182.8	2.4
	69.23	179.2	182.2	2.9	184.3	5.0	180.4	182.9	2.5
	67.46	177.0	179.6	2.7	181.9	4.9	177.9	180.1	2.2
		Average Increase (feet)		**1.9**		**3.3**			**2.0**
		Maximum Increase (feet)		**3.2**		**5.3**			**2.5**

COMPARISON BETWEEN CURRENT MODELING OF CLIMATE CHANGE EFFECTS AND WSDOT ANALYSIS

- WSDOT used 25% to account for hydrologic uncertainty, future development, land-use change and climate change
- Current modeling uses 26% (average) or 50% (max) increase to account for climate change
- WSDOT found that 3 feet of freeboard was adequate for 25% flow increase
- Current analysis shows water level increases as large as 3.2 feet (for 26% scenario) or 5.3 feet (for 50% scenario)
- Results not directly comparable due to differences in analysis method and project vs non-project condition, but the relative changes can be compared

ARE THERE ADDITIONAL CLIMATE MODELS THAT WE SHOULD CONSIDER?

- There are other scenarios that could be used and climate projections will continue to evolve.
- At this time, OCB is not recommending the use of other climate models but this is something that should be evaluated over time.
- Do TAG members have additional comments regarding evaluating climate effects on hydrology/flooding?

EVALUATION OF DIFFERENT FLOOD EVENTS (CASEY KRAMER)

SUGGESTED REVISIONS TO PLANNING ASSUMPTIONS AND OUTCOMES FOR EVALUATING FLOOD DAMAGE REDUCTION FROM LOCAL ACTIONS PROGRAM

SUMMARY

- *During the January 8, 2021 TAG meeting, there was discussion around the need to refine some of the Board's Planning Assumptions and Desired Outcomes*

- *A DRAFT Memo was developed for TAG review and input*

- *The DRAFT Memo recommends a way to provide a clearer approach to planning efforts that will address the Board's Desired Outcomes related to flood hazards caused by inundation as well as flood hazards caused by erosion*

PLANNING ASSUMPTIONS

EXISTING - PLANNING ASSUMPTION 2. FUTURE FLOOD CONDITIONS

- *The Local Actions Program will plan for the 100-year flood conditions that are predicted for 2080 when considering outcomes and actions to include in the program.*

DRAFT PROPOSED - PLANNING ASSUMPTION 2. FUTURE FLOOD HAZARD CONDITIONS

- *The Local Actions Program (LAP) recognizes there are multiple flood hazard conditions within the basin, which can occur at various flood flows (magnitude, frequency, and duration), each being location specific. To provide clarity in evaluating the Board's Desired Outcomes, future flood hazard conditions have been divided into two main categories, specifically:*
    1. *Flood Inundation Hazards*
    2. *Erosion Hazards*

DRAFT TECHNICAL STATEMENT REGARDING SMALLER, MORE FREQUENT FLOOD EVENTS

1. Flood hazards caused by inundation ("**Flood Inundation Hazards**")
   - *The Board desires that all potential actions considered for addressing flood inundation hazards be evaluated for future flood conditions, up to and including the 2080, 100-year flood. The Board recognizes that some transportation routes may be inundated by lower magnitude, higher frequency flood events and that investigating projects that focus on these lower magnitude flows may assist in keeping transportation routes open more frequently, compared to existing conditions, and be more cost-effective than trying to solve for the 2080, 100-year flood flows.*
2. Flood hazards caused by erosion ("**Erosion Hazards**")
   - *The Board recognizes that erosion hazards are more appropriately evaluated under more frequent, lower flow conditions.*

DRAFT RECOMMENDED FLOWS FOR EVALUATION

1. **Flood Inundation Hazards**
   - 2080, 100-year flood
   - Flows determined on a reach/project basis using feedback from local communities/Tribes/agencies on existing observed flood inundation hazards
2. **Erosion Hazards**
   - Evaluation to determine historic average erosion rates
   - Determination of ways to assess potential changes to erosion rates (e.g., will climate change, development of basin, etc. effect magnitude/duration/frequency of floods that may change erosion rates)
   - Determine timeframe (e.g., 30- , 50- , 100-, X years) for determining erosion hazard boundaries based on historic and future average erosion rates
   - Once erosion hazard boundaries are delineated, assess potential risk to assets (structures, infrastructure, agriculture, habitat, etc.) identified by local communities/Tribes/agencies

EVALUATION OF DIFFERENT FLOOD EVENTS

- What additional feedback or comments do you have on the technical statement?

HOW TO INTEGRATE ADDITIONAL HYDROLOGIC AND HYDRAULIC MODELING TO SUPPORT BOTH THE FLOOD DAMAGE AND ASRP NEEDS

ADDITIONAL NEAR-TERM AND LONG-TERM HYDROLOGIC AND HYDRAULIC MODELING OPTIONS

- Near-term – use available main stem and tributary models to delineate 2080 floodplain
- Long-term – develop new or updated hydraulic modeling to facilitate evaluation of flood damage reduction on the following tributaries:
  - Skookumchuck River
  - Newakum River
  - Satsop River
  - Wynoochee River
  - Alder and Mill Creeks
  - Cloquallum Creek
  - South Fork Newaukum River
  - Salzer Creek
  - Aberdeen/Hoquiam Stormwater Master Plan
- For Board Consideration:
  - Update prioritization using latest modeling and 2080 floodplain analysis

HOW TO INTEGRATE ADDITIONAL HYDROLOGIC AND HYDRAULIC MODELING TO SUPPORT BOTH THE FLOOD DAMAGE AND ASRP NEEDS.

- What additional questions or comments does the TAG have?

FLOODPLAIN STORAGE AND ADDITIONAL ANALYSES FOR STRUCTURAL OPTIONS

FLOOD STORAGE

- Additional locations to increase flood storage either through restoration of natural conditions or removal of infrastructure
  - Additional flood storage along mainstem Chehalis at 2080 100-year flow is insufficient to reduce flood damage, but could provide localized benefits at lower flows or in tributaries
  - Additionally, there is potential for a multi-benefit synergy when combining additional floodplain storage with habitat restoration through the ASRP
- Long term option for flood storage evaluation could be to expand the analysis to additional tributaries

PROTECT HIGH VALUE STRUCTURES AND CRITICAL INFRASTRUCTURE

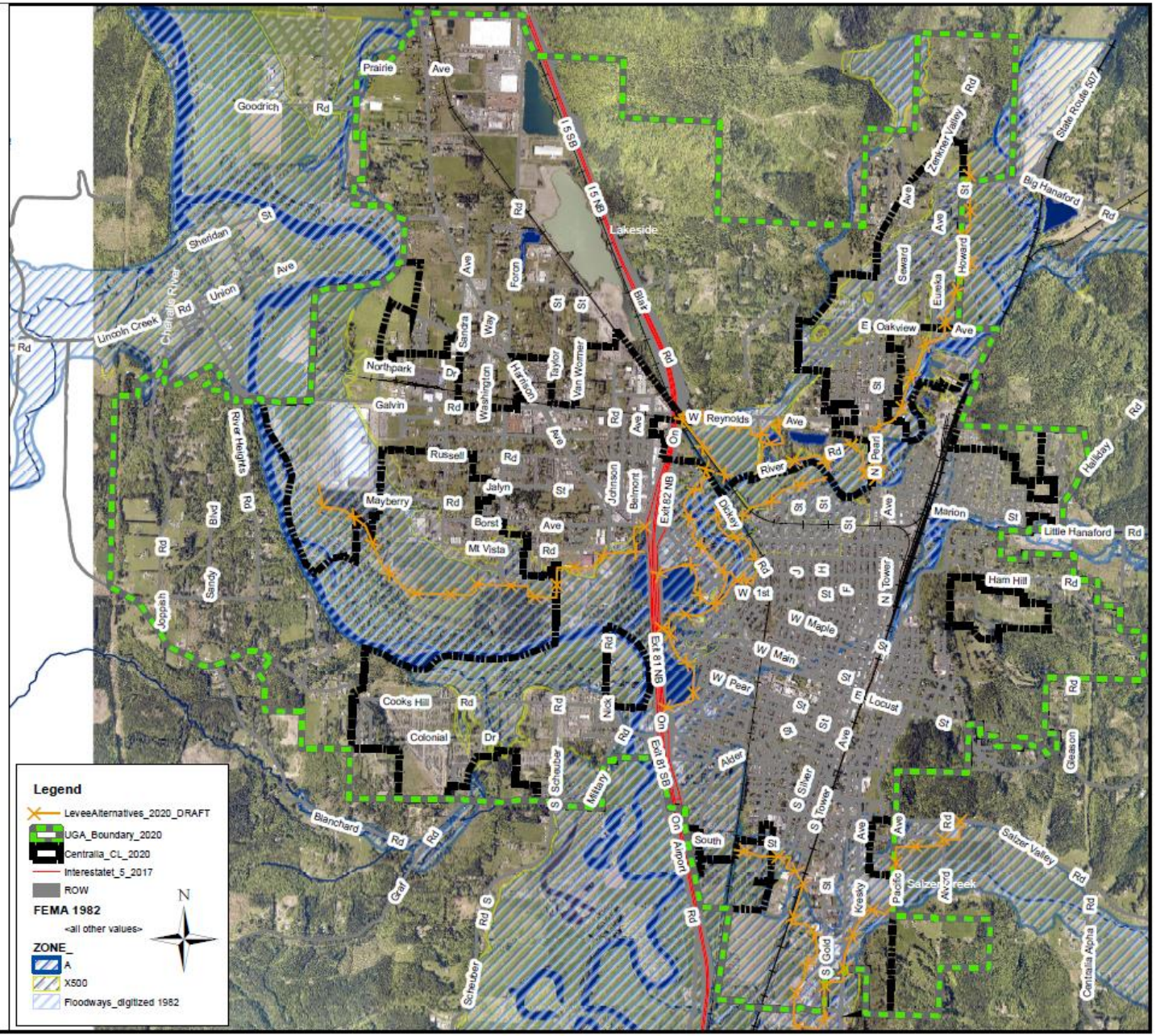
- Additional approaches to protect high value structures and critical infrastructure such as improving or building new levees, floodwalls, or pump stations
  - Areas of higher density development within the 2080 100-year floodplain were identified for potential local infrastructure such as levees; these areas could also be considered for flood-proofing or relocations
- Long-term option is to further analyze the 14 areas identified in the near-term analysis (modeling, concept design, etc.)

SIDE BY SIDE – CORPS AND WSDOT STUDIES

Project Elements	Corps Study	WSDOT Study
Protection of I-5	Raise Airport Levee, levees or floodwalls from Mellen Street to Airport Levee, and segments between SR-6 and 13th Street exits and Dillenbaugh Creek	Raise Airport Levee, levees or floodwalls from Mellen Street to Airport Levee, and segments between SR-6 and 13th Street exits; levee segment south side of Chehalis
Protection of Chehalis	I-5 segments with connection to high ground south of 13th Street	Protection of much of Chehalis through I-5 protection
Protection of Centralia	I-5 segments, raise / extend Salzer Creek levee segments, raise / extend Skookumchuck River levees, raise Long Road levee, West Centralia levee segment, Skookumchuck Dam storage (11,000 ac-ft)	Segment north of Airport Levee could protect some portions of Centralia
Effects Upstream and Downstream	Initial estimate of 100-year elevation increase of 0.3 feet upstream of the Airport; updated estimate of 100-year elevation increase of 1 foot near Mellon Street, less than 1 foot elsewhere	Increase 100-year elevation up to 1.8 feet upstream of Airport; a few tenths downstream of the Airport
Tributaries	Did not address China Creek; Effects of floodgates on Salzer and Dillenbaugh creeks would need further analysis	Since I-5 is not constructed as a levee, concerns about Dillenbaugh Creek flooding and effects on roadbed
Stormwater	Did not address stormwater	Initial consideration for location of levees and floodwalls to accommodate stormwater from I-5
Mitigation	Initial mitigation, reconnect Chehalis River to SR-6 oxbow and divert flow and restore Scheuber Ditch as floodplain, wetland, stream, and riparian habitat	Not specifically identified
Costs	$123 mil initial authorization (2007); updated costs of $205 mil in 2012; updated cost does not include mitigation or China Creek and stormwater measures that could be required	$80-100 mil, but doesn't include widening costs which would add another $225-330 mil ($305-430 mil total)
Funding	Cost-shared with 65% federal dollars and 35% local dollars	State-WSDOT funding
Other Considerations	Initial identification of 8 structures that required floodproofing; not identified how many more structures that could be affected for 2012 work	Initial identification of 140 structures that could be negatively affected

A LOCAL PERSPECTIVE (EMIL PIERSON)

Concept Levee Map: Centralia Area with Floodplain and Floodway



TAG AND IAG FEEDBACK ON POTENTIAL NEXT STEPS FOR LOCAL STRUCTURAL FLOOD REDUCTION ACTIONS

- Status of existing levees (height, condition, etc.)
- Identify types of structures in priority areas (residential, commercial, etc.)
- Outreach to jurisdictions and public in priority areas on interest and need for local actions (potential interest in lower flood levels)
- Identify land use, zoning, buildout, economic and social justice considerations for jurisdictions
- Consider identifying initial alignment possibilities
- Modeling, if any areas worth analyzing further to help determine height and costs

ADDITIONAL ANALYSES FOR STRUCTURAL OPTIONS

- What questions or comments does the TAG have?

ACQUISITION PROGRAM

DIFFERENT STRATEGIES FOR ACQUISITION PROGRAMS

- Whether an acquisition program approach proactively seeks acquisitions and relocation to reduce all or most at-risk structures in certain strategic areas and/or…
- Responds to acquisition requests across a dispersed area.

ACQUISITION PROGRAM - IMPLEMENTATION GROUP FEEDBACK

- Program that is responsive to interest across the Basin - one of the tools in the toolbox (CFAR)
- Relocation of major portion of community in specific areas challenged by available locations, interest and potential economic/social equity issues
- Determination of feasibility requires significant advance work (master planning and outreach)

ACQUISITION PROGRAM

- What questions or comments does the TAG have?

EROSION STRATEGY

ADDRESS BANK EROSION DAMAGE

- Ways to address damage from accelerated bank erosion
  - Developing initial maps for up to 100 miles of high priority areas
  - Developing an erosion management approach to evaluate reach-scale opportunities for reducing erosion damages while protecting and enhancing habitats and ecological processes
- Long-term option
  - Identifying one or more pilot subbasins to outline how to develop a pilot technical assistance program for landowners with relative cost and staffing needed for a program (in coordination with staff from the Office of Chehalis Basin and Washington Department of Fish and Wildlife)
  - Potential to complete CMZ delineations in high priority areas

UPDATED EROSION MANAGEMENT STRATEGY

- Channel migration and bank erosion are natural processes that form and maintain habitats. However, erosion rates can become accelerated above natural rates due to land uses, facilities, hard bank protection or other factors.
- Recommend that erosion management projects should be developed and implemented in the context of reach-scale conditions and geomorphic processes…and promote the use of bioengineering techniques.
- Recommend that erosion management projects included within the Chehalis Basin Strategy occur only where they can be combined with habitat enhancement or where critical infrastructure is present and threatened and an expanded reach-scale project can be pursued that benefits both public and private landowners and enhances habitat.

UPDATED CRITERIA TO DETERMINE POTENTIAL FOR AN EROSION MANAGEMENT PROJECT

MUST MEET FIRST TWO CRITERIA:

1. A local project sponsor is willing to develop a reach-scale project with multiple landowners.
2. Erosion risk is immediate or near-term (within next 5 years) that that would cause significant damage to valuable structures, infrastructure, or productive agricultural land ("significant" loss or damage).

MUST MEET AT LEAST THREE OF THE BELOW CRITERIA:

1. Landowner is willing to consider relocation that would provide long-term reduced erosion (or flooding) risk (either with or without an associated bioengineered or habitat solution).
2. Landowner is interested in a bioengineered solution and willing to maintain a bioengineered solution as part of a funding agreement.
3. Opportunities exist for a reach-scale approach to reduce velocities through reconnecting former channels/swales, placement of large wood, riparian revegetation, bank sloping/terracing, or other elements that would benefit the reach and maintain or restore natural processes and/or habitats.
4. Project is likely to provide significant benefits for the cost to multiple landowners.

EROSION STRATEGY

- What additional questions or comments does the TAG have, or considerations that should be included in an erosion strategy?

URBAN STORMWATER

- Percentage of impervious surfaces in the basin are small, effect could be significant in small urban drainages but not on mainstem and major tributary flooding
- Considered as part of structural improvements consistent with the Strategy

TAG IDENTIFIED REMAINING ISSUES

- Can we recommend any projects as a result of this process?
- Phasing of next steps
- Identifying the process for receiving and prioritizing proposed projects.
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- Integration of ideas and conceptual layouts for proposed elements.
- Are there additional climate models that we should consider? There is considerable variability in model outcomes depending on available data. Maybe consider additional studies?
- How to integrate additional hydrologic and hydraulic modeling to support both the flood damage and ASRP needs.
- How will the TAG be able to respond and/or participate when the Board is making decisions based on this work?
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- Has urban stormwater runoff been evaluated due to impervious surface contributions? Stormwater basin planning may help lead to stormwater infrastructure improvements to reduce peak discharges to tributaries and the mainstem

QUESTIONS/COMMENTS

DO YOU HAVE ADDITIONAL COMMENTS ON THE WORK WE HAVE COMPLETED THROUGH THE TAG MEETINGS OR COMMENTS ON FUTURE TECHNICAL WORK?